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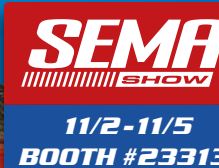
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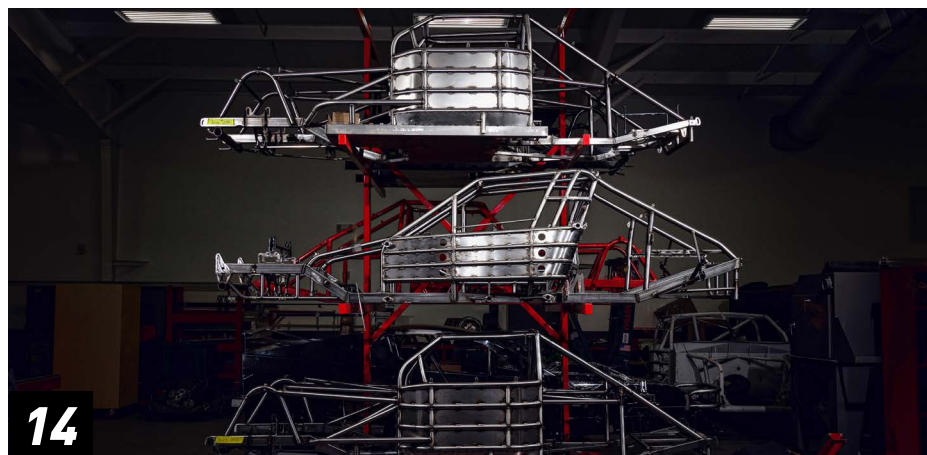
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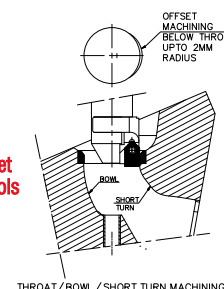
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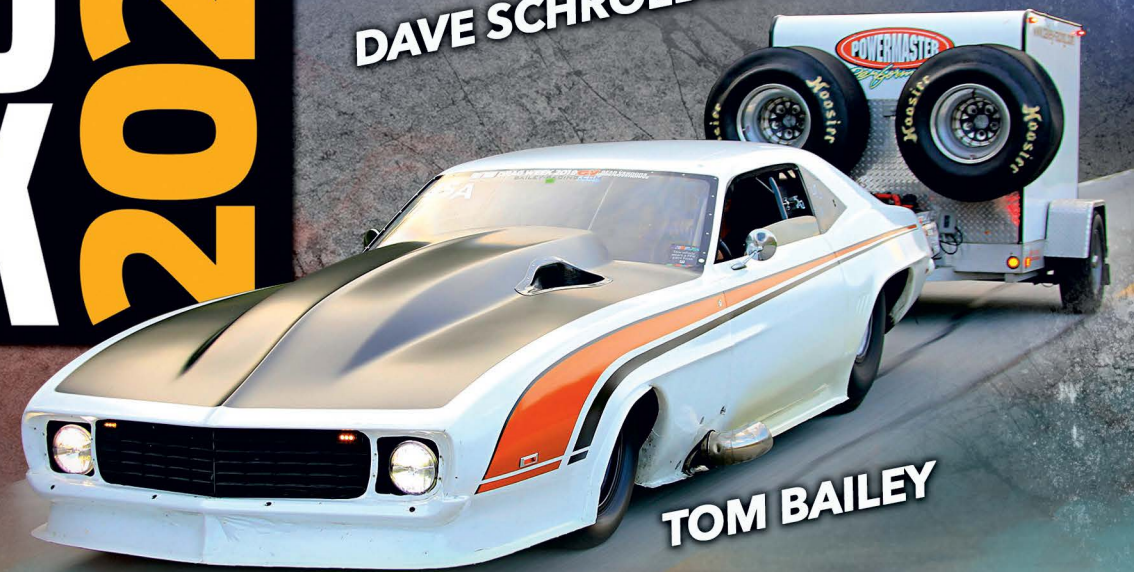
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FROM THE PRESIDENT

I have been to more race tracks in the last 30 days than at any point in my life. Racing is wild in America right now, and I could not be happier to see this industry at full throttle. A lot of my most recent visits have been in conjunction with the wildly successful PRI Road Tour—an across-the-country road trip that is bringing the world's best content creators to you and your favorite race track. Check out any of your favorite social platforms or the PRI website (performanceracing.com) for daily updates from the road. I also recently attended the SEMA/PRI Council Summit, where over 400 industry leaders from around the country gathered to discuss the latest strategies that will drive the industry forward. This event was hosted by and celebrated the new Chairman of the Board (congratulations to James Lawrence) as well as the new SEMA/PRI Board of Directors. From all of these interactions, I can give you a look at the challenges that we face as well as what PRI is doing to help.

Of the priorities presented by SEMA/PRI leadership, the preservation and growth of the motorsports industry was one of the top initiatives. You have already seen significant investment in staffing, programs, legal support, and entire programs (PRI Membership) designed to unite and protect the racing industry. This work will not stop, as the Board has pledged a long and continued devotion to motorsports professionals, track owners, sanctioning bodies, racers, and all of the people that make up the performance racing industry.

There are legislative challenges as well. At the local level, you may see this with city boards limiting the use of race tracks or, in some cases, banning the track from operating completely. We have also seen an increased enforcement of the Clean Air Act by the US Environmental Protection Agency. In some cases, this has spilled over into the racing industry with race shops seeing significant fines for putting race parts on race cars. This can happen

to you, and it will unless we come together to push back on this government overreach. PRI's legal team is on the job, and we have spent thousands of hours over the past year working to pass the RPM Act, as well as helping individual race tracks get back up and operational after being shut down by the pandemic.

There are other challenges in our industry that are not unique to racing. We are hearing from manufacturers that are experiencing shortages in staff (especially skilled technical help), raw materials of many types, and several key race parts, most notably tires. In fact, the lack of tires has forced the cancelation of some races in certain areas of our industry. If you have similar issues at your business, send us a note so we know what's going on with you and your company.

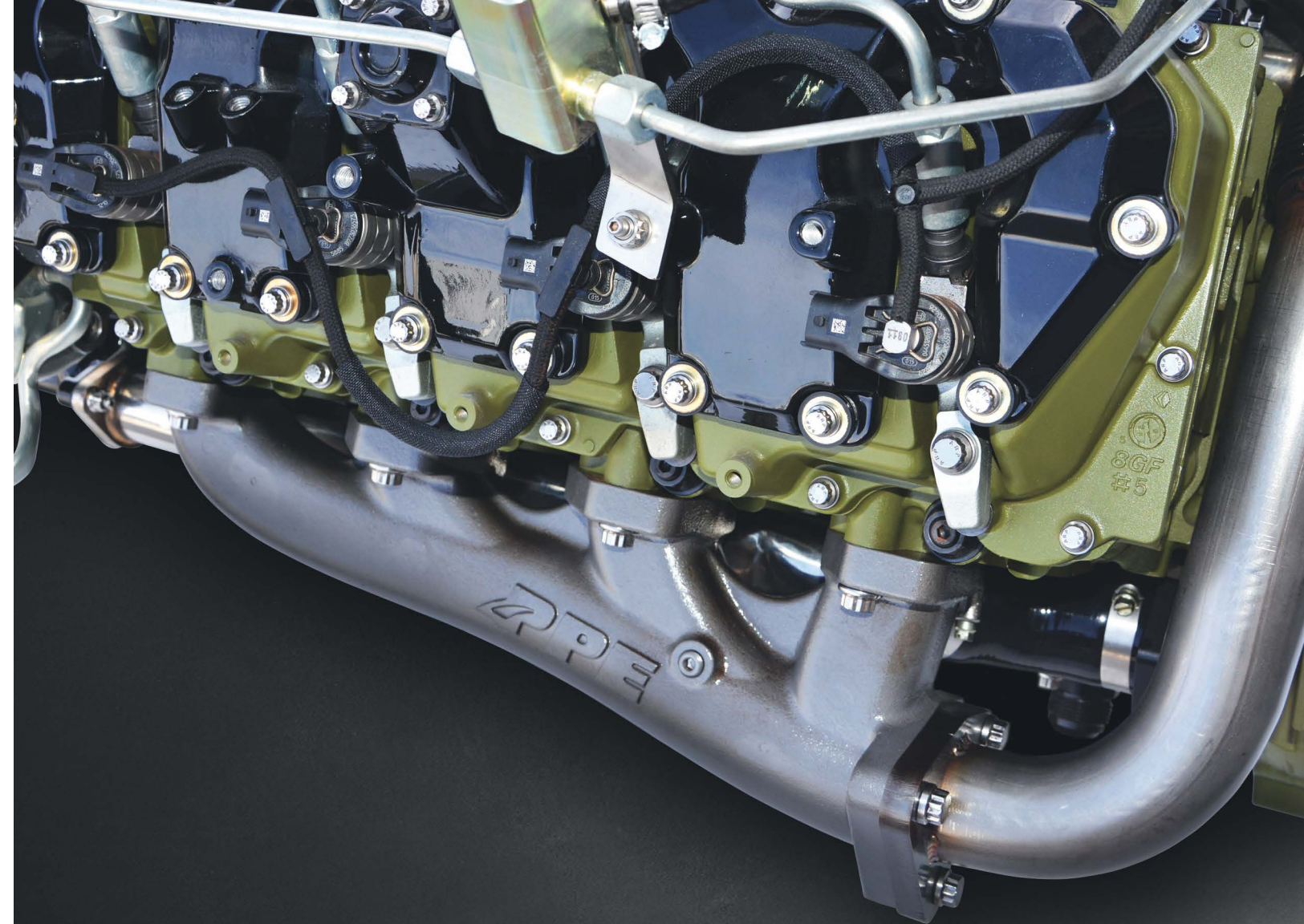
**“FOR MANUFACTURERS
AND SPONSORS, THE
SPORT HAS NEVER BEEN
SO HOT.”**

The Board is committed to improving the PRI Trade Show itself with cutting-edge content, the world's best race parts manufacturers, an educational program that is rivaled by no one, and a host city in Indianapolis that is very excited to hold the event. You will see several new Show elements this year, including a PRI Central area for all sorts of special activities, an electric vehicle (EV) racing area, and a reimagined area for content creators and influencers who shape the story of the racing industry.

I will close this month's letter as I started: I hope you are out there and actively participating in motorsports. For the racers, I know you have as many or more choices than you have ever had. For manufacturers and sponsors, the sport has never been so hot. Until the Show, I'll see you at the races. **PRI**



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FROM THE EDITOR

Three things I think while, just up the 405 Freeway, organizers are making final preparations for the Acura Grand Prix of Long Beach, set for September 24–26:

1) I THINK THERE ARE SEVERAL

interesting takeaways from this month's Special Report on the raw materials shortage that has dogged motorsports parts manufacturers and service providers dating back to last year. Beginning on page 64, contributor Steve Statham's article provides an inside look at how different companies are dealing with a supply chain disruption that, while not unique to racing, has strained resources and forced many suppliers into a never-ending game of catch-up. Lest you think it's all doom-and-gloom, however, we did unearth some silver linings—for example, California-based Scat Enterprises is having success offloading "C and D movers, like pistons that are .060-over when everybody buys .030-over," Tom Lieb told us. For more on how businesses are adapting to this (hopefully temporary) new normal, read Statham's well-researched piece.

2) I THINK RACERS ARE ALWAYS GOING

to find a way—and a place—to race. Take the off-road community, which faced a fair amount of uncertainty after the Lucas Oil Off Road Racing Series was shuttered back in November. This was no small void, to be sure. Countless young drivers earned their stripes in JR 2 Kart, RZR 170, Modified Kart and other classes throughout the series' 12-year run. Fortunately, competitors wouldn't have to wait long, or travel great distances, to find suitable alternatives. Series like Minnesota-based AMSOIL Championship Off-Road and the Valley Off Road Racing Association out of Northern California, for example, have stepped in to provide ample opportunities for teams, tracks and sponsors. From those aforementioned youth and feeder classes up to Pro Buggy, Pro Lite, and Pro 2, a main focus for these groups has been offering enough short-course options to suit almost any racer. For much more on how tracks and sanctioning bodies are keeping



DAN SCHECHNER
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these segments trending skyward, see writer Bradley Iger's piece beginning on page 74.

3) AND FINALLY, I THINK WE MAY HAVE

found the world's grassiest grassroots racing organization! Calling itself the Dirt Squirts Kart Club, this collection of "average guys" competes in recreational-grade machines that have been modified up to about 20 hp, often by way of a new four-cycle engine, along with some upgraded parts and clever tuning tricks. The group has an innocent-enough history: It was established in 2018 after co-founder Peter Austin returned from "one of those Rusty Wallace driving experiences.... When I got back, I thought, 'Man, I gotta do something like that because it was so much fun.'" A tidy eight-page rulebook keeps costs, and competitors, in check. Tempers do flare—this is racing, after all—but no members have yet crossed the throw-a-punch-and-you're-out threshold, Austin assured us. Competitors are currently in the midst of an eight-race season, he noted, with events taking place on members' properties that have been mowed into different configurations, including ovals, a semi-rectangle, and a "road course" that winds around trees. One of the tracks is even run clockwise...because why not? For more on this series that represents just about everything we love about racing, see our coverage beginning on page 142. **PRI**

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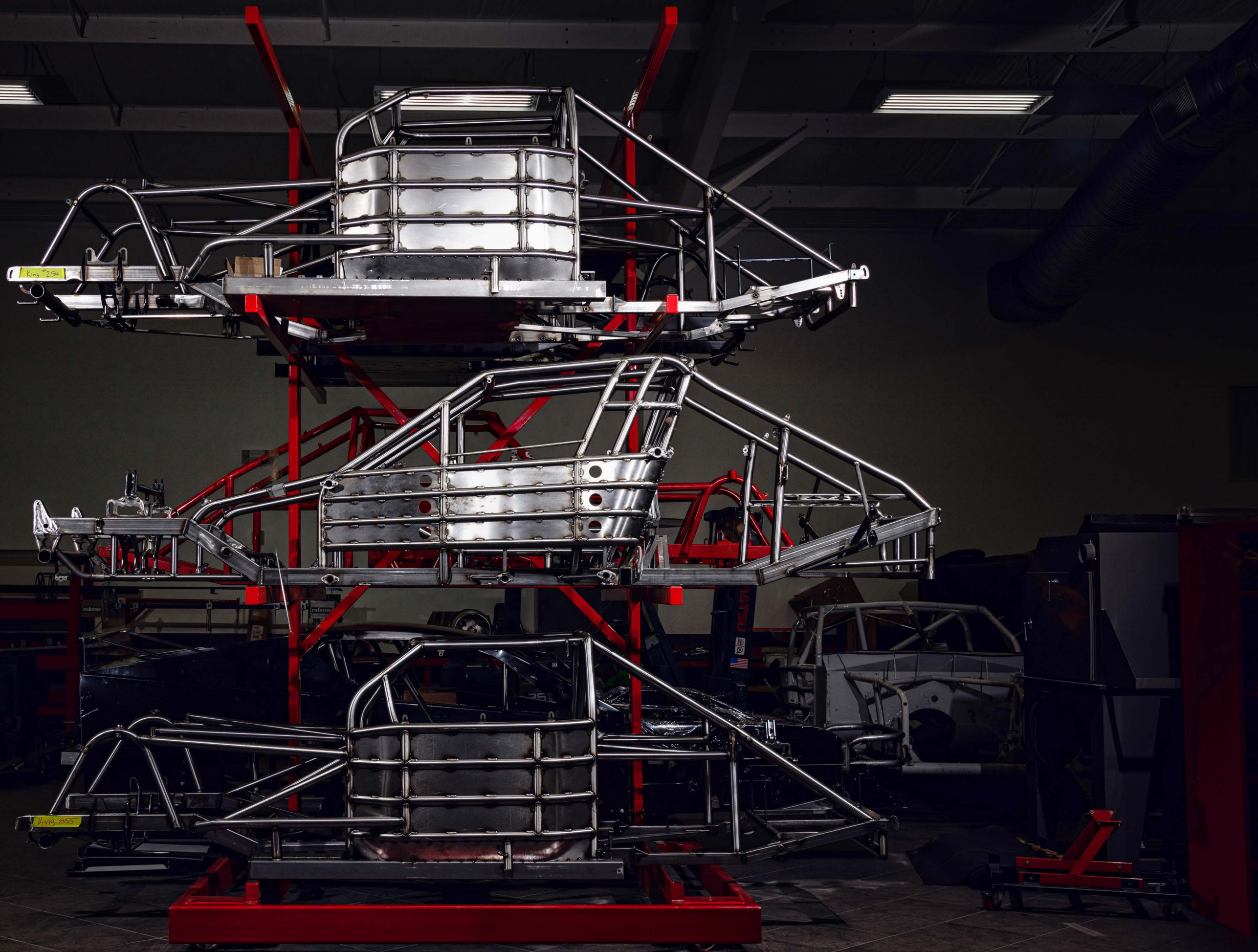


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LEAD POSITION

If there's any truth to the saying, "it's what's inside that counts," then racers should take note of the latest advances in chassis fabrication and welding. Though not always apparent to the naked eye, subtle developments in materials and construction, as well as expanded use of computer-aided design (CAD), are resulting in safer and stronger cages. As we discovered in our report on the topic, some shops, like TC Design in Campbell, California, are leading CAD revolution by incorporating 3D scanning to image and design roll cages and cabins. "I really think that's where the high end of this industry is going," said TC's Tony Colicchio, who cited newly purchased equipment that's capable of both blue laser 3D scanning and probe scanning for better consistency and efficiency. For more on how fabricators are pushing the engineering envelope to craft higher-performing race car chassis, like these pictured from Fury Race Cars, see our coverage beginning on page 134.





PLANNING FOR

PRI 2021

We've got the checklist to help you make the most of your visit to Indianapolis for the world's premier motorsports trade event in December.

By Rex Roy

Yellow. Yellow. Yellow. Green!

Planning almost always leads to better results—both on the race track and in business—and now's the time to start planning your trip to the PRI Trade Show.

At press time, nearly 1,000 exhibitors had signed on to be front and center in Indianapolis, Indiana, from December 9–11. And PRI is more than ready to accommodate. "There's pent-up demand to conduct business and network face-to-face," said PRI Trade Show Director Karin Davidson. "This year's event will be the first opportunity for the entire motorsports community to come together under one roof in more than a year, making PRI 2021 a can't-miss event."

Susie Townsend of Visit Indy added, "Indy, as a city, is very excited to welcome PRI back after a year's absence. When PRI is in town, they kind of own the city, and the way the registration is going, the numbers are looking really strong."

Planning ahead will help you make the most of your trip to Indy for the PRI Show in December. So, make sure the following items are included on your checklist:

1) BECOME A PRI MEMBER

First, your PRI membership supports and protects the sport that is such a major part of your life. Second, every

level of membership gets you great benefits. Third, becoming a member is easy, just visit performanceracing.com/membership. The sign-up process only takes a couple of minutes, and there are multiple membership options to choose from. Fourth, it's cheap. The Individual Pro Membership cost is just \$40. Finally, you can't get into the 2021 PRI Trade Show without being a PRI member. In addition to the three paid membership options, for 2021 only, qualified Trade Show attendees can receive a complimentary membership until the end of this year.

2) REGISTER FOR THE SHOW

Once you're a member, you can register for the PRI Trade Show online. Go to the PRI website at performanceracing.com, click on "Trade Show," then hit the "Attend" pull-down menu. There's no cost for PRI Members to attend the Show.

The PRI team will process your registration and mail your credentials if you complete the process before the November 18 deadline. After that date, attendees can still register on the PRI website, but they must go to Express Badge Pick Up in the Indiana Convention Center and scan their confirmation letter to print out badges. On-site registration will also be available, but having your credentials in hand means no waiting in line once you arrive to the Show.

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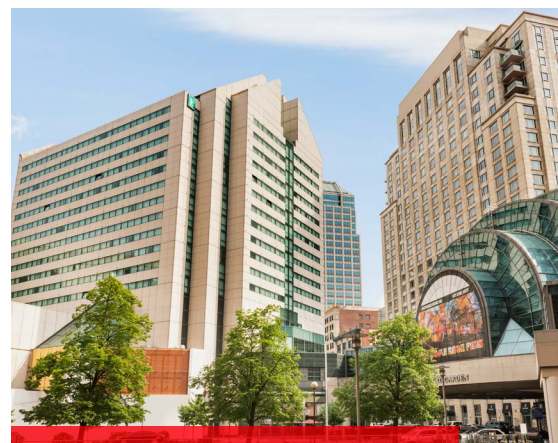
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PRI TRADE SHOW



Attendees who want to stay close to the Indiana Convention Center are encouraged to book now, as downtown hotel rooms typically sell out fast.

3) BOOK YOUR HOTEL

The PRI Show is among the most popular trade shows in North America. Our team is expecting tens of thousands of attendees and exhibitors. That's a lot of people on the ground. While downtown Indianapolis added 900 hotel rooms in 2020 to bring its total up to 4,700, there's still not room in the city center for every attendee. If you want to be close to where the action is, book now.

The PRI team made finding a hotel room easy by developing a registration site with Visit Indy, the city's convention bureau. Go to the PRI website at performanceracing.com, click on the "Trade Show" button, then click on the "Hotel & Travel" pull-down menu.

4) SET GOALS

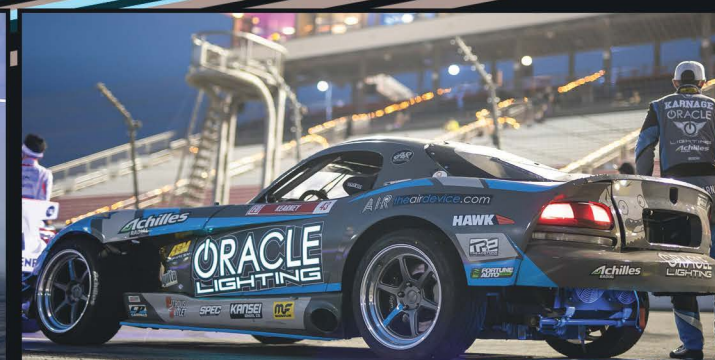
The PRI Show is THE place to get business done. Start thinking now about which exhibitors and features you'll want to see at the Show. For instance, are you looking for new product lines to add to your inventory, or do you want to maintain, renew, or grow your existing supplier base? Plan ahead to visit those booths and make a list of people you need to talk to.

Are you looking for shop equipment and tools? Put Machinery Row on your agenda.

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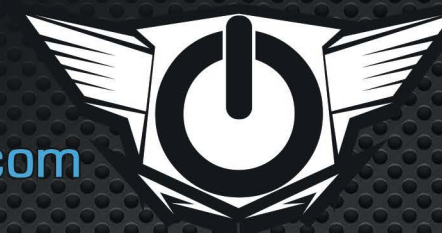


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TWIN FLOW



8.5
LBS.

- 20 1/2" HEIGHT
- 17 1/2" WIDTH
- 2" THICKNESS
- PART # BSC400-49933

DOWN FLOW



7.8
LBS.

- 19 3/4" HEIGHT
- 20 1/8" WIDTH
- 2" THICKNESS
- PART # BSC400-49929
- 22 1/8" HEIGHT
- 20 1/8" WIDTH
- 2" THICKNESS
- PART # BSC400-49930

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PRI TRADE SHOW

PRI



PRI attendees are advised to set goals, which includes noting which exhibitors they want to visit, before arriving on the Trade Show floor.

Do you want to expand the portfolio of products you sell? The Featured Products Showcase is another can't-miss area. And make a note to check out the new EV Performance section to see how a new sector is growing up around electric racing and aftermarket performance mods.

5) COME PREPARED

While the PRI Show is fun, come prepared to get business done. The Show is a face-to-face event, so stock up on business cards to make it easier for contacts to follow up. If you're reaching out to sponsors, consider printing some flyers with a QR code that will take prospects to your website on their mobile device right on the Show floor.

You can also make a powerful impression with logo'd apparel, but those do take time to design, order, and ship.

6) ADDRESS THE PRACTICAL CONVENTION REALITIES

Information to help plan a trip to the Circle City can be found at performanceracing.com/tradeshow, including a "Need To Know" section. Two things to think about are dinner reservations and parking.

While there are dozens of great restaurants in the city center, many of the

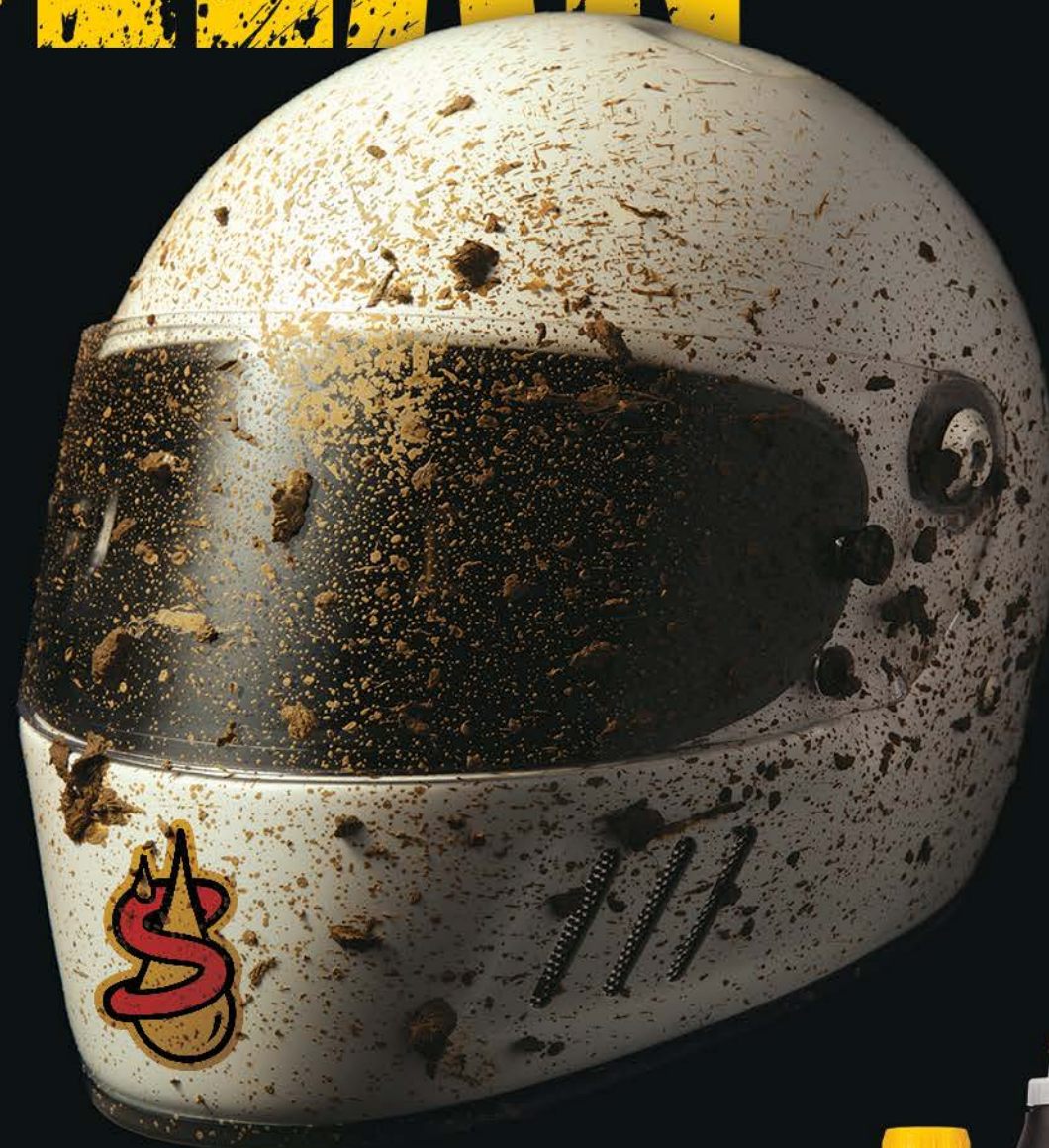
most iconic destinations—like St. Elmo Steak House—will already be booked by Show time. So, if you're planning on entertaining clients or buyers, check out the available options and make reservations sooner rather than later.

Visit Indy's Townsend recommended looking at key areas just a few minutes from the Convention Center and Lucas Oil Stadium. "The new Bottletworks District just opened," she noted. "In addition to the beautiful new hotel built in a historic Coca-Cola bottling plant, right across the street is a high-end food court called The Garage that's a great place for dinner. Fountain Square is another one of Indy's six cultural districts that offers excellent places to eat, and much more, in a restored area that's actually the oldest commercial area in Indy."

Due to its downtown location, parking for the PRI Show can be tricky. The city has spaces available for more than 60,000 vehicles, but it's best to know where you're going to park beforehand. A parking map and other travel options can be found at performanceracing.com/attend/getting-there. Maps of Indy's cultural districts, lists of restaurants, and more are all available at the "Hotel & Travel" section of the PRI website.

Yes, the PRI Show is still months away. But by planning and acting now, you'll be ready to walk through the doors of the Indiana Convention Center ready to win. **PRI**

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- Eliminate Engine Varnish
- Reduce Deposit Buildup
- Increase Performance
- Decrease Operating Temperatures
- Conquer Your Home Track



PRI FOUNDING MEMBERS:

CONNECTIONS ARE EVERYTHING

As an industry we're strongest when we stand united, both against legislative hurdles as well as in the pursuit of business goals.

By PRI Staff

The fourth installment of our series reveals why industry leaders have signed on to become PRI Founding Members. Their reasons might surprise you, but in their own words the rationale boils down to connections. You've heard the saying, "It's not what you know, but who you know." At PRI, we don't really believe the first part. Brains matter. But in some situations, connections matter more.

Connections are so valuable, in fact, that nearly two dozen companies have committed \$25,000 to PRI Membership over a 10-year period. Why would they do that?

The first reason involves influencing business regulations. Especially when you're dealing with the federal government, who you know is exponentially more important than what you know. While the PRI family respects that you might be an expert with a cylinder hone, can pull a perfect 0.000 out of the hole, or have turned a profit each year you've been in business, nobody in government cares. Sorry, that's just reality.

With this understanding, nearly every PRI Founding Member has put their faith in PRI's Government Affairs group to lobby the right legislators with the right messages that benefit our industry. The Founding Members trust PRI to communicate their support of PRI's Save Our Racecars campaign and the RPM Act of 2021.

A unified, professional voice in Washington, DC, and in state capitols, matters for businesses that are presently burdened by government legislation or legally threatened by the same. PRI Founding Members know that when our entire industry wins battles against unwarranted regulation, our entire industry benefits—a rising tide lifts all boats.

The second key reason Founding Members made their commitment is because they wanted to connect with other leaders. Business owners benefit from networking. Face-to-face meetings provide great opportunities for new relationships, which in turn lead to business growth.

While the window to become a Founding Member only opened this spring, PRI has already invited this elite group to take part in exclusive video conferences to discuss PRI business and legislative updates. Additionally, many Founding Members attended the annual SEMA Installation Gala, where they helped celebrate the yearly transition of SEMA leadership. The Las Vegas event, held in July, was the first

opportunity for PRI Founding Members to meet in person, and to meet SEMA's 2022 leadership (and additional potential business connections).

The second Founder's face-to-face event took place earlier this month. All Founding Members were invited to the NHRA US Nationals in Indianapolis. Their VIP treatment included four-day all-access passes and PRI Suite access. While the on-track action was exciting, there were business opportunities to be found in the PRI Suite as well.

The experience at the US Nationals helped prove (again) that we—together—are strongest when we stand united. This matters when facing legislative struggles, and it also matters when we pursue new business goals. By stepping up to Founding Member status, the companies you'll read about are sending a clear message that they support our entire industry while pursuing individual business goals. And, as Founding Members these companies support the reality that our industry's collective political voice and economic power carries more impact than any single company's attempt to navigate today's complex legislative and economic challenges.

PRI Founding Member status remains available for a limited time for \$25,000 (with a payment option of \$2,500 per year over 10 years). In other words, for the cost of a business trip for you and a co-worker, your company could position itself at the forefront of the racing industry.

At the close of the SEMA Installation Gala, one Founding Member was overheard talking about who he hoped to connect with at the upcoming Founding Members events at the PRI Trade Show. There are certainly more exclusive opportunities to come in Indianapolis this December.

Like the impact of the Founding Members, your involvement with PRI allows our team to continue to build, promote, and protect your livelihood, as well as the prosperity of the entire racing and aftermarket community. Consider joining as an individual or business.



Public relations and marketing used to be simple activities. With hard work, some creative ideas, and the right connections, you'd get print media coverage that would grow your business. TV exposure was a huge bonus.

Things couldn't be more different today. The media landscape is fractured yet heavily matrixed, and getting exposure requires a sophisticated multi-channel and data-driven approach. Kahn Media, formed in 2008, is a recognized and awarded PR and marketing agency with deep roots in the automotive aftermarket, motorsports, technology, and outdoor lifestyle markets.

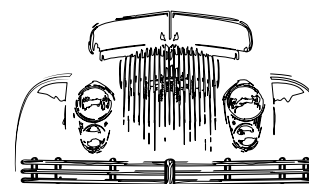
Operating worldwide from their Southern California headquarters, Kahn Media's talented team of public relations experts, in-house creatives, and digital marketers help clients derive the most ROI from their budgets. Their client roster includes names you know: MotoAmerica (American Superbike), Driven Racing Oil, Roush Performance, Aeromotive, Centerforce Clutches, Lotus Cars, McLaren, Aprilia, Rolex, Motul, Nitto Tire, and many others. The team's work has been recognized three times by *Inc. Magazine* in the *Inc. 5000* list of fastest-growing private companies in America,



as one of *AdWeek's* Fastest Growing Agencies, and as the top PR firm by a Southern California business journal for the past four years.

Importantly, because enthusiasts know how to connect with other enthusiasts, the Kahn Media team is comprised of performance and racing insiders—people who came from, or are engaged in our industry. This helps the Kahn Media team connect their clients to targeted audiences in meaningful ways.

Dan Kahn takes a long view on our industry. "The future and growth of motorsports relies heavily on igniting the passion in the next generation of enthusiasts," he said. "We like to think that with our background in social media, influencer marketing, digital, and content creation, we are uniquely positioned to help other PRI members connect with younger audiences to build brand loyalties that will last a lifetime. Becoming a PRI Founding Member was the best way for us to strengthen our connection to PRI, and to support the organization as it powers forward."



REGIS COMMUNICATIONS

With a healthy sense of humor, Rex Roy incorporated Regis Communications on April Fool's Day in 1991. Since then, Roy and his Detroit, Michigan-based company have supported over 30 automotive brands including multiple imports and every division of General Motors, Ford, and the original Chrysler Corporation. Roy's stints at major marketing agencies provided him with deep insights about strategic and tactical best practices while serving clients including Motorcraft, GM Restoration Parts, GM Service Parts, and Team Chevy. Roy has helped launch more than 120 vehicles, including the 2020 C8 Corvette, and creative directed permanent large-scale public display areas at Daytona International Speedway and in Detroit's Renaissance Center.

Roy is no stranger to the performance and racing industry, having completed projects for Championship Auto Shows, Kalitta Motorsports, and Borla. As two side-hustles in the late 1990s, Roy opened PowerCurve Chassis Dyno & Tuning Center and was a partner in a national high-performance driving school.

A sharp eye will recognize that the Regis Communications' logo

is a 1934 Chrysler Airflow. The revolutionary car was a sales flop even though its engineering led the industry into the modern era of aerodynamic testing and steel unibody construction. However, Chrysler didn't take control of the car's story, and the unenlightened critics won the media battle and killed the Airflow's chance to succeed. To Roy, the Airflow is a reminder that storytelling matters in marketing.

"One of the things I've realized is that every company has a story to tell, whether it's using a press release, promotional video, TV ad, website, or sponsorship ask. But many companies, even those with smart marketing teams, could use some outside help to tell their stories better. This leads to more awareness that drives growth. Story development and effective comms are what I can offer PRI, whether a company needs just a press release or a complete marketing overhaul," Roy said. Adding rather glibly, Roy noted, "But if we don't band together through PRI membership, we might not have an industry anymore. Given the way government agencies naturally trend toward regulatory overreach, I don't think this is an overly dramatic point of view."

Daren Poole-Adams of Shelby, North Carolina, is an exceptional drag racer, engineer, and businessman. Regarding these characteristics, he's not that different from many in the performance and racing industry—he found a way to make a business out of his passion for racing, and has been doing so since the late 1990s.

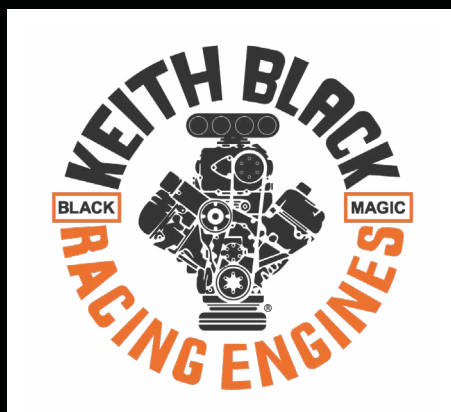
Poole-Adams' current pair of COPO Camaros are a common sight around the country as he competes in various NHRA and NMCA events. Partnering with PRI heavyweights like MAHLE, Goodyear, Holley, and Chevrolet Performance, the COPOs are development platforms that advance racing tech. The championship-winning Poole-Adams is a front-runner, for example, in bringing direct fuel injection to the Stock Eliminator field.

The work Poole-Adams is doing benefits the entire sport, especially at the grassroots level. He told PRI, "We have a passion for production drag racing. It is a study in efficiency that is very relevant to various manufacturers in their quest to bring better, more efficient products to market. As an example, we are currently getting more than 100 drag strip passes out of a pair of Goodyear slicks. Something you never would have dreamed of years ago."

About becoming a PRI Founding Member, Poole-Adams stated succinctly, "It shows that my business is committed to supporting the racing community." While there was certainly no doubt about his commitment before, Founding Member status makes this company's



pledge visible and even more influential. "More than anything, we (the people in our industry) need to do some joint educating. They (the EPA) need to understand that converting a street car to a race car actually has a decreased impact on the environment when compared to that same car being run for 100,000 miles on the public roads. Why can't we partner with the EPA and industry leaders to promote ways that our racing businesses can reduce our carbon footprint in a way that would really have an impact? I spend a whole lot more time in my tow rig or my shop than I do in a COPO!"



What would today's drag racing scene be without engine blocks from Keith Black? This man's contribution to professional drag racing is unparalleled. While Keith passed 30 years ago, his legacy of innovation and performance lives on.

For those who are not familiar with Black's legacy, as an engine builder he started in the late 1950s building marine engines that set multiple world records. The transition to the 1320 proved natural. Black-engineered engines propelled the legendary Don Prudhomme Top Fuel dragster to more than 250 round wins in 1962 and 1963. Black's affiliation with Chrysler began in 1965. His company started producing aluminum

engine blocks based on the Chrysler Hemi designs in 1971, and his engines would dominate drag racing by the end of the decade, winning every national record in Top Fuel between 1975 and 1984.

Darren Beale, owner of Keith Black Racing Engines (KBRE) in Buena Park, California, told PRI that its status as a Founding Member is another step in making known the company's role in helping create the very DNA of the American performance aftermarket. Looking ahead, Beale explained, "When KBRE was started in 1959 it involved a collection of passionate people that weren't afraid of risk-taking and innovation in the pursuit of power. The decision to become a Founding Member was immediate. And for the future, we're focusing on engine block products that massively increase the strength and power-handling capabilities of the everyday modern V8, that perform equally as well on the street as they do at the strip."

Black-block engines—still based on the Chrysler Gen II Hemi and RB Wedge V8s—have powered many brands over the years, not just MOPARs. As a matter of fact, one of the company's latest partnerships (with Herrod Performance, a leading performance company that focuses on the Ford brand)



resulted in the APOLLO package, a reliable 4,000-hp powertrain for Mustangs.

Beale said, "We are not only committed to ensuring that Keith's story and legacy lives on, but that Keith Black also earns renewed respect in a more complex, developing, and modernizing market. We feel one of the larger challenges facing everyone will be keeping racing relevant, and that this can only be accomplished by making sure racing remains enticing to younger people and in embracing modern powertrain platforms that can be dramatically improved upon." As a PRI Founding Member, Beale is in good company that shares his passion. **PRI**

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RACE TEAM CONFIDENTIAL

WORLD TIME ATTACK—BRETT DICKIE

MELBOURNE, AUSTRALIA

After earning 16 domestic championships and a World Time Attack crown, this Australian is making a name for himself on the world racing stage through Global Time Attack and, most recently, Pikes Peak.

From a young age, I was always around motorsports with my dad. Growing up watching him race go-karts was always a great experience for me, and I knew it was a dream of mine to race. I owe all of my racing to my family for the sacrifices they made to keep my dream alive.

As a kid, I always had a dream of being a State Champion, which I've now done 14 times (Victorian Time Attack champion four times, Victorian Sports Sedan champion eight times, Victorian Sprint champion two times). Then I looked to becoming the Australian champion, which I've now done twice (Australia Honda Nationals). I was pretty content with those achievements until I won a World Time Attack crown in 2018. That's when I set my sights on racing in America and receiving an overseas podium, which I recently achieved in April with Global Time Attack.

I'm currently driving for Project Import in America in a Honda S2000 in the Global Time Attack series, as well as in the Victorian Sports Sedan Championship in Australia in my family-owned tube chassis RWD Honda Prelude. I also drive the Elusive Racing Honda Integra World Time Attack car. This year, I've been doing select rounds in each series—four races in America, two Victorian Sports Sedan rounds, and the week-long World Time Attack event.

The World Time Attack and Global Time Attack events are along the same lines, but Global Time Attack is based in the US with 99% American or Canadian drivers, whereas World Time Attack is based in Sydney, Australia, and attracts drivers from all over the world—it's the crown of time attack worldwide. Win World Time Attack and you're

world champ in your division. Win Global Time Attack, and then it's time to head to World Time Attack to go up against the best.

Scheduling races around the world is currently the hardest thing I do because with the pandemic, I can't just fly in and out like I did in 2019. Every time I return to Australia, I need to do a mandatory two-week hotel quarantine. That, along with the fact that I pay for all of my flights and travel myself, makes it very hard on me because missing work is a huge issue. I always need to allow that aspect into my schedule each time, and also make sure Australia allows me to return each time. Plus, with the current COVID restrictions my family isn't able to join me in the US, so leaving them for months is also very difficult for me.

My next goal is to reach the summit of Pikes Peak on race day, and a top-three finish would be even better. I raced Pikes Peak this year as a rookie, but because of the weather we weren't able to go to the summit on race day. Part of me is over the moon for finishing the race, but the other part knows I haven't quite finished yet. The finish line is at the summit, and technically I haven't reached it other than in practice, so Pikes Peak still needs to be tamed.

However, to be a listed driver for Pikes Peak has always been a dream of mine, and this deal came together very late this year. I was still in Australia in January when we got confirmation that we had made the event, and we didn't even have a car yet. I arrived in America in April, and we had until June to make everything happen.

We entered a Honda S2000 time attack car with a custom Honda F20C engine with an Eagle Specialty Products 2.3L stroker kit.



It had custom hand-ported cylinder heads by David Flood, and also featured Skunk2 Racing Ultra cams, Garrett G35-900 turbo, TTI six-speed sequential gearbox, Emtron KV8 ECU and electronics, MoTeC dash, custom fabrication by Circle City Hot Rods, and aero by Amir Bentatou at RS Future.

Race day was a whole new experience for me. From the moment we turned up, people knew who we were, and the event was second to none. The number of fans was next-level, and the interest in our car was overwhelming. To have that number of fans so close to the track was insane. To reach the finish line was a massive relief for me and the whole team, but afterward I knew it was time to start planning for a better 2022 Pikes Peak.

The parade back down the mountain to the pits was a dream; to have every fan line the track to high-five each car was an experience in and of itself. People know the car and knew me, and I can't wait to experience that again from the summit in 2022. **PRI**

"I OWE ALL OF MY RACING TO MY FAMILY FOR THE SACRIFICES THEY MADE TO KEEP MY DREAM ALIVE."

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ASK THE EXPERTS

UPSELLING

How to ensure your frontline people, those critical points of customer contact, have the skills needed to maximize sales transactions.

By Drew Hardin

There's no question that the Internet has made fundamental changes in retailing. Yet despite a proliferation of online merchants and a waning of traditional brick-and-mortar stores, in many cases the act of the sale still comes down to a personal interaction between a customer and someone representing the retailer. "People buy from people," explained Randy Sosnoff of Scott Lewis Associates Inc., Baldwin, New York. "No matter how the conduit works, whether the customer is on the phone or in front of you, there are two people there."

That being the case, how can a retailer be sure that its frontline person, that critical point of customer contact, has the skills needed to maximize a sales transaction? How can that person not only provide the customer with what he or she asked for, but use the interaction as an opportunity for additional sales?

The answer is simple, yet complex at the same time. What it takes, say the sources interviewed for this

article, is education.

"Having a good, fundamental understanding of the components of the car or product is critical," said Sosnoff. "The first thing counter people really need to think about, before they say one word to the customer, is to envision what the job takes. If you understand what the job entails, then you can talk about replacing all the components to do the job. Don't let the customer go without at least trying to sell them the other components."

"When a person comes to you, they want your knowledge and they want your service," said Bob Balderston of Plumb Bob Automotive, Romulus, Michigan. "They don't ask for pricing, they want you to solve their problem. Upselling is easy because you're selling knowledge."

When a customer comes into his store asking for something specific, Balderston will go to his shelves to retrieve the asked-for "widget," then he'll "go to the bolt section, get a couple fasteners, maybe some

According to one of our expert sources, education always trumps a quick sale. "[If] you want to upsell," he said, "teach your employees.... If the customer thinks, 'This guy knows what he's selling,' they will wait in line to see you."



other piece that might attach to the widget that maybe the customer isn't aware of." He'll then set the part on the counter, plus the additional items, and explain how they work together. "Ninety-nine percent of the time the guy will say, 'I could use those fasteners because mine are all torn up,' or, 'I didn't even know those things existed.'"

"Knowing what you sell gives the opportunity to present the customer solutions," Balderston said. "You can upsell easily if you educate the customer because you've been educated. If you just go by what the computer says to sell, you will never upsell."

This is where the situation gets more complex.

"At the end of the day, you have two problems," Sosnoff said. "One,

"KNOWING WHAT YOU SELL GIVES THE OPPORTUNITY TO PRESENT THE CUSTOMER SOLUTIONS."

Customers often look to counter people for knowledge and service, noted one of our sources, who added, "They don't ask for pricing, they want you to solve their problem. Upselling is easy because you're selling knowledge."



"IF YOU JUST GO BY WHAT THE COMPUTER SAYS TO SELL, YOU WILL NEVER UPSELL."

you have a customer who may not know what he needs. And you may have a counter person who doesn't know what the job needs, either."

The education gap that can hamper a counter person's effectiveness has several root sources, starting with the fact that "technology is moving so fast," said Sosnoff. "We went from carburetors to fuel injection, now we're in electric vehicles. There aren't that many vehicles that guys are working on like they used to. So there are a lot of people who don't really have the expertise to talk about this stuff, because they don't see a lot of it."

There is also a limit to the educational resources available.

"As a manufacturer, I talk to my direct customers all the time, but none of us ever talk to the counter person who's selling the product to the consumer or the installer," said Dennis Grau of Energy Suspension, San Clemente, California. "And there's so much pressure today, with cell phones, social media, video games, cable TV—how much time do they have to dedicate toward learning?"

Grau said this situation has been "high on my list of priorities for a long time." Which is why he is proposing a video training program that he calls Energy Suspension University. It would consist of video modules related to the company's products, such as "engine mounts, suspension bushings, body mounts. There could be seven to eight categories, and as a counter person passes a module, we could give them some sort of reward for their effort."

He also foresees this growing into a resource in which, for example, "a chassis component manufacturer works with us to

educate the counter people about the whole chassis. I can speak to the advantages of the bushing, but I don't know what a chassis company's control arm will do. That's why collaboration with other manufacturers is critical. Everyone has the information, but no one has brought it together into a video library that I'm aware of."

Grau said the benefits for such a program could be "massive," especially when applied to those counter people working in chain stores. He explained that Energy Suspension is "a performance bushing company, but we enjoy business with all three majors. If there's roughly 16,000 stores at 4.5 counter people per store, that's 72,000 counter people. If we can educate them and show them how to sell just \$20 a month, that's \$17.3 million. That's a hell of a good head start for our industry."

It's not just the chain retailers that would benefit from such a program.

"Education trumps a quick sale any time of the week," Balderston said. "You want to upsell? Teach your employees. They are the ones who represent your store. If the customer thinks, 'This guy knows what he's selling,' they will wait in line to see you." **PRI**

SOURCES

Energy Suspension
energysuspension.com

Plumb Bob Automotive
facebook.com/plumbbobautomotive/

Scott Lewis Associates Inc.
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TECH UPDATE

DECONSTRUCTING CRANKSHAFT BALANCING

How this critical, but often-misunderstood process helps eliminate the harmful forces that can prevent your engine from freely transmitting the power it creates.

By Randy Neal

The practice of balancing rotating assemblies is one of the most misunderstood dynamics within the engine building community. Just look at social media forums, which are filled with misguided or “voodoo” information on the subject.

So let's start at the top: The main reason for balancing rotating assemblies is to eliminate damaging and parasitic forces that cause erratic mechanical activity that in turn robs the engine of its ability to freely transmit its generated power. Most people overlook the fact that all engines from the first stage of manufacturing go through some process of balancing. When the crankshaft and all related components are manufactured, they must be shaped and weighed to meet a target weight specification.

As such, the crankshaft is designed with counterweights that offset the reciprocating and rotating forces generated via the combustion

cycling, which causes the assembly to rotate. While this is generally known and understood, what we need to make clear is that the engines we used just a few decades ago were running at a relatively low rpm band as compared to the engines we're currently getting from the OEMs. Notice that I am talking here about “grocery getter” vehicles, not high-performance machines.

Now, let me provide some information that hopefully will get your attention: In the 1990s, OEMs such as GM, Ford, and Chrysler produced engines that would generally accept a balancing tolerance of 2.0 ounce-inch. So what does that mean? Essentially, the 2.0 ounce-inch tolerance means that a typical crankshaft that has a total diameter of 6.0 inches will have 18.95 grams of unbalance weight residually embedded at the outer edge of the counterweights. When the engine is running at 1,000 rpm (just above idle), the embedded

Shown here is excessive bearing wear due to fretting caused by vibration from an unbalanced rotating assembly.



weight will cause the rotating crank assembly to generate a “centripetal unbalance force” of 3.56 pounds. As we increase the rpm to 2,000, the unbalance force increases to 14.24 pounds; at 4,000 rpm, it is now 56.96 pounds; and 8,000 rpm will generate 227.84 pounds of force.

It is important to understand that even though the unbalance force can increase from 3.56 pounds all the way up to 227.84 pounds at 8,000 rpm, the actual embedded weight of 18.95 grams is still the same. Only by increasing the rpm do we increase the generated unbalance force. Simply put, as you increase rpm, the generated centripetal force of the offending

“AS YOU INCREASE RPM, THE GENERATED CENTRIPETAL FORCE OF THE OFFENDING UNBALANCE MASS IS INCREASED EXPONENTIALLY.”

Pictured here is an abnormal wear signature indicating harmful out-of-balance forces.



“SOMETHING I'M OFTEN ASKED IS WHETHER BALANCING MAKES HORSEPOWER. THE ANSWER IS NO, AT LEAST NOT IN DIRECT FORM.”

unbalance mass is increased exponentially.

At this point you may be saying that because we rarely operate the engine at 4,000 rpm, the 56-plus pounds of force is not a big deal. Well, let me point out that if you had a 56-pound hammer and you dropped it on, say, the hood of your car, you would notice an unwelcome dent. Now let's imagine that the hood of your car is an engine bearing. This bearing is receiving a pounding load of that 56.96-pound hammer at a rate of over 66 times per second at 4,000 rpm; and at 8,000 rpm, this hammer now weighs 227.84 pounds and is cycling at 133-plus times per second.

It is critical to understand that the damage created at the higher rpm is not recoverable by simply reducing rpm.

For the grocery-getter, you're probably more interested in fuel efficiency. But for the high-performance engines you should be more concerned with the durability and stability of your engine components. And, you must acknowledge that parasitic drag is stealing horsepower.

Something I'm often asked is whether balancing makes horsepower. The answer is no, at least not in direct form. It does, however, eliminate parasitic forces, which unleashes horsepower. These disrupting (parasitic) forces also can generate erratic mechanical disruptions, resulting in what we call “excitation” to engine components. As we know, vibration is directly linked to premature wear of the engine bearing, along with block and head machined mating surfaces—especially main bearing caps and block registers. It's also linked to natural frequency excitation “triggering” that results in potentially disruptive harmonics

associated with all moving and non-moving components (where you will witness fretting on mating surfaces).

Here's a quick example of how drivetrain components are linked and work in harmony: While driving down a smooth highway, you accidentally veer off the edge of the smooth asphalt surface. You instantly feel the shuddering of your steering wheel. The tire is bouncing, but again, you feel the disruption in your steering wheel. Now, in order for you to feel the disruption, you must understand that the initial catalyst of that disruption came via numerous interconnected components, all of which were affected before you felt the vibration.

Referring back to the engine, the out-of-balance forces generated by the unbalanced crank assembly emulates the same “disruptive excitation” induced by the rough surface of the unpaved road. But, by simply driving back onto the smooth asphalt you can eliminate the disruptive force. Unfortunately, that's not the case with an unbalanced crank assembly. Any unbalance force retained within the crank assembly can only be corrected by disassembly and rebalanced to the correct ISO 21940 Balance Tolerance. **PRI**

Randy Neal is the owner of CWT Industries in Norcross, Georgia. A 50-year veteran of the auto racing industry, Neal is widely considered a leading authority in the design and manufacture of dynamic balancing machines. Over the years he has developed proprietary software, machinery, and application knowledge that's helped take the “voodoo” out of the balancing process.

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PROBLEM SOLVERS

Is your legacy performance business due for a rebranding? See how this Honda-centric parts supplier expanded its offerings to other marques and attracted a new audience without alienating its traditional customer base.

By David Bellm

THE PROBLEM: A 30-year-old performance parts business lost touch with younger customers.

THE SOLUTION: A comprehensive rebranding to meet the expectations of a new audience.

Motorsports and performance cars can be a tough bird. To some extent, they're classic. Enduring. Unchanging. But on the other hand, everything evolves. What used to be cutting-edge cool eventually gets pushed to the fringes as "retro" or "old-school"—the warm, comfy blanket for a shrinking crowd of seasoned enthusiasts.

And that's exactly what happened to sport-compact performance pioneers DC Sports, based in City of Industry, California.

Founded in 1987, DC Sports was a force in the early sport-compact scene. With most of its enthusiasts geared toward Honda cars for the segment's first decade or so, it made sense for DC's entire product line to cater to that brand.

The company continued with its all-Honda focus as it was acquired by current owner, Pilot Automotive, in 2007. But over the years, the sport-compact scene had evolved considerably. Honda and Acura products were still a big part of it, but sport-compact enthusiasts were by this time eagerly embracing other car brands. By limiting itself to serving only Honda owners, DC found itself out of step with its audience.

It was time to dig in and regain the edge that had made the company a leader in the sport-compact market's formative years.

To begin the rebranding process,

DC's marketing team first established a baseline understanding of how the company was perceived. "When I came into the company at the end of 2018, I sat down with some of the team to figure out how we were going to position ourselves within the market," said Danny Anguiano, brand manager at DC Sports. "We noticed that the older demographic, 35–40 years old and up, are huge diehards of the DC Sports brand. For them it's a nostalgia thing. But a lot of those dudes now have families, and they can't really be playing with their cars anymore."

From that insight, a picture emerged for how the company should best approach the new audience it sought. "The new generation didn't really know what DC was before," explained Anguiano. "They don't see us as a Honda brand moving into Nissans



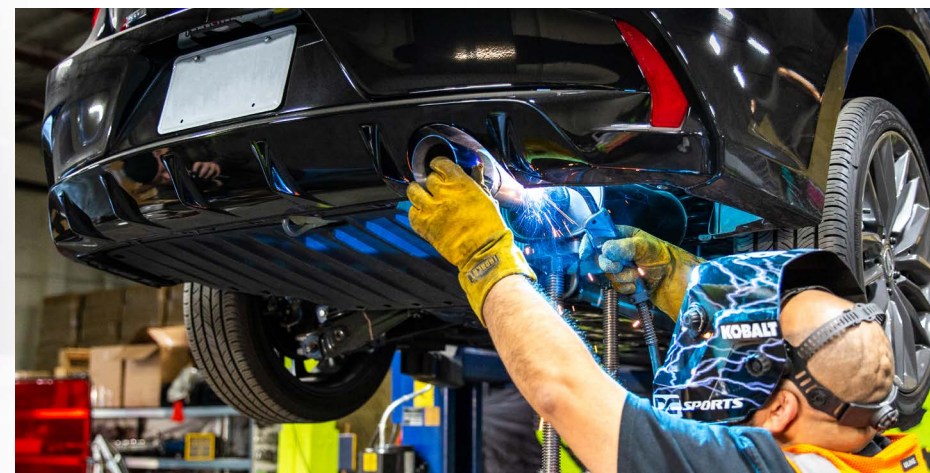
or a Honda brand moving into WRXs. They see us as something completely new. So it made more sense for us to come in and rebrand as almost a new entity to the market that didn't know us before."

The essential foundation of the rebranding was, of course, the parts that would be offered. The company sells only DC-branded components.



As part of DC Sports' rebranding, the brand's visual identity had to be overhauled in order to better appeal to its younger target audience. "We spent weeks going over different colors, different fonts, and how those correlate in the minds of different age groups," our source noted.

The sport-compact market had evolved considerably since DC Sports was founded in 1987. As a result, an early step in the Honda-centric company's recent rebranding process involved developing parts for a wider variety of makes, including Subaru, Toyota, and Nissan (pictured).



While DC Sports' "older" demographic—those 35–40 years of age and up—were major supporters of the brand, it became clear that younger enthusiasts did not quite share that same sense of nostalgia. "The new generation didn't really know what DC was before," reported a company source.

So the first step had to be developing pieces for other auto brands, including Subaru, Nissan, Toyota, Kia, Lexus, and Genesis.

Once DC had parts to offer a wider range of car owners, its next challenge was getting the right look. The marketing team overhauled the brand's visual identity to better appeal to its younger target audience. For this phase of the process, the bigger resources and deeper pockets of parent company Pilot Automotive proved to be a vital asset.

"We didn't want to completely change the logo, but we did add some flavor to it," recounted Anguiano. "We spent weeks going over different colors, different fonts, and how those correlate in the minds of different age groups. We were able to get quite a bit of data from different branding agencies that Pilot has done market research with. There were things that say what different colors represent to the human mind. For someone between 18 and 22, blue might mean one thing, but to a 25-year-old it could mean something different. I had never seen research like that."

Next, it was time to get the message out. And for DC's younger new target audience, social media was the obvious choice—Instagram, in particular. But at the same time, some of the best results have come from a more classic medium. "Email lets us provide people with clear and direct info without it getting diluted like on the Internet, or getting

all the other people that are trying to put their opinion into somebody else's decision."

The company is also starting to experiment with paid online advertising, including ads on Instagram and Google. But Anguiano so far is taking a cautious approach. "We have to collect some data before I start pushing the needle too much and it backfires on me."

In addition, DC has always relied heavily on live event appearances to maintain contact with its audience. The company participated in 70 events in 2019, and hopes to resume that pace once pandemic restrictions are eased.

Although Anguiano describes DC's rebranding as "a work in progress," the effort has already yielded impressive results—a 400% annual revenue increase compared to years prior to the project's start in 2018, he said. At the same time, he also points to intangibles that bode well for the long-term health of the DC Sports brand. "Personally, when it comes to the rebranding side of it, I measure success through the engagement. Because at the end of the day, you're only around because of your customers." **PRI**

SOURCES

DC Sports
dcsports.com



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EDITORS' CHOICE

Hundreds of new product announcements cross the desks of PRI editors each month. Following are our top picks for September.

PERFORMANCE LOWERING SPRING KIT FOR TESLA MODEL 3 AWD

REKUDO

holley.com/brands/rekudo/

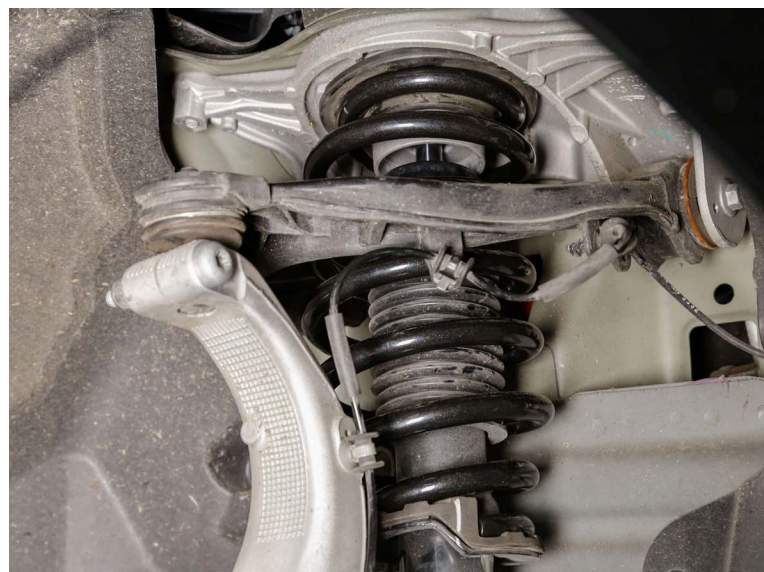
Competition-minded Tesla 3 owners will appreciate the aggressive stance and improved cornering from these lowering springs from Rekudo, part of Holley Performance Products, Bowling Green, Kentucky. The springs will lower the ride height 1 inch in both the front and rear, and are designed to work with the Tesla factory struts.

"These lowering springs are well suited for autocross and track days due to the fact that they lower the car's center of gravity, and their progressive rate will improve handling as well as maintain a comfortable ride quality under normal driving conditions," explained Greg Whittle.

The kit will fit 2018–2021 Tesla Model 3 AWD vehicles and come in a black epoxy finish. Overall, they're designed with a slightly firmer ride when compared to the factory springs while offering a "good compromise" and a sporty feel.

"When installed by a competent mechanic, the install should take two to three hours," added Whittle. "Other than basic hand tools, the only 'specialty tools' required are a coil spring compressor and a thin-wall 13-mm socket to access the top strut nuts. Thick sockets, such as impact sockets, will not clear the counterbore the strut nuts are recessed into."

The front springs feature a constant 257 lbs./in. rate, while the rear springs have a variable 314–525 lbs./in. rate. —Mike Magda



SUPERLITE 1200 & 1600 LITHIUM MOTORSPORTS BATTERIES

E3

e3lithium.com

More power and lighter weight are the two main selling points of the new SuperLite 1200 and 1600 lithium batteries from E3 Spark Plugs in Ponte Vedra, Florida, both of which are designed for motorsports applications.

To demonstrate these benefits, E3 replaced the two 16-volt AGM batteries in an ARCA car with just one SuperLite 1600. The car had considerable amp draw with EFI, coil-on-plug ignition, and 12 electric cooling fans. After 300-plus laps of testing, the data recorder revealed absolute consistent voltage and amperage outputs.

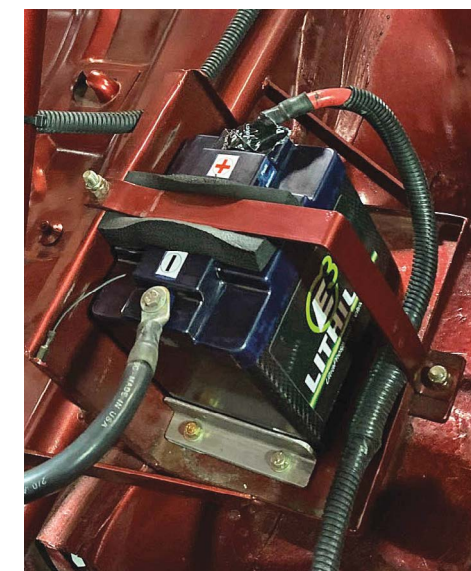
"Next, we wanted to see what it would take to kill the battery," said Rob Fisher.

The alternator was disconnected, and the car ran 25 laps, or 40 minutes, on battery power alone without a loss of performance.

"In a lead-acid or AGM battery, it will deliver 100% only while fully charged, then drop off to 95%, 90% and so on as it drains," explained Fisher. "Our lithium battery will deliver 100% of capacity and equal output at all times until the second it runs out."

The SuperLite 1200 is 13.2 volts, features 24.8 amp-hours capacity, and weighs just 6.9 pounds. The SuperLite 1600 weighs 8.9 pounds, features 1600 pulse cranking amps, and 32 amp hours of capacity.

E3 also offers lithium batteries for marine and powersports applications. —Mike Magda



RFX WIRELESS SUSPENSION LOAD STICK

INTERCOMP

intercompracing.com

The new RFX wireless load stick eliminates the cumbersome cabled indicator currently utilized by many load sticks on the market, allowing racers to concentrate on the measurements.

"Load sticks can help a racer ensure consistent performance from their car in a couple of ways. While at the track, load sticks can be used to determine the strength of spring needed to get a car to a particular attitude at one, two, or all four corners of the vehicle," explained Aaron Van Heel of Intercomp, Medina, Minnesota. "This could be the result of a setting change or damage sustained while out on track."

Each Intercomp load stick features a 3,000-pound capacity load cell and can span shock mounting points stretching from 15 to 25.25 inches. The bodies are machined from hex-shaped billet aluminum for easy adjustment with hand tools.

"Load sticks can also be effective for racers that travel to several different race tracks throughout a season," Van Heel noted. "Race tracks with extremely similar traits at the beginning of a race event will oftentimes behave very differently from beginning to end. Small variables, like moisture content in the air, have the potential of making last weekend's race-winning setup completely un-drivable. A racer that utilizes load sticks has a better chance to keep up with those changing conditions by providing the most complete picture of a race car's handling performance." —Mike Magda



MAKE THE CASE

BUSHED LIFTERS VS. NEEDLE-BEARING LIFTERS

Even though both styles have been around for some time, the debate over these two lifter designs remains a hot-button topic in motorsports today. While many racers already have their minds made up, our advocates note that what makes one option superior to the other often comes down to the demands of the application.

As told to Bradley Iger



BUSHED LIFTERS ADVOCATE:

Nolan Jamora,
Isky Racing Cams

"THE AVERAGE BUSHED LIFTER LASTS THREE TO FOUR TIMES LONGER THAN A NEEDLE-BEARING LIFTER WOULD IN THE SAME USE CASE."

A little more than a decade ago, we bought one of the first Spintrons off the line. We wanted to create a new line of oval track valve springs. As we were developing these springs and they got to a point where they could handle the rpm and the pressures, we started breaking our lifters. The needles would fail and go all throughout the motor. We'd have to pick them out, rebuild the engine, and keep testing. Eventually we decided that there was probably a better way to do this, and that's when we started looking at a bushing lifter.

We knew that we would need a material that would be porous enough to pull the oil in, but it also needed to keep the oil in it. Figuring out the right mix of materials took us about two years of testing, but what we ended up with was something that would allow us to keep running the Spintron 24 hours a day, seven days a week without having to do rebuilds.

Whether we're talking about street use or a hardcore racing application, the average bushed lifter lasts three to four times longer than a needle-bearing lifter would in the same use case. The other huge benefit is if there is a catastrophic valve spring failure, valve tip or stem break, or an oil system failure, a bushed lifter will never break

apart and spread needles throughout the engine. It will keep the damage localized to the valvetrain and camshaft rather than spreading to the crank, rod, and piston areas.

Another key difference with bushed lifters is that you don't see distortion of the bushing as it goes up the main acceleration ramp in the way that you do with needle-bearing lifters under high spring load, high rpm, and higher pressures. This distortion causes variations in the translation between the designed cam motion and the actual valve motion, and that leads to a loss of horsepower. Since the bushing follows that designed cam motion and it is fully translated to valve motion, you don't lose that horsepower with a bushed lifter.

Another great thing about our bushed lifters is that you really don't have to make any special considerations for them. These will drop right into an existing combination. If you're running a solid-lifter roller now, you don't have to make changes to the oiling system, the oil you use, or the spring pressures. With our bushing material you can run a restrictor, or run it on the street, or run it on high heat—you don't have to worry about any of that. That's one of the reasons it's been so successful at events like Drag Week.



NEEDLE-BEARING LIFTERS ADVOCATE:

Billy Godbold,
COMP Cams

"THE CAMSHAFT AND LIFTER WHEEL WILL LAST THREE TO FOUR TIMES LONGER WITH A GOOD NEEDLE-BEARING THAN IT WILL WITH A BUSHED LIFTER."

The camshaft and lifter wheel will last three to four times longer with a good needle-bearing than it will with a bushed lifter. A bushing bearing is designed sort of like a drum brake: As the cam comes off the closing ramp onto the base circle and the valve is closed, there's no spring force going to the rocker arm, the pushrod, and the lifter. The lifter is just floating there, so it will hydroplane on the oil that's on the camshaft. As the wheel is hydroplaning, it is also slowing down.

If you've ever watched big planes land on an air strip, you've probably noticed that as soon as the landing gear touches down, there's a big puff of white smoke. Basically the same thing happens on the opening ramp of a camshaft in an endurance application that runs bushed lifters. Every time it comes around, it will "skid" as it comes back up to speed.

With a needle-bearing lifter, there is much less surface area making contact, and as a result, the amount of friction being created is dramatically lower. That means that the inertia of the wheel doesn't have time to appreciably change its rotating speed, so you don't see that smearing of metal as it hits the opening ramp on the other side.

With a bushed lifter setup, you also have to be careful with the type of motor oil you're using. Because there's no true pressurized oil between the axle and the bushing as

in the cam bearing, you don't have this hydrodynamic wedge all the time. Without that wedge, the oil chemistry becomes much more important. You need extremely low friction in that sliding area, and you need oil that will get in there and stay there.

Needle-bearings, on the other hand, require very little oil. That's why there are a lot of needle-bearings in Pro Stock motors and builds like that. They don't want the oil dripping down the camshaft onto the crankshaft, so a lot of folks will go with needle-bearings just to get away from windage issues.

Even though they run cam tunnels, all the NASCAR teams are still using needle-bearings for the camshaft as well. Since they're limited to a 60-mm camshaft, these teams run needle-bearings to reduce the amount of oil that needs to be directed to that part of the engine. They know that will allow them to make both the pressure stage and the scavenging stage of the oil system smaller. They're very conscious of how much power the oiling system takes, and they don't want to give up a horsepower's worth of oil to pump it in there and then pump it back to run the babbitt bearing on the camshaft.

At the end of the day, if you know your valvetrain is under control, you want to run a needle-bearing. But if you're not sure, a bushed lifter can provide some insurance by spreading the load out. **PRI**

STOP DOING THAT...DO THIS INSTEAD

SIZING HEADERS

Bigger isn't necessarily better, as factors like engine rpm, camshaft choice, transmission, and more should be carefully considered in order to maximize performance.

By Drew Hardin

Racers tend to believe that, especially when it comes to engine components, bigger is better. The quest for ultimate power means stuffing as much air and fuel as possible into an engine, and then venting its waste through sewer-pipe-size headers.

While there is certainly some validity to that bit of tribal knowledge, it doesn't hold true 100% of the time, especially on the exhaust side of the equation.

"There's a notion that, in order to get a lot of exhaust gas to flow out of a cylinder, the pipe needs to be large," explained Vince Roman of Burns Stainless, Costa Mesa, California. "But we find that's not really the case. It needs to be the correct size."

"Racers want to make horsepower, and big-tube headers typically make top-end power," said Chris Hill of Specialty Products Design, Rancho Cordova, California. "But a properly sized header takes into account how the engine will be run. Where do you want the engine to make torque and horsepower?" Because big-

tube headers "don't start working until further up in the rpm band. A Pro Stock car running at 10,500 rpm may like that, but a Super Gas car running on an index likely won't."

"There are a couple things going on," Roman said when explaining why a big pipe may not always be a better pipe. "One is scavenging. With a very large exhaust pipe on an exhaust port, when the exhaust port opens and the exhaust starts flowing out, recirculating eddies form out of the exhaust port. That is an energy waster."

Another important factor is "keeping the velocity of the gases sufficiently high so that the gases will have a lot of momentum as they flow out of the port," he continued. "One way to think about that is when you put a nozzle on a water hose. The nozzle increases the velocity of the water and actually throws the water out further."

"The nozzle reduces the amount of flow through that hose," he noted. "An open hose will flow more than one with a nozzle on it, but the nozzle will push it out further. It's all about finding that happy medium,

Among elements at play in an exhaust setup are collector types, which "would have an influence on how the header is finished, noted our contact from Specialty Products Design, who added, "That's a whole different conversation."



balancing the exhaust flow rate with exhaust header flow capacity. If you don't, the exhaust gases will not have a lot of momentum, so at the end of the exhaust stroke and at the beginning of the intake stroke, there will be a lot of exhaust gas still close to the exhaust port. When intake filling starts to happen and pressures lower in the cylinder, the exhaust gases that haven't traveled very far from the cylinder will be sucked back into the cylinder, giving you a less explosive charge for the next cycle."

"IT'S ALL ABOUT FINDING THAT HAPPY MEDIUM, BALANCING THE EXHAUST FLOW RATE WITH EXHAUST HEADER FLOW CAPACITY."

The idea that a pipe needs to be large in order to get a lot of exhaust gas to flow out of the cylinder is "not really the case," said our source from Burns Stainless. "It needs to be the correct size," he added.



"A WELL-DESIGNED EXHAUST SYSTEM WILL PROVIDE BETTER THROTTLE RESPONSE."

To calculate proper header size, "engine rpm, camshaft choice, transmission type, and car weight can all play a factor," Hill said. "You need the header to start helping at 5,000–5,500 rpm." As an example, he cited a "550-cubic-inch Super Gas drag car running at 7,500 max rpm. There's no reason to put a 2.50-inch OD header on that car. My choice would likely be a 2.25-inch OD header, or maybe a 2.25-inch OD stepped to 2.375-inch OD."

Hill also noted there are other elements at play in the exhaust setup, including collector types, "that would have an influence on how the header is finished. That's a whole different conversation."

Another factor with an influence on header size is whether the engine is naturally aspirated or has a power adder, Roman said. And if it's the latter, what type of power adder is being used.

"The scavenging portion of the cycle becomes less important since a power adder, like a positive-displacement blower, provides much more cylinder-filling pressure than a scavenging wave," he explained. "There aren't such low pressures in the cylinders during the intake stroke because there is so much pressure filling them."

Scavenging is still an issue "with nitrous and centrifugal superchargers," he said. "At part-throttle and low rpm with a centrifugal supercharger, the cylinder-filling pressures aren't as high as they are at higher rpm. You still want to have good throttle response when it's not up to full boost. Exhaust scavenging will help here." The same holds true with a nitrous system, as the racer isn't always "on the nitrous. A well-designed exhaust system will provide better throttle response in that case."

With a naturally aspirated engine, a well-designed header "is essentially a power

adder," Roman said. "Well-designed intakes and exhausts do supercharge engines. You will see volumetric efficiency of 125%–130% with a well-designed engine, and that's a result of intake and exhaust tuning."

Both Hill and Roman recommended racers take advantage of the exhaust companies' expertise when it comes to properly sizing headers. "If a racer is honest about his or her usage, most reputable companies can assist in a choice," Hill said.

Meantime, Burns Stainless has a computer program "that sizes headers and collectors based on engine parameters and combinations," Roman said. "Using our algorithm, we can calculate proper exhaust tube size and get the length of the header and the collector sizing so that it works with that particular engine combination."

"But some of this stuff is still trial and error," Hill pointed out. "For instance, there are all kinds of combos in Competition Eliminator. You better be on your game to even be competitive."

"The exhaust system doesn't make or break a race car," Roman admitted. "There's a lot that goes into it. But if somebody has a big header, and he's running first in his class, everybody wants to run everything that guy has. We still see these cycles, but we try to stay tried and true to what we espouse. It works for us and our customers." **PRI**

SOURCES

Burns Stainless
burnsstainless.com

Specialty Products Design
spdexhaust.com

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NEWLY APPOINTED

AARON COALWELL

The Trans Am technical director takes on the same role for the Formula 4 United States Championship and Formula Regional Americas Championship, and he's got his calculator ready, just in case.

By Jim Koscs

In mid-July, Aaron Coalwell took over technical director duties of the Formula 4 United States Championship powered by Honda and Formula Regional Americas Championship powered by Honda. He also continues as technical director of the Trans Am series.

The Formula 4 role seems ideally suited to Coalwell, who got his start in racing on the Southern Polytechnic State University Formula SAE team in the late 1990s. After working as a volunteer tech official at numerous SCCA Club Racing American Road Race of Champions (ARRC) races, he was hired in 2000 as SCCA assistant technical manager, based in Colorado. Among several roles he held during nine years on the team side, Coalwell served as team manager and race engineer for different race teams in the World Challenge Touring Car program, including BimmerWorld, 3ZERO3 Motorsports, K-PAX Racing and 3R Racing.

FIA Formula 4 began in 2014 as an affordable step up from karting into open wheel racing. SCCA Pro Racing and the FIA then created the Formula 4 United States Championship with series partners Honda, Honda Performance Development, Hankook Tire America, and Onroak Automotive. Onroak makes the Ligier JS4 chassis in South Carolina for the series. The four-cylinder Honda engines come from the carmaker's Ohio plant.

Coalwell recently shared his plans and goals for growing both series.

PRI: What are you most looking forward to as technical director of these series?

Coalwell: As we have done with Trans Am, I look forward to further developing a close-knit technical and operational team to ensure a level playing field for all FR Americas and F4 United States teams. I want to help develop both series as key properties of Parella Motorsports Holdings while providing great customer service that helps make each event as easy and fun as possible for participants.

PRI: How has your tech official background prepared you for this role?

Coalwell: In my 16 years as a tech official and my nine years on the team side, I have learned how teams might interpret and exploit the gray areas of the rules for their advantage. I know what it takes to write clear and enforceable rules. I've learned what it takes to run a winning team, so I am



AARON COALWELL

TITLE:
Technical Director

ORGANIZATION:
Formula 4 United States Championship, Formula Regional Americas Championship and Trans Am

HOMETOWN:
Charlotte, North Carolina

FAST FACT:
Coalwell loves riding motorcycles, and the curvier the road, the better. If driving to a race, he sometimes brings his 2003 BMW K1200 R or 2006 Suzuki GSX-R 750 with him to experience different parts of the country.

also empathetic to teams' needs and concerns.

PRI: What do you see as the biggest challenges ahead?

Coalwell: Both the F4 and FR series are relatively new to the US, so the biggest challenge is to continue to grow both.

PRI: Can you share your top strategic goals for the next 12 months?

Coalwell: My top 12-month strategic goals, in no particular order, are to help foster growth of entry numbers for both series, improve operational efficiencies and maintain the current high technical standards to ensure a level playing field for all teams.

PRI: Describe the need in road racing for these junior series.

Coalwell: Junior series are important as a steppingstone between entry-level club racing events and the top-level professional series. The junior series are operated by professional staff in such a way that teaches teams and drivers how to operate and be successful in a professional racing environment.

PRI: You remain technical director for the Trans Am series. How will serving in these dual roles help you?

Coalwell: As the technical director of all three series, I can more easily share successful practices between them. It will also allow me to better coordinate sharing of equipment and staff as needed to make all three series more efficient and successful by covering any operational gaps that may arise during our busy events.

PRI: What's your most gratifying professional accomplishment?

Coalwell: I often say that, as a tech official, you are only doing your job right if everybody is equally upset with you. My gratification comes from having really good, close racing, and then finding all the cars to be compliant afterward.

PRI: Who have been the biggest influences in either your professional or personal life and why?

Coalwell: Probably my first two managers in SCCA Club Racing, Sven Pruett and Patricia "Patc" Henry, and my first two managers in SCCA Pro Racing, Mitch Wright and Shawn Passen. They taught me how to operate professionally and fairly. Sven and Shawn were great teachers on how teams try to circumvent the rules and how to properly inspect cars for compliance.

PRI: If you could have a conversation with anyone past or present, who would it be and why?

Coalwell: Anyone who was very innovative in race car design and building. People like Smokey Yunick, Jim Hall and Colin Chapman, to name a few.

PRI: What is one mistake you've learned from?

Coalwell: Not getting details of conversations in writing. I learned this years ago after too many conversations with teams, or customers, were misinterpreted. I prefer to communicate via email so that I have a written record.

PRI: Excluding your cellphone/tablet/computer, what's one thing you can't live without?

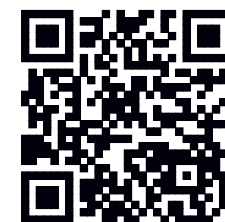
Coalwell: That would be my calculator. In Trans Am, the teams do not use a single brand of data system, except in TA2, so I am always using my calculator to compare the performance of various cars. All the FR and F4 cars use the same data system, and we have a series DAG (data acquisition engineer), so I will not need to use my calculator as much for those. **PRI**

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"I'VE LEARNED WHAT IT TAKES TO RUN A WINNING TEAM, SO I AM ALSO EMPATHETIC TO TEAMS' NEEDS AND CONCERNS."

INDUSTRY INSIGHTS

BILL RHINE

The namesake of this one-of-a-kind North Carolina operation takes us inside the vault and reveals the untold stories of preserving vintage race cars, supplying race props to the TV and film industry, and even non-profit work that gives American military personnel an opportunity to find out what it's like on a pit crew.

By Dave Argabright

Bill Rhine is an inspiring success story from the American business and racing community. A native of South Florida, Rhine entered motorsports in the 1990s on the very bottom rung as a rookie crew member with a team competing in NASCAR. Pursuing his dream of working on a professional NASCAR team, Rhine followed the path from Florida to Georgia to South Carolina and finally North Carolina. After honing his mechanical skills and earning greater team responsibility, Rhine later joined Petty Enterprises as fourth-generation driver Adam Petty was moving into NASCAR Busch Grand National competition. Petty lost his life on May 12, 2000, in a crash at New Hampshire Motor Speedway. Amid his grief, Rhine stepped away from team involvement and forged a new path as a self-employed business owner.

Twenty-one years later, Rhine Enterprise is regarded as a premier resource in the restoration and preservation of vintage race cars, having overseen more than 100 such projects. Located in Denver, North Carolina, Rhine and his small crew have accomplished big things, including building and preparing racing machines for various television and film productions. A keen researcher, Rhine proudly displays his amazing collection of vintage racing iron, a collection that offers priceless insights into a rich, earlier era. Rhine Enterprise has also played a key role in the preparation and maintenance of show cars for various entities through the years.

Rhine can best be described with a combination of the phrases “hard knocks” and “old school.” He runs his business today with a flip phone—don’t bother asking about text messaging—and a steady combination of work, sweat and worry. Rhine has survived the hair-raising highs and lows of business ownership amid the ebb and flow of more than two decades of economic cycles. PRI recently visited with Rhine to tap into his honest and straightforward view of life as a small business owner.

PRI: Let’s begin by talking about Rhine Enterprise, Bill. Give us a look at the various work you and your crew are involved in.

Rhine: We do just about everything, really. Our favorite thing to do is restore vintage stock cars. We are considered the world leader in vintage race car restoration, of the NASCAR variety. We also like vintage Can-Am, we like vintage Trans Am, and we’ve restored some of those cars in the past. We also handle Toyota’s entire NASCAR show car program, and the building of some of their custom projects. We do custom builds for the NASCAR Hall of Fame, and different amusement things. Sometimes we get involved in unique projects, so it’s many things.

We’re trying to ramp back up a little bit after COVID. Pre-COVID, we had four people in the shop and one in the office, with two on the evenings and weekends shift. We’re down to two in the shop, two in the evenings, and one in the office. We’re trying to get back to those levels, and we’re trying to find help. We’re like everybody else.

PRI: You experienced a unique series of circumstances that led to you becoming a business owner. What do you remember

most about the genesis of Rhine Enterprise?

Rhine: After Adam Petty passed away [in 2000], I decided to get out of racing. When I started working for Adam and at the Richard Petty Driving Experience, that was Adam’s rookie year in the Busch series. We worked out of a building in the back of the Richard Petty Driving Experience, and I watched them build show cars for different clients. I remember looking at various show cars at that time and thinking, “For the money these customers are paying, I could build a much nicer product and make good money.” So that’s how we started; we went after the show car business. The goal was to build a nicer piece than everybody else for roughly the same money. The margins would be a little tighter, but the goal was to get more work. It worked out really well for us and grew and grew and grew.

are people who say the past is gone and forgotten, but it looks like your work restoring vintage race cars blows that idea away.

Rhine: Yes, absolutely. It’s a funny thing. We hear from tons and tons of NASCAR fans from the past, and they say they don’t even watch the [current] races anymore. But they still love those old [drivers] and those old cars. They are very passionate, and it’s cool to see. What’s great when restoring an old car is when the people who were involved in the car’s original days come look at it and get emotional when they see the car. Those are the moments that will stay with me forever.

PRI: Your collection of vintage race cars continues to generate lots of attention. How many cars are currently in your collection?

Rhine: I think it’s right at 65 cars right now, restored and unrestored.

“WHAT’S GREAT WHEN RESTORING AN OLD CAR IS WHEN THE PEOPLE WHO WERE INVOLVED IN THE CAR’S ORIGINAL DAYS COME LOOK AT IT AND GET EMOTIONAL WHEN THEY SEE THE CAR.”

PRI: Here we are 21 years later. Could you have envisioned the pathway you and your company have traveled?

Rhine: No, not really. And I don’t say that in a negative way. I was under the naive impression that at some point it would get easier. Maybe five, 10, 15 years into it, it would get easier. It’s never gotten easier (laughing). But it has never been not worth doing, if that makes any sense.

We love what we do, we love building cars, we love the people. I joke and say that my business hasn’t made me wealthy to the standards I’d like to be at someday, but it has made me wealthy in the friends and the race car people I’ve come to know. I’ve made some amazing, awesome friendships. That’s the big fun of it, meeting the crew guys and drivers from the past and showing them that somebody still cares about what they did 20, 30, 40 years ago. That’s the cool part.

PRI: Nostalgia is an interesting proposition, and it triggers powerful emotions. There

PRI: Wow, impressive. How do you typically find new cars to acquire? Is there a network that keeps you up to date when cars become available?

Rhine: Yes, there is a network. An amazing network of friends! There are three or four who regularly call me about something they’ve found, and why they think it’s real. I’ll report this to another friend and say, “This is the car we think we have. Who can help us verify what it is?” They’ll help me track down the original people—car builder, driver, crew members—who can verify that this is a legitimate car. And when we restore the car, we go back to those original guys. I love to get them to sign the dash. We haven’t done this in a while, but sometimes we sit them down, buy them a steak dinner and a beer, and film them as they reminisce about the car, telling stories. Nothing polished or professional, just catching it naturally. We don’t use that footage or sell it to anybody, but we archive it. We just want to have it.



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Bill Rhine rose from humble beginnings to eventually earn a spot with Petty Enterprises. Now he follows his passion for restoring vintage race cars, like these from his collection.

PRI: Have there been missed opportunities? Are there cars that got away?

Rhine: Oh, yes. I was at Barrett-Jackson probably 12 to 15 years ago, and I saw a No. 50 Inman Brothers Racing 2+2 Pontiac. It had been raced in vintage and abused. It was all there, but it was worn out. When I looked it over and read the car's background, I was skeptical because I didn't believe it was real. It went across the auction block and sold for something like \$22,000, and a friend of mine later bought the car and asked me to help document the car's history. As soon as

I started digging, I discovered that this was the car in which Tim Richmond won his first [NASCAR Winston Cup] race at Riverside and won again at Riverside six months later. Richard Petty also drove the car, and also Al Unser Sr. I immediately thought, "Damn it. I missed a great opportunity to own a great car."

You develop a cynical view when you look at these cars, and rightfully so. There are so many fakes out there. I hear from people all the time who purchase a vintage car and discover that it's not at all what it was represented to be.

Cars come to Bill Rhine's shop in a wide range of age, condition, and historical significance. "We never really know what's coming next," he said.



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INDUSTRY INSIGHTS

PRI: Your work with the television and film industry is interesting. Tell us what you do in that industry, and what is the key to success there?

Rhine: The key? Be patient (laughing). We've done a lot of TV commercial stuff. We did all the race props for the Will Ferrell NASCAR movie ["Talladega Nights"]. The TV and film industry is interesting, and I've worked with some awesome people there. Mike Brewer, the "Wheeler Dealers" guy, they came and did an episode of their show at our shop. His entire crew of people are some of the greatest I've ever worked with. We've also done some commercial shoots for different companies—I won't name them publicly—who were the absolute most miserable people I've ever met. The whole, "Don't you know who we are?" thought process. So the industry is a mixed bag. The Will Ferrell film, 99.5% of those production people were the most wonderful people you could work with. But there are always a few in every group, it's kind of hit and miss. I guess every business has some of that.

We have turned down three TV shows in the last few years. My team and I have worked hard to build a good reputation, and TV can destroy that reputation as quick as it can make you famous. There are lots of different ways to be famous, and being the most famous person at Walmart is not the type of famous I'm interested in. I'm not going to make my team look like fools just because some producer thinks that if you throw a wrench at Thomas today it will be good television! No, I'm not going to do that.

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PRI: Let's talk about your early days. Working on a racing crew is far more demanding than most people realize. How did those early years shape how you run your business today?

Rhine: The most fortunate part of that experience was learning to deal with people. When you're on a race team you're not going to get along with everybody. You never will. There will always be some guy—and he might be your boss—who makes life difficult. Learning to get along with people, even when you don't want to, was a big part of that education.

I was also fortunate to come along before racing teams became so compartmentalized. Today they have specialists: The duct work guy just builds duct work; the crush panel person just does crush panels. But when I started, if you did finish fabrication, you welded tailpipes together and mounted pedals and did crush panels and duct work and side panels and valances and bezels and everything. I'm so fortunate and so glad that I had the opportunity to do so many different things. "Oh, you're done making crush panels? Good, go make some brake lines!" Absolutely, that was a good education.

PRI: As you transitioned from crew member to owning your own business, what was the first business lesson you learned?

Rhine: Mistakes cost money. And you're only going to survive if you make minimal mistakes, because there is only so much money. I'll be honest, when I first started the business, I was so young. When I'd go to vintage races the first two years, I'd fly to California on my own dime six times a

Bill Rhine demands absolute authenticity for his cars, a process that includes detective work. "You develop a cynical view," he said. "There are so many fakes out there."

year and go to a [vintage] race just to help people. When we got there, they wouldn't give us the time of day because, "What could this kid possibly know?" We had to work very hard to prove to the community that we were real, and we were okay. We did this for two years, just proving to everybody that we weren't just some dumb kids from North Carolina trying to step into somebody else's swimming pool.

PRI: Did you have mentors in those early years? As you tried to get your business going, were there people who helped advise and guide you?

Rhine: In racing, there were a lot of mentors. People I really appreciated. If I was willing to listen, they would point me in the direction of the answer. Ray Stonkus, he was absolutely one of my mentors. Bill Pink the carburetor guy, Butch Lamoreux from Hendrick Motorsports. Many guys in racing won't teach you what they know because they're afraid you might take that knowledge and do it better than them, but I was fortunate I met people who were willing to help me. And I was always willing to listen; if it meant staying until 10 o'clock that night, I'd do that. I've been lucky all through in that way.

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INDUSTRY INSIGHTS

PRI: You devote some of your time and energy to a very interesting non-profit, the Military Pit Crew Challenge. Tell us about the organization.

Rhine: We started this project 10 years ago. We travel to military bases with four Cup cars, five sets of pit equipment, all kinds of spares, 80-some sets of tires and wheels, and we train teams of 10 personnel from different commands and squadrons and we do NASCAR pit stops. Real impact [tools], one-pump jacks, the whole deal, the real stuff. We'll train up to 40 teams in a two-week trial, and we'll have a huge competition on the last Friday or Saturday for prizes and awards. For seven years in a row that was the only vacation I took each year, because I loved it. I love working with our military, because they are awesome. When people today worry about the youth of America, we've still got good kids in America. They're in our military.

So I love doing that. I also started building large-scale metal naval ships. I've got one on display at the naval museum in Pensacola [Florida]. I'm building another one now. I started horsing around with those in the evenings and weekends. I've also got a couple of other [hobbies] on my mind. I still love restoring old race cars, and I never want to stop doing that.

PRI: When someone looks at one of your restorations, what's the most meaningful thing you can hear them say?

Rhine: One of the best was Bobby Allison. Years ago, we found his old Buick Apollo Busch car and restored it to original. We sat it in Don Miller's museum in Mooresville, at the North Carolina Auto Racing Hall of Fame. Bobby came to look at it one day, and I was so excited for him to see it. We had the hood up, the trunk up, and he was looking all over this thing. He finally said, "Bill, I've gotta tell you. I have one problem with it."

"What's that, Bobby?"

"It never looked that shiny when I raced it (laughing)."

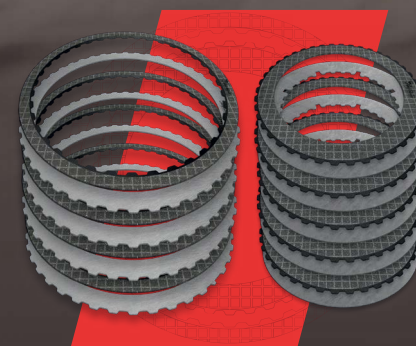
And that's the trick, to keep a car looking good and looking correct, without overdoing it. These cars are wonderful show pieces when they are restored, so you take the time to make them shine a little better.

PRI: What advice would you give a young person today who is launching a new business? Any words of wisdom?

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Rhine: I would tell them to turn off the Internet and turn off the television for the first five years of their business. Everything on TV tells you how great and how wonderful it's going to be tomorrow, but the reality is that to build your business correctly takes a long time.

I've been doing this for 21 years, and there are a lot of people who grew faster than we did because they used social media or did this or that, but a lot of them fell apart down the stretch. Doing it right takes time, and you can't believe the hype or the Cinderella stories. There are Cinderella stories that are great, don't get me wrong. But the mindset today is that it's going to be easy, it's going to be quick, and it's going to be no problem. Well, business doesn't work that way. It's not easy, it's not quick, and there are many problems. Deal with your problems when they come up. Don't hide from them, don't wait a month to discuss something with somebody. If it's an issue now, fix it today. That's probably the biggest thing I would tell someone.

PRI: As an employer, is it difficult to find people who are as driven by passion as you are?

Rhine: Yes. And it's funny that you use both of those words: driven and passion. You find a lot more passion than you find driven. If you can find both, hire 'em (laughing)! There are a lot of things people are passionate about, but when things become difficult, the passion kind of cuts back a little bit. But the driven people, they are going to march through it and get it done regardless of what comes up. And it is difficult right now in that way. I was fortunate that we had such a really good group for a while, and unfortunately COVID kind of forced

us to cut back a little bit. But we have a core of people that have been with us for a long time.

For example, the gentleman who started wiring my cars when I opened my company over 20 years ago is out in my shop right this minute, wiring another car for me. He's wired everything that's come through this place in 21 years. He's not a full-time employee, he just comes in when we need him. And we've got a lot of guys like that. They've been here for the long haul with us.

PRI: You're on the front lines on this topic, and I'm curious. Where will the next generation of people come from to work in racing shops and for manufacturers?

Rhine: That's a great question. What we see in kids today is different. For example, we used to have an intern program with a local school, but we had to end the program because we fired too many kids. The school that was giving us interns decided not to send us interns anymore. They worked here for a week and they'd come sit down in my office and say, "I don't want to do the crap work anymore." Well, everybody sweeps up at the end of the day, even the guys who have worked here for 12 years. So it's not the crap work, it's cleaning up after yourself at the end of the day. You've got to learn to take engines apart before you learn to put 'em together,



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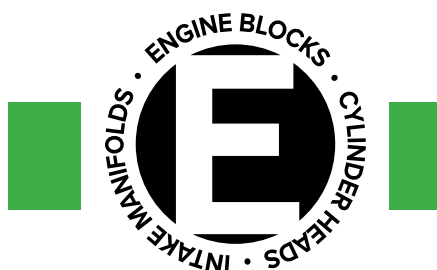
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Bill Rhine points out that passion is important, but it's drive that brings success. "You find a lot more passion than you find drive," he observed. "If you can find both, hire 'em."

and you'll take a lot more engines apart than you'll put together, you know? You can't make a quarter-panel on an English wheel until you can make a flat crush panel and make it fit properly. They don't want to hear that. What we've found is that they don't get that, because of the environment they grew up in. The influences.

We had a kid work here for three days and then tell us they weren't going to do the work we assigned. "I came down here to build engines, and that's what I want to do or I'm going to go home." Well, you aren't going to build an engine for any team for two or three years; you're going to take engines apart and you're going to clean parts. I was really disappointed in that whole intern program. Of 27 kids who came through the program, I think we got three kids who were good, and those kids are still in racing.

PRI: But that probably goes back to that dedication and drive we were talking about. You either have those things or you don't.

Rhine: Yes, exactly. When I got the opportunity to go Busch Grand National racing for the first time, stepping into what I felt was the big time, I left a job in Georgia that paid \$500 a week. I drove to South Carolina and slept in my truck for the first two weeks. I got paid \$150 a week cash for those first two years. I almost starved to death! I know what a \$2-a-day food budget looks like. But again, that was the greatest thing

for me because I learned. I learned how to save money properly, and I learned how to live on nothing. The team took the chance on this kid from Georgia, that I could work like I needed to. I did, and they kept me. It was great. Now, it wasn't fun at the time; it was a struggle. But it was exactly what I needed, and there is a limited number of kids right now who are willing to do that.

PRI: In addition to finding help, it seems that one of the greatest challenges of running a small business today is how to promote yourself properly. Would you agree?

Rhine: That's absolutely true. We don't advertise and we don't promote our work like we should, and I regret that sometimes. A lot of times, we'll have a really cool project come through the shop, and after it's gone out the door one of us will say, "Did anybody get any pictures of that?" Nope. There wasn't enough time. We could post more on Facebook, and we should. We have a nice Facebook page—I haven't been on there for five years, but I hear it's really cool (laughing). But on the other hand, our business has been everything it needed to be. I don't have any complaints.

PRI: We'll wrap it up with this, Bill. What's coming up for your business? Any new things on the horizon to talk about?

Rhine: We have some Gen-7 projects coming up, the new NASCAR stuff, which is exciting. We have a lot of cool vintage cars we're working on now. You know, it's funny, we never really know what's coming next. The phone has just kept ringing for 20 years, and when it rings, something new is coming. There are eight cars in the shop right now and two more on the way, and a commercial shoot in LA we have at the end of the month. It just keeps coming.

PRI: We appreciate your time, Bill. Until next time, keep that car collection shined up.

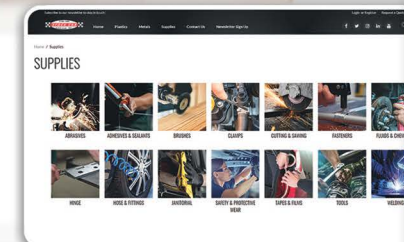
Rhine: Thank you, Dave. Tell everyone at PRI to come see us. **PRI**



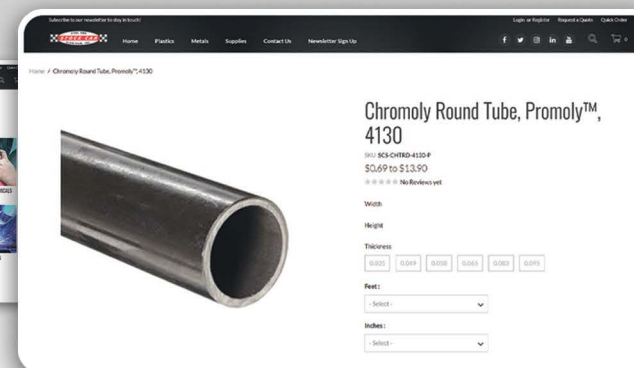
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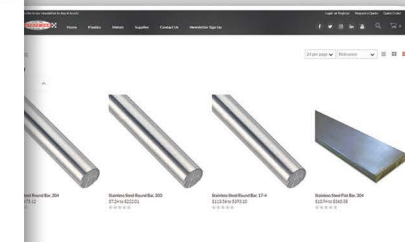
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EXCLUSIVE COVERAGE

2021 PRI ROAD TOUR

Let's go racing! PRI's iconic Road Tour returns for its sophomore season, and this year we've unleashed our award-winning content creators on events and race tracks across the US. For this second edition of the Tour, PRI is visiting famed venues like Pikes Peak in Colorado, Eldora Speedway in Ohio, Oswego Speedway on the shores of Lake Ontario, and Crandon International Raceway deep in Wisconsin's Northwoods. We'll be on the road for over six months, capturing behind-the-scenes footage and bringing you the untold stories and extraordinary images you won't see anywhere else. Enjoy this first of a four-part pictorial series—and for all the latest news, images, video, and more from our travels, visit performanceracing.com/roadtour.



PIKES PEAK INTERNATIONAL HILL CLIMB

The 2021 PRI Road Tour will take us across the country and behind the scenes to see events large and small like never before. Our team's first stop was at the famous Race to the Clouds. Officially known as the Pikes Peak International Hill Climb, the 2021 event was its 99th running, trailing only the Indy 500 as America's second oldest professional racing event. Timed runs for the race start at an altitude of 9,390 feet, in the thin air nearly 1.5 miles above sea level. The course is strewn across 156 turns covering 12.42 miles up America's Mountain. The finish line is regularly at the 14,115-foot summit, another vertical mile higher than where the green flag dropped, but clouds, snow and ice-covered asphalt near the summit caused race officials to forego the highest three miles of roadway from the 2021 event's official course.



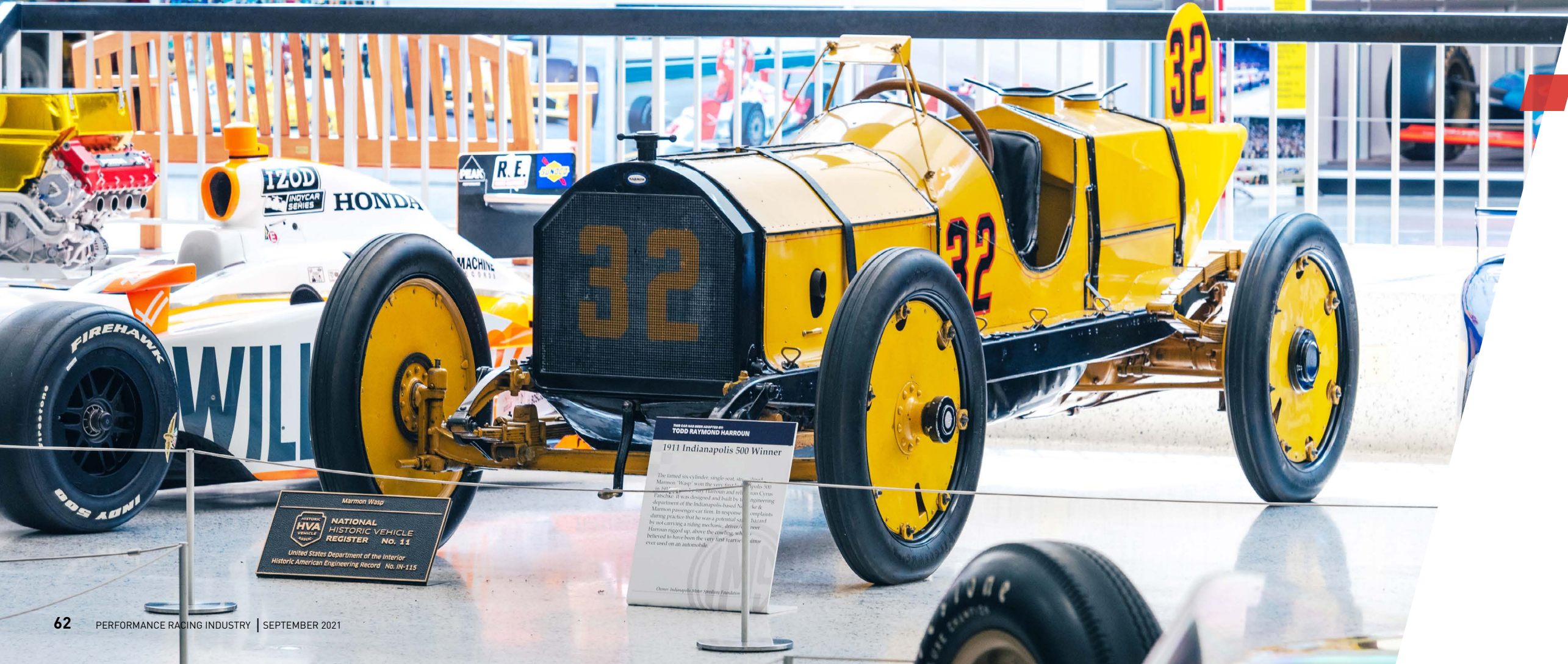
DIRTCAR SUMMER NATIONALS

In contrast to the lofty heights of Pikes Peak, where competitors race upwards of two miles above sea level, the 2021 PRI Road Tour's second stop was absolutely down to Earth...as in, in the dirt for the annual DIRTcar Summer Nationals held at the new Circle City Raceway in Indianapolis, Indiana. The new track grew out of a partnership between the Marion County Fairgrounds and Indy businessmen Jonathan Byrd and Kevin Garrigus, the promoter and owner, respectively, of the Indianapolis Speedrome. Garrigus and his team transformed the fairground's old circle track into a premier facility over the winter of 2020 and 2021; the facility first opened its gates to racers and fans for Test and Tune laps in May. During our visit, the 1/4-mile oval hosted two events: the DIRTcar Modified Nationals and the DIRTcar Summer Nationals, a series known across social media as the #HellTour.

KINGS ROYAL

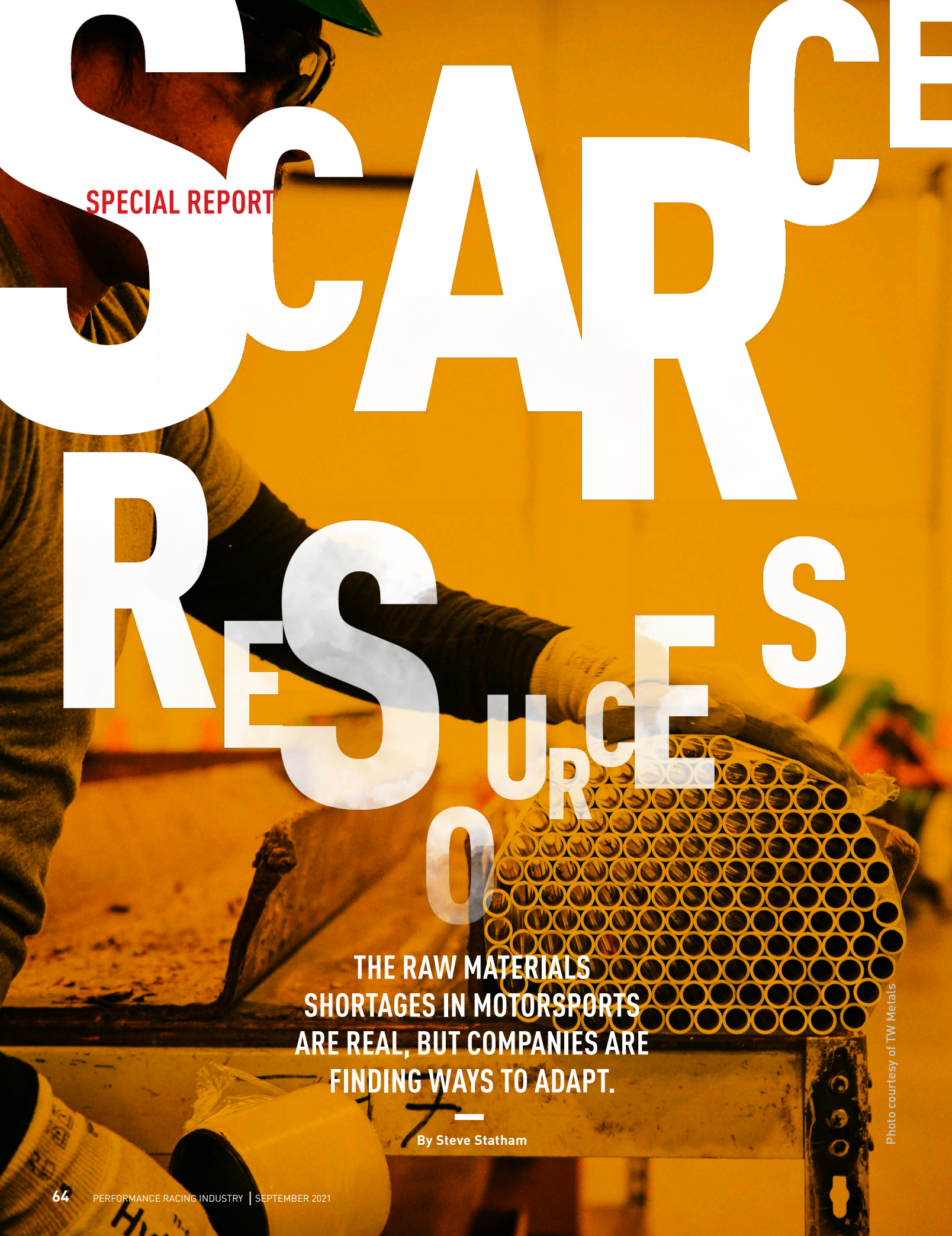
To understand racing as an industry, just follow the money. That is, the big money at Eldora Speedway, which in mid-July hosted not one but two of its iconic Kings Royal events. (The 37th annual Kings Royal, originally slated for 2020, was black-flagged by the pandemic.) So, the World of Outlaws series worked with Eldora to hold both editions. And, because Kings Royal events include two feature races, the weekend featured four total events, with a total winner's purse that exceeded \$374,000. Like we said, just follow the money. Today, Eldora regularly hosts dirt late models, modifieds, Eldora Stocks, World of Outlaws sprint cars, USAC National midgents, USAC Silver Crown, and more, and the PRI Road Tour was on hand for the World of Outlaws NOS Energy Drink Sprint Car Series double-feature event.





IMS MUSEUM

As far as we're concerned there's only one Rocket man...and it ain't the piano player. No, ours is the four-time Indianapolis 500 winner and six-time pole sitter whose feats have landed him in multiple motorsports halls of fame, including that of the famed Brickyard. So it stands to reason that the Indianapolis Motor Speedway Museum would pay homage to one of its greatest competitors via the "Rocket Rick Mears" exhibit, appropriately on the 30th anniversary of his fourth 500 victory. Also appearing for a limited time is the tribute "Granatelli: Larger Than Life," which features Andy Granatelli's family story along with several STP-clad Indy cars. While there, we also got a gander at the Museum's Restoration Department, whose four full-time employees and one full-time detailer are constantly prepping cars for exhibits and special events—like when the vehicles actually run during Indy 500 pre-race. **PRI**



SPECIAL REPORT

SCARCITY

RESOURCES

THE RAW MATERIALS
SHORTAGES IN MOTORSPORTS
ARE REAL, BUT COMPANIES ARE
FINDING WAYS TO ADAPT.

By Steve Statham

Photo courtesy of TW Metals

We live in interesting times, to say the least. There's no need to re-hash the pandemic of 2020 and whether the responses from governments around the world were correct or not. The memories are all too fresh, and in many places restrictions have not yet been fully lifted. The slow-motion car crash that is the world economy is still tumbling down the highway, leaving a trail of debris in its wake.

For the motorsports industry, the outlook is mixed. The racing calendar is full once more, and fans are back in the stands, but one of the biggest pandemic hangovers is an acute raw materials shortage that has stifled recovery efforts. Demand is high, supply is low, and companies are scrambling to secure enough materials to manufacture parts and keep racers in business.

Of course, this isn't a problem unique to the racing world. Raw materials shortages are popping up everywhere. "We have found most customers to be very understanding of the situation, as they are facing it in all areas of their lives," said Chris Douglas of Edelbrock Group, Olive Branch, Mississippi. "Whether it's lumber, patio furniture, outdoor equipment or other goods, consumers are seeing significant shortages and fulfillment delays. These challenges started during the pandemic but have continued as supply chains try to catch up with an extraordinary surge in demand coupled with workforce challenges around the world."

In speaking with several manufacturers, fabricators, and metal suppliers for this article, we found out some sectors have been hit harder by shortages than others. "It's been very rough with mild steel and chromoly

in sizes that are most popular for roll bars and roll cages," said Jill Fazekas with S&W Race Cars and Components, Spring City, Pennsylvania. "It's been very sporadic with everything else, but in the most popular sizes it's been a very long wait. We just recently received eight bundles of chromoly, 1 5/8- x .083-inch wall, and we've been waiting over two months for that."

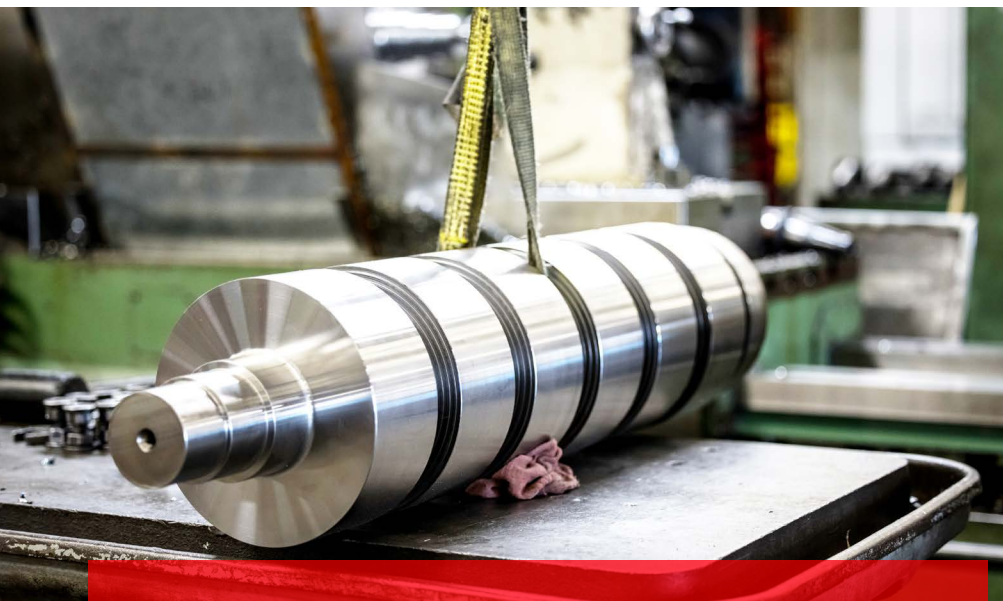
TW Metals in Exton, Pennsylvania, is a specialty metals supplier for motorsports, aerospace, marine, oil and gas, and other industries, and has a ground-level view of which shortages are hitting the motorsports industry the hardest. "Currently there are three product categories that are the most affected: 4130 tubing, stainless steel tubing, and all forms of aluminum," said Keith Cookson. "The metals industry was hit head-on with high demand coming off a challenging year and has been trying to correct itself from the disruption of COVID-19."

He added, "All parts are seeing some type of shortages, but it seems chassis builders and exhaust manufacturers are some of the most affected."

The Edelbrock Group's various brands cover a wide cross-section of the industry, from manifolds and cylinder heads to electronics, hoses and lines. "Our most challenged materials are in the metals," said Dan McKinstry. "There is limited capacity at foundries for casted iron products. Aluminum suppliers are also struggling to keep up with demand, and the cost of aluminum has increased significantly over the last 12 months. We are also beginning to experience pressure on copper-based products used in our electronics portfolio."



The pandemic has caused shortages in many different materials, especially steel. "It's been very rough..." said our source at S&W Race Cars and Components.



Many manufacturers depend on complex, vulnerable supply chains with long lead times. Logistics in particular have been "turned upside down," explained our source at Scat Enterprises.

FOLLOW THE PARTS

To understand how a shortage of a particular raw material can echo through the industry, it helps to look at a commonplace example of the supply chain in motorsports. Tom Lieb at Scat Enterprises in Redondo Beach, California, a manufacturer of crankshafts, connecting rods and rotating assemblies, among other products, gave us a look at all the moving parts it takes to deliver a finished part to the racer.

"Our raw material is billet material for billet cranks, round bar, and then forgings and castings for the other," Lieb explained. "The round bar we buy here in the United States is from Timken in Canton, Ohio. As far as the forgings and castings, we buy those from China. We do have raw material available, but the big problem is the logistics. In other words, the manufacturer makes it, but it's 7,000 miles away. So the challenge is to get it from there to here. The whole logistics, the shipping, not only internally in the United

States but also overseas, is turned upside down. The lead times are more affected by the shipping than they are anything else.

"In our case, we buy from a steel mill, we ship it to a forging or casting house in China. That's done, and then at that point we either bring in a raw forging straight from the forging factory or it goes to a machining facility where they do some partial machining, then it comes here," Lieb continued. "And so the problem is, we actually operate six to eight months ahead of time. In other words, our pipeline now [in June] is being loaded for November or December of this year.

"When the pandemic hit, we had product in all this pipeline. We had product on the shelf that was ready to be shipped, we had work in process that was in the shop being worked on, and then we had raw material that was in the warehouse that would go into the shop as the work orders were written. And then we had material that was onboard



Shortages can arise in unexpected ways. "Tubing hasn't been an issue," noted our source at Ultimate Headers. "Probably the biggest part has been header bolts and gaskets."

a ship that was somewhere on the high seas. And we had product that was in inventory in China that was finished and ready for shipment or getting ready to be shipped. And then we had work in process, and steel mill orders, and things like that. So this whole pipeline, every day, moves."

Until it didn't. "The shutdown in China kept anything from getting on board the ships," Lieb said. "And then when ships did arrive here, the harbor was locked down and they were not unloading. Of course, here, we never shut down. We do some stuff that's critical," he concluded.

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And so it goes throughout the industry. If any particular link in the chain is disrupted, it can affect multiple products down the line. "Container imbalances have increased lead times out of China, further contributing to our shortages," said Edelbrock's McKinstry.

"ALL PARTS ARE SEEING SOME TYPE OF SHORTAGES, BUT IT SEEMS CHASSIS BUILDERS AND EXHAUST MANUFACTURERS ARE SOME OF THE MOST AFFECTED."

"We have increased orders to our Asian suppliers to fill the pipeline and compensate for extended lead times. However, we are now finding that Asian manufacturing sites are operating at high utilizations, limiting our ability to increase the pipeline."

"We're actually a link in that supply chain to chassis builders, so we're not only filling the orders to our direct customers, but to those folks as well," said S&W's Fazekas. "It's been tough, because the tubing we do receive, we're earmarking it for making

our products, to keep our products getting out to our customers. So other customers who just want to buy an 8-foot length of tubing, or a full-length of tubing, or 4 feet of tubing for whatever project they're working on, we had to suspend those sales and

discontinue offering that until we get all of our backorders filled. As you have to understand, we've had so many backorders on the roll bars, roll cages, and chassis kits, now that we're finally having the material show up, we're just using every piece to fill those backorders. The lost tubing sales have really had a significant negative impact on our cash flow."

Much of the industry has found itself stuck in a perpetual "catch-up" cycle. "Now the problem is, the warehouses are empty," Scat's Lieb said. "The manufacturing cycle is trying to make up for all of these gaps that were generated by non-working, and so the reality of that is, we're going crazy trying to get product to the customer. Our production rates are up 30% to 40% over last year. But it's not sustainable, because we're not only taking care of demand, people who are standing there with money in hand waiting to buy a crankshaft, but we're also, on top of that, replenishing the inventory that the

customer has run out of. We've got a double whammy. We ship parts to them; they don't go on the shelves. They turn around and they're shipped off to their customer. Their shelves are still empty."

Even for businesses that planned well to maintain their primary products and have been able to stay a step ahead of the shortages, the lack of peripheral items can still trip things up.

"We have survived through it with some careful planning. Tubing hasn't been an issue," said Jim Browning with Ultimate Headers, Berea, Ohio. "We buy our 321 stainless in a master coil. When they make that coil that's all for us, and we get thousands, and thousands, and thousands of feet out of it. We've been good on tubing, and careful planning has kept us going without any shortages. Probably the biggest part has been header bolts and gaskets. Some of what you would think are kind of basic things have been tough."



A scarcity of workers is at the root of many disruptions. "The single most contributing factor to these shortages is labor constraints," said our source at Edelbrock.

THE HUMAN ELEMENT

Nearly every source we spoke to mentioned one particular raw material that was in short supply: human labor. The reasons why "help wanted" signs are getting ignored vary, but most can likely be attributed to a combination

of expanded unemployment benefits during the pandemic, worker hesitation to return to potentially infected workplaces, or even, for a not-insignificant number of people, a reassessment of life goals after experiencing extended free time during the shutdowns.

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Whatever the reason, the lack of available labor is putting a severe crimp in the supply chain. “What makes this shortage unique compared to other years is most vendors’ inability to respond to increased demands, and labor shortages across all manufacturing categories has limited suppliers’ ability to respond to increased demands,” said McKinstry with Edelbrock Group. “On almost every call with my vendors concerning shortages and delays, the single most contributing factor to these shortages is labor constraints. Going into the pandemic, many of our vendors’ facilities were already operating at high utilizations due to a high demand from a strong economy. Extended plant shutdowns with continued strong demand created large

backlogs and additional pressure on already capacity-constrained facilities. As state restrictions eased, plants struggled to get their workforces back. Many of our vendors looking to increase capacity by increasing shifts found it difficult to hire people to fill the open positions.”

That labor shortage is one more brake on an industry that is ready to operate at full throttle. “Our customers have been extremely understanding, because it didn’t take long for the word to get out to people,” S&W’s Fazekas said. “They understand there’s a shortage. And not just a shortage, but also in the delivery. Some of our suppliers are saying, ‘Yeah, we have it, but we don’t have the staff to load our trucks to get it to you because of the issues with staffing at different companies.’”

ADAPT AND OVERCOME

If the materials and labor shortages are frustrating, they are also forcing companies to be nimble. There are ways to improvise and innovate, and the companies we spoke with are not standing still as passive victims.

“One of the things that’s happened, which is interesting, is that we have inventory that we consider to be C and D movers, like pistons that are .060-over when everybody buys .030-over,” said Scat’s Lieb. “Well, if a guy really needs a part, our sales department has said, ‘I know you want .030-over, but we do have a set of .040s.’ And the guy knows he can’t get anything else, and he’ll buy them. So it’s been a help to us to get rid of some inventory that is not prime.”

S&W Race Cars & Components has taken a similar path in offering alternatives. “What we’re doing whenever possible is offering an upgrade. We’ve been able to do that on a couple different things, like in the roll cage material,” Fazekas said. “If they, for

example, wanted mild steel 1.625-inch x .134-inch tubing, we upgraded them to a different tubing, 1.75-inch x .134-inch mild steel roll cage tubing at no extra charge. It was a swap to something we had in stock that still met spec, and it was a little bit of an upgrade.” She noted that the high-demand 1.625-inch x .134-inch-wall mild steel tubing bundles finally did arrive two weeks before our interview after a 20-week wait, and the 1.625-inch x .083-inch chromoly tubing bundles arrived at the end of June after a 23-week wait.

Remembering who your friends are has also been important during this rough patch. “Partnerships are critical in times like these,” said TW Metals’ Cookson. “We’ve resourced well with our suppliers and have made additional investments in personnel to do all we can to stay ahead of demand.”

A defensive mindset and not being too quick to expand into new markets, tempting as they may be, is another way businesses

are rolling with the punches. “I’m always looking and keeping my ears open to what’s happening, what makes the best sense for us as a company, and to best serve our customers,” said Ultimate Headers’ Browning. “We could go down a path and do a bunch of stuff and then really put ourselves in a position where we can’t ship, and then that doesn’t help anybody. We’re just being very careful in what we do and why we do it.”

Marketing plans by necessity have had to be adjusted as companies moved to adapt. “For the last 10 months we have been focused on creating marketing plans around our inventory position more so than strategically promoting new products or growth categories,” said Edelbrock’s Douglas. He also noted that current conditions have offered a good opportunity to double-down on quality control. “We have been extremely focused on making sure that we don’t allow quality to slip during these



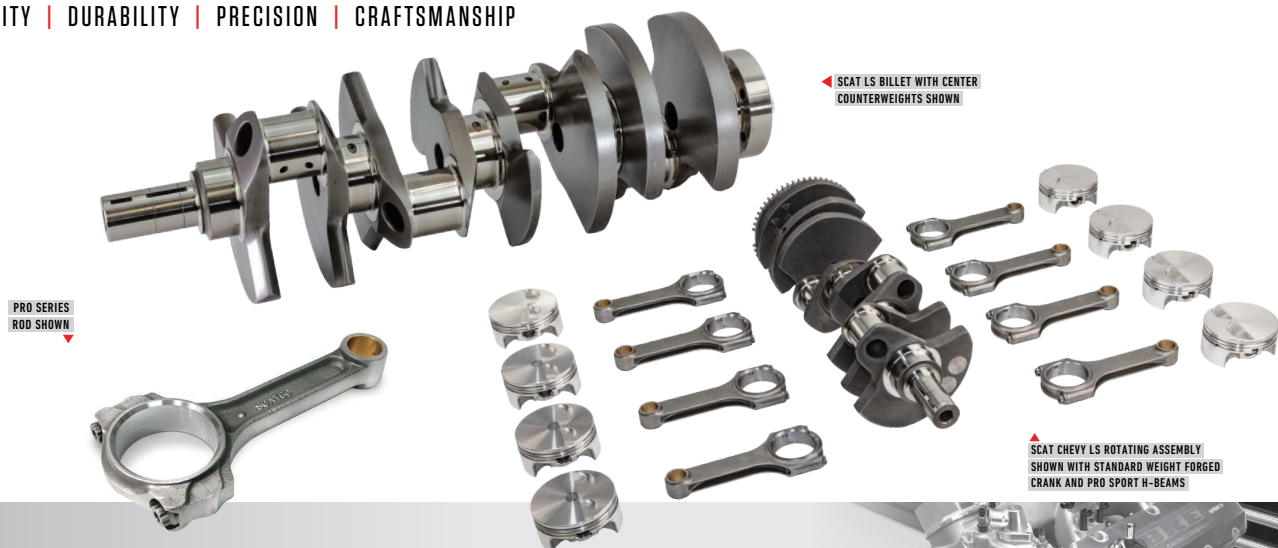
Pandemic-induced shortages are common in all sectors, so most people have come to accept them. “Customers are understandably concerned, but patient,” reported our source from TW Metals.

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Even so, for a company that services as many market segments as Edelbrock Group, the search for raw materials requires constant vigilance. "We've had to continuously pursue alternate sourcing, both domestic and abroad, to secure quality materials and components to service our backlog of orders," Douglas said. "Candidly, it is the most challenging supply environment that I have ever experienced in my career, and we are having to be extremely resourceful and nimble to find materials. Unfortunately, the material shortages are also leading to significant material cost increases, and consumers will continue to deal with inflation for the foreseeable future."

There will be other challenges to address in the near future that companies should be

thinking about now. How will last year's brief racing season, and this year's shortened one, affect demand in the coming months?

**"PARTNERSHIPS ARE
CRITICAL IN TIMES
LIKE THESE."**

"The build season for racing was real, but once they got the cars built and they weren't running, everything just stopped," Scat's Lieb said. "It's going to be interesting to see how the season pans out, now that things are beginning to open up." But, he added, "the season has been cut short, so how's the maintenance side of the business going to happen? They haven't got a full season on their stuff, so they're not breaking. Are they going to go through a normal rebuild, or are

they going to say, 'Gee, we only raced three times last year. We'll change the oil and let it sit and we'll go race again. We don't need to build a new engine or re-do the race car.' That's still yet to happen, but I suspect that not everybody's going to run a full season, which means they're not going to spend money on building new stuff or rebuilding existing stuff in the same manner that they would have a few years back."

CUSTOMER EXPECTATIONS

According to our sources, most customers are taking the shortages in stride. "They hear it from every vendor. What I tell them isn't anything they haven't heard from somebody else," said Ultimate Headers' Browning.

That said, clear communication is essential to retaining a customer base. "You deal with it in two ways," said Lieb. "First, you tell them the truth. And second, if you have an alternative, you tell 'em and let them make a decision. Probably 50% or 60% of

the time when you give them an alternative, if it fits within their realm, they'll go with the alternative. So you salvage the sale. The key to the whole thing is communication."

Fazekas at S&W reports most people have been very understanding during the shortages, although some explanations are easier than others. "It's hard to explain to some of our customers, 'Yeah, your whole kit is complete but we're waiting for these vendor-supplied components.' And that's where they get a little antsy," she said. Besides keeping retail customers satisfied, there are also dealer expectations to manage. "We try very hard to be fair to everybody, between our retail customers and our dealer network," Fazekas said. "There's no favoritism there, because we figure that's just the only way to keep this fair. So they get put into order just like our regular retail customers do, as far as when the order was placed, and when the material comes in, they get filled. Everybody has been very

understanding about that, and we've had no issues whatsoever."

A "we're all in this together" mindset is still prevalent in the racing industry, softening some of the potential sharp edges brought about by shortages. "Customers are understandably concerned, but patient as the supply chain works its way through these issues," said TW Metals' Cookson. "TW has also expanded our web portal to help service our customer base around the clock. Communication has been key, keeping our customer base informed of all challenges and working closely with them in non-traditional ways to minimize the effect on both ends."

"As far as attrition, with people saying, 'Cancel my order,' because they just couldn't wait any longer, there have been a handful of those folks," acknowledged Fazekas. "They weren't angry at us or anything. They just needed to find a different source, they were able to find a different source, or they just

decided to bag their project or whatever it may be. No hard feelings or anything, we're victims of circumstance, all of us." **PRI**

SOURCES

Edelbrock Group
edelbrockgroup.com

Scat Enterprises
scatenterprises.com

S&W Race Cars & Components
swracecars.com

TW Metals
twmetals.com

Ultimate Headers
ultimateheaders.com

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BLESSING IN DISGUISE?

Photo courtesy of Great American Shortcourse

Despite the loss of a prominent series, the short-course off-road racing community is expanding with new opportunities for pro, sportsman and young racers alike.

By Bradley Iger

Lucas Oil's announcement last November that it was discontinuing its off-road racing series certainly wasn't welcome news to its competitors or the off-road racing community at large. Faced with mounting financial strain because of the pandemic and continued uncertainty about what lay ahead, the series called it quits after 12 seasons. During that time it made a significant mark in racing, playing host to some of the biggest names in off-road motorsports and helping to develop the talents of a number of young drivers along the way.

As the Greek philosopher Heraclitus once pointed out, the only constant in life is change. But racers tend to be a resilient

bunch, and in the time since Lucas Oil's withdrawal, several series across the country have stepped up to not only fill the gaps, but also assess what worked in the Lucas Oil series and what needed a bit of tweaking.

"I've been involved in the sport for more than 40 years, so I've seen sanctioning bodies come and go," said Frank DeAngelo of AMSOIL Championship Off-Road, Albertville, Minnesota. "Lucas Oil announced that they were done last year, but it was also the first year for Championship Off-Road. It was born from a group of tracks in the Midwest that wanted to see short-course racing continue but needed a sanctioning body. I realized there was a need for some changes in order to

stabilize things and ensure the growth of the sport in the years ahead."

It's a sentiment that's shared among these organizations that takes into consideration the needs of pro, sportsman, and youth competitors alike, and it points toward a more unified strategy moving forward.

BUILDING MOMENTUM

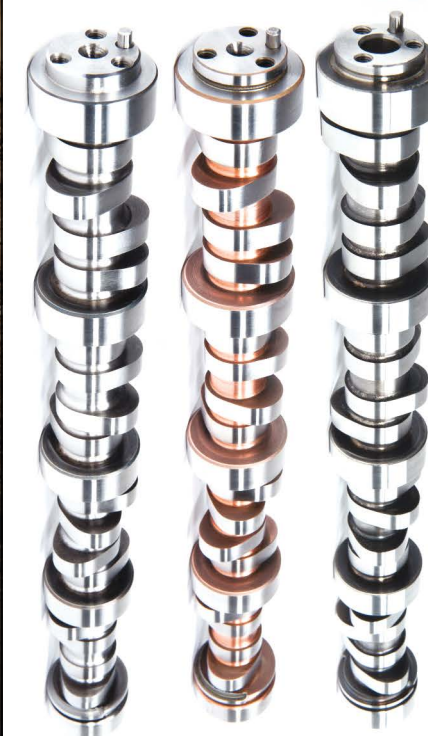
Lee Perfect originally helped to develop the Lucas Oil series and now serves as director for the Great American Shortcourse (GAS) series based out of Temecula, California. Perfect said that key areas for future growth of the sport are evident today and based on interest that flourishes outside of top-tier classes.

"The regional series has always been about grassroots racing and providing more track time for everybody, and the youth classes are solid," Perfect explained. "We've got three classes for the trophy karts and another for the RZR 170, and these kids are getting started as early as six years old. The other area that's seeing a huge amount of interest are the UTVs. That's been the big industry for the last few years, and we expect that to continue. At GAS, we have five different UTV classes now between Youth, Production 1000, Production Turbo, the Unlimited class, and the SR1 spec class, the latter of which uses a Yamaha R1 street bike engine and is about the fastest you can go for the least amount of money."

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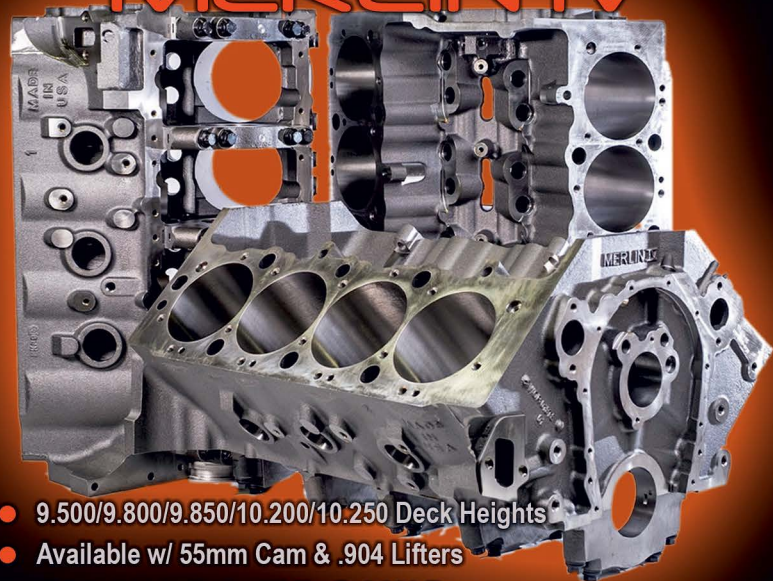


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SHORT-COURSE OFF-ROAD RACING

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Laura Butcher of the Valley Off Road Racing Association in Elk Grove, California, agreed that a strong grassroots foundation is the key to growth not only in the short-course format, but off-road racing in general. "We want to see the kids out there. That's the future of our sport, so there's a big focus on keeping this affordable and accessible to families. And UTVs are absolutely booming. Production 1000 is one of our biggest classes. Being able to walk into a dealership, finance one, and prep it for racing with safety

Short-course off-road racing is hugely popular, although it was left scrambling after Lucas Oil's abrupt departure. In its wake have risen new series, however, such as AMSOIL Championship Off-Road.

equipment for just a few thousand more is a real game-changer. Short-course is great for newer racers because there's never going to be a situation where you're stranded out in the middle of the desert, but it's also a very exciting environment. You can hear the crowd go wild when something happens. And the fans and sponsors love it because they can see the entire track and follow the action throughout the race."

Lori Wilson of Glen Helen Raceway in San Bernardino, California, said that approachability and affordability are major drivers in the enduring appeal of the short-course off-road format. "We charge these folks a very minimal fee, and the rules aren't overbearing. Somebody can buy a UTV, a quad, or trophy kart without any racing experience and get involved with minimal expense and lots of track time."

"WE WANT TO SEE THE KIDS OUT THERE. THAT'S THE FUTURE OF OUR SPORT, SO THERE'S A BIG FOCUS ON KEEPING THIS AFFORDABLE AND ACCESSIBLE TO FAMILIES."

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But Perfect noted that he also didn't want to leave anyone from the Lucas Oil national and regional series behind with the Great American Shortcourse series. "When they abruptly pulled the plug, it kind of left a void," he said. "So we have some mini-stock and some other classes there to provide a spot for people who want to show up and run what they've got. Then we get into the Pro Buggy, Pro Lite, and Pro 2 classes. Championship Off-Road provides a class where the Pro 4 racers can run out there, too."

He also explained that the purpose-built nature of many of these vehicles would have left competitors effectively stranded if series like GAS and Championship Off-Road hadn't picked up where Lucas Oil left off.

"From the little trophy karts all the way up to Pro Buggy, Pro Lite, and Pro 2 classes, these teams don't have another avenue for racing aside from these groomed short-course tracks, and they didn't have anywhere to run on the West Coast until our series was established," Perfect said. "My phone started ringing the same day Lucas made the announcement, and fortunately I had almost all of the equipment already on my property—scales, trucks, trailers, and basically all the other equipment we needed to run the series. It took a little while to get our ducks in a row and make a deal with Lucas—there was a lot to sort out along the way—and COVID certainly didn't help expedite the process. But we had 138 at our first race, which was right around what we expected, and then we had 150 at our second race."

"UTVS ARE ABSOLUTELY BOOMING."

Along with big car counts in UTV classes like Pro Stock and Pro Modified, DeAngelo cites Pro 2 and Pro Lite as the classes with strong support at the upper end of the totem pole for Championship Off-Road this season. "Pro Spec is also something brand new for this year," he explained. "It's similar to the Pro Lite class but uses a spec powertrain that cuts down the costs to field a truck tremendously. Manufacturers have also come

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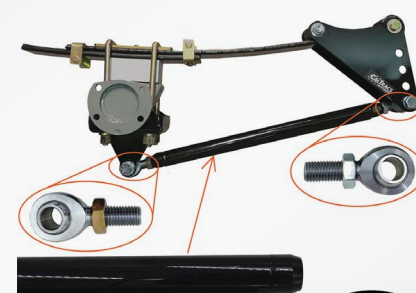


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Race organizers are taking advantage of the sport's recent shakeup to reconsider rules and classes. "We wanted to set up our rules so that everyone could play," said our source at Championship Off-Road.

on board to post prize money for that class."

Don Demeny of Dirt City Motorplex in Lena, Wisconsin, said that the loss of the Lucas Oil series has been something of a blessing in disguise for permanent off-road race tracks like Dirt City. "I hate to say it, but it's been good news for us because it's sending these racers our way, and we're happy to have them. The growth of Pro 2 over the past few seasons has been particularly exciting for us, and this year we're expecting double what we had last year."

REFINING THE FORMULA

While ensuring that racers from the various classes in the Lucas Oil Off-Road Racing Series have new places to race has taken priority for Championship Off-Road and Great American Shortcourse, this restructuring process has also provided an opportunity to consider new approaches to the ways in which the sanctioning bodies operate.

"We picked up the same rules, most of the same equipment, and a lot of the same staff from the Lucas series, but we wanted to kind of change the attitude and receptiveness to some of the racers," said Perfect. "We're trying to learn from some of the things that have happened in the past, both good and bad."

DeAngelo said that the rule set that Championship Off-Road has been using wasn't far off from the Lucas Oil series to begin with. "That was by design, to a degree.

But we also wanted to set up our rules so that everyone could play. For example, there was a situation where Lucas Oil had switched over to a specific cubic-inch engine, and that was the max you could have. We wanted to be a little more accommodating, so for the teams that have the older engine packages, we offered a way to continue racing that with restrictors. The general rules that have been in place for many years have been adopted, but we also made allowances to provide a way for everyone to come race."

Great American Shortcourse has adopted similar balance-of-performance measures to achieve parity between the different engine packages in use in its Pro Lite and Pro 2 classes as well.

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Some insiders told us the departure of the Lucas Oil Off Road Racing Series has been a boon to permanent tracks. "It's been good news for us because it's sending these racers our way," noted our source at Dirt City Motorplex.



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MINT 400 ADDS EV TRUCK CLASS FOR 2021

One of the biggest off-road races in motorsports just got bigger with the addition of the nation's first dedicated electric vehicle (EV) class. EV racers can now join the 550-plus teams taking part in this year's Mint 400, set for December 1-5, in the Nevada desert, just outside of Las Vegas. The new class comes in response to requests from EV truck manufacturers and owners, according to Mint 400 CEO Matt Martelli.

"EV cars have been rapidly evolving, and off-road racing has always been a proving ground for new technology," Martelli said. "We were contacted by several groups of EV makers and owners, so we made the announcement public [in early March] so the industry understood we welcome them to come and verify their cars. If you have an EV vehicle that can go 400 miles off-road, then you know it can do that mileage on the road."

An ultimate-test environment, the Mint 400 is a four-lap race with pits every 30 miles, allowing EV teams to recharge or change batteries mid-race. "We expect teams to start with one or two laps before pitting, but as battery storage technology gets better, they could eventually make it all four laps," Martelli said.

Teams that opt to charge their batteries would get their time back on their overall score, like their internal combustion engine (ICE) counterparts. "The advantage of the Mint 400 is racers can refuel as frequently as they need to—they could refuel three times in a lap if necessary—so we're lumping EV into fueling, whether it's fast-charging or

continued on page 82

continued from page 81

swapping batteries out," Martelli said.

Safety is a priority, too, as race officials will implement battery-specific extinguishing systems and safety procedures.

Although participating EV makers and teams were not confirmed at press time, Martelli said there was significant interest from ICE competitors. "On the independent racer side, I've probably had 50 calls with racers who are going to buy EV drivetrain systems and build their own vehicle. So, the announcement sparked a lot of curiosity and interest with people."



Following the lead of Extreme E (seen here), the Mint 400 will add an electric-vehicle class to its December event. "Off-road racing has always been a proving ground for new technology," said our source at Mint 400.

Looking ahead, officials are exploring adding separate EV classes based on chassis style and design following the 2021 event. And, who knows, an EV team may take the podium this year, as Martelli pointed out, "From a torque perspective, EV's immediate torque is superior to what we have now, so EV teams are definitely in contention to score the overall winner of the race." —Laura Pitts

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continued from page 80

Another important recent change for Championship Off-Road was the switch from specially developed race tires used in some of the Pro classes to off-the-shelf DOT rubber. "There were only a couple of companies that were offering race tires," said DeAngelo. "So last year we came out and said, 'No race tires—everything has to be a DOT light-truck tire.' This year we've had six tire companies

sign on to sponsor the series and racers."

GAS has also adopted similar DOT tire rules.

Although GAS and Championship Off-Road are taking a somewhat coordinated approach in terms of rule sets and event scheduling, Perfect noted that they generally tend to attract different types of racers. "The idea for us is, if you've got a race car on the West Coast that raced with Lucas before, we're going to have a place for you to race

"SHORT COURSE IS GREAT FOR NEWER RACERS BECAUSE THERE'S NEVER GOING TO BE A SITUATION WHERE YOU'RE STRANDED OUT IN THE MIDDLE OF THE DESERT."

out here. Championship Off-Road is a bit more involved, in terms of both time and money. They run every two weeks or so from June until Labor Day. So for the racers out here that wanted to run in that series, they would either be constantly traveling back and forth, or they'd need to get shop space out there. As we were putting things together, the majority of the folks who showed interest in our series didn't want to do that."

Wilson said that it largely comes down to location and commitment levels for most teams. "The guys who are local will support the Great American Shortcourse series. But since there are fewer dates on the calendar, the bigger teams that want to keep their cars going are generally still back East," he explained.

Sanctioning bodies are working to develop a unified, inclusive strategy for the sport, with plenty of room for young competitors and grassroots efforts. Photo courtesy of Championship Off-Road.



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MAKING INROADS

As with any motorsports discipline, sponsorships are a crucial part of the equation for short-course off-road racing. Demeny suggested that would-be sponsors are better served by starting out with a team rather than going directly to the tracks.

"There are companies out there that are interested in getting involved, but maybe they're not ready to make a full investment," he explained. "I think sponsoring something like a sportsman truck is a good way to get your feet wet. And products—everybody needs products. It doesn't need to be cash. Something like motor oil is basically as good as cash, because these racers are going to need to buy it anyway. Consumables will be valuable. We have more tire companies involved now than we've had in many, many years."

"THE GUY WHO KNOWS HOW TO TUNE THAT SUSPENSION IS GOING TO HAVE AN ADVANTAGE."

And with more classes adopting production or spec-style engine rules across the board, suspension tuning is becoming a bigger competitive element. "Looking at something like Pro Lites, the guy who knows how to tune that suspension is going to have an advantage," Demeny added. "On short courses it's not always about horsepower."

For those looking to get involved on the chassis building and tuning side of things, BJ Butcher of VORRA advised attending some events before diving into development. "Talk to the racers and crew chiefs about what you should and should not be doing, and take notes," he said. "The community is a great resource for that. These teams are going to be receptive and more than happy to help you out." **PRI**

SOURCES

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INVASION

Affordability, competition, and technology are driving the segment's popularity, and creating newfound opportunities for those who can provide meaningful race services.

By Bradley Iger

Photo courtesy of AMSOIL Championship Off-Road

Although it took some time for side-by-sides to earn their rightful place in motorsports, few can deny they've helped transform the off-road scene in recent years.

"Five years ago, they were basically considered beefed-up go-karts by the other classes," said Justin Smith of Shock Therapy, Phoenix, Arizona. "But they got better so much quicker than I think anyone expected them to. Now it's certainly the segment with the most growth, and typically the largest car counts wherever you go, whether that's SCORE, Best In The Desert (BITD), or somewhere else. And it's probably one of the most competitive classes, too."

Increased manufacturer involvement has been a key factor in that competitiveness, but these factory-level efforts have also upped the ante in turn. "Back in the day, the UTV guys kind of had to band together because we really had no other choice," explained Nate Martinez of Team Alba Racing, Santee, California. "SCORE and BITD obviously have a giant UTV following now. They have great turnout. But I also know that there are a lot of people out there who are having a hard time getting into the sport now because the factory involvement has significantly raised the costs required to be competitive."

side racing, the specialized needs of these platforms—and the rule sets they must adhere to—guide the demand for components and support.

POWERTRAIN

While endurance-style desert racing formats continue to see strong interest, short-course UTV racing is becoming increasingly popular in various parts of the country. "I've noticed that a lot of the woods racers have transitioned into short-course recently," said Alex Reed of CT Race Worx, Monroe, North Carolina. "I think a big factor there is the ability to be on TV, and the fact that you can run in front of fans who can see 90% of the track from one position. The format allows for a lot more visibility."

But the two formats tend to favor different tuning strategies when it comes to UTV powertrains and their continuously variable transmission (CVT) designs. "Whether you're in a stock class or an unlimited class, everyone is running a CVT," said Dustin Boyko of Trinity Racing, Huntington Beach, California. "The drive belts in these transmissions are designed to be the weakest link in the chain. It's a lot less expensive to change a belt than it is to replace a transmission. The factory ones are typically made for

"IT'S CERTAINLY THE SEGMENT WITH THE MOST GROWTH, AND TYPICALLY THE LARGEST CAR COUNTS WHEREVER YOU GO."

But as with any racing discipline, a bit of ingenuity can go a long way, even in the production stock classes. For those looking for inroads into side-by-

engines that are making 100, maybe 120 horsepower, but the turbo models are making quite a bit more than that now, so the belts needed to get better.

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Side-by-sides have caught on big in recent years. They now tend to have the largest car counts at races like this AMSOIL Championship Off-Road event at Crandon International Raceway.

Ours use different rubber compounds and different internal cords that allow enough slip to prevent failures but provide enough traction to efficiently put the power down. Those compounds and cords also prevent the belt from retaining too much heat, which can lead to a belt failure. If you have a belt failure, you're

dead in the water. I carry two spare belts with me all the time, just in case. You never know, and you don't want to be stranded."

While CVT belts are designed to be a sacrificial component in the driveline, a belt failure in the middle of an event can ruin a team's race, so finding a balance between performance and durability is crucial. Smith told us that clutch kits play a key role in that.

"The clutches are an item that everyone spends time on," he explained. "Making sure that your clutch tuning is dialed in is hugely important, because if it's not, you're going to blow a belt. And I think that the durability of those belts really has more to do with clutching than the design of the belt itself. These belts are designed to handle 600 horsepower. What it really comes down to is whether or not the vehicle is tuned properly to keep heat out of the belt at an acceptable level. Heat kills those belts, and the only way you really get heat in the belt is from incorrect clutching."

Reed said that improved clutching can also

yield significant performance increases with no other changes. "For example, with the 2020 Maverick X3, Can-Am made some significant changes—a different engine with more power, and different clutching. If you change just the clutch kit on one of those cars, it will show an increase of 10 horsepower on the dyno. So you can over-work the belt and make more power if that's the goal, but with that comes more heat."

That's where things get interesting: An aggressive tune makes more power but will shorten the belt's longevity, while a conservative tune improves durability. Which approach makes the most sense often comes down to race format. "It's about making sure it lives for that race," Reed said. "A short-course guy might run for 10 minutes, but the desert guy is running for 10 hours. So the priorities are different."

And as Smith pointed out, the transmission tends to be the focal point in UTV powertrain tuning because of the limited amount of changes to the engine that are typically

allowed outside of unlimited classes. "With a class like Pro Turbo, you're using a factory crate engine that's sealed. The only things you're allowed to do are injectors and an ECU

flash. But that's also the only thing you really need. Our Can-Am makes 330 horsepower to the crank with just a flash and bigger injectors on an otherwise stock engine."

Short-course racing is increasingly popular for UTV competitors. Races like this AMSOIL Championship Off-Road event in Minnesota allow greater visibility for fans, and are sometimes televised.



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CHASSIS AND SUSPENSION

As with most off-road racing disciplines, breaking parts is more or less unavoidable in UTV racing, particularly chassis components. "You're smashing into rocks constantly out on course," Boyko noted. "So wheels and tires take a lot of damage and need to be replaced often."

can replace individual parts of the wheel as needed rather than the entire thing. If you damage a cast wheel you don't really have any choice but to replace it."

The beating doesn't stop at the wheels themselves. Parts like A-arms, ball joints, tie rods and axles are also in demand. "Racers are upgrading to long-travel boxed-arm

moving well beyond the expected use-case of these machines. "A lot of stock components just aren't going to take the abuse that these cars go through. Control arms tend to be a weak point, so we jump to a thicker wall material and use chromoly to get the most strength out of the part with the least amount of weight."

With limited drivetrain modifications allowed, UTV racers largely focus on chassis tuning to maximize performance. "Not many people are leaving their suspensions stock and going out racing these days. It just won't be competitive," said Smith. "In the stock classes, most guys go for a spring kit and shock valving, and hopefully they're working with someone who has some experience on the motorsport side of things, someone who understands car setup. But the guys that are super-fast are spending a lot more time on it. They're working with shock specialists to tune their setups at every single race. Two weeks

According to our source at Trinity Racing, drivetrains can be a challenge in UTV race prep. "The drive belts in these transmissions are designed to be the weakest link in the chain," he noted.

before the race they're verifying what they have, or they're making changes from the last race to hone in on it. The fast half of the upper-tier racers are constantly tuning their cars with specialists. They're spending the same amount of time on that suspension tune as the Trophy Truck guys are."

Yet as the capability of these vehicles continues to evolve, the stakes are being raised in turn. "As these cars get faster, safety is being scrutinized more and more," said Martinez. "I think there are very few manufacturers of aftermarket roll cages that have any sort of roll-over protection certification right now."



THE ROAD AHEAD

While the horsepower levels are now starting to plateau after years of significant increases, the evolution of UTV racing is far from over. "The progression of power is starting to calm down a bit," said Reed. "I think the fight now is for durability, and

the transmission is a big part of that. Belts continue to be an issue, so I think the next big change is going to be moving away from belts entirely. I wouldn't be surprised if the next big, bad vehicle from Polaris or Can-Am came with a dual-clutch transmission rather than a CVT."

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Along with short-course, UTVs have also gained popularity in endurance-style desert events, like the Mint 400. And though the cars look similar, their prep is quite different.

He also expects to see more manufacturers lean toward vehicle offerings with a semblance of race tuning, but only to a manageable degree.

"I think it's about refinement at this point: The differentials are going to get more durable, driveshafts are going to be stronger,

axles are going to be beefed up. People are running King of the Hammers on 35-inch tires with these things. The spindles, hubs and bearings were never designed to have that much mass and leverage on those components. But while these manufacturers built their cars with racing in mind because that's a key marketing element for them, they can't build race-specific vehicles. They need to be able to sell these vehicles to a wider audience," Reed added.

Meanwhile, Smith sees big improvements coming on the technological side of the suspension systems, "things like live valve shock systems and terrain-following adaptive systems. Whoever can get behind the tech side of things is going to have a major advantage. It requires a major investment, but it's where things are going. I think that might be difficult for some of the smaller UTV businesses to do, but I could imagine a larger company like Holley Performance venturing into that space.

"THE FAST HALF OF THE UPPER-TIER RACERS ARE CONSTANTLY TUNING THEIR CARS WITH SPECIALISTS. THEY'RE SPENDING THE SAME AMOUNT OF TIME ON THAT SUSPENSION TUNE AS THE TROPHY TRUCK GUYS ARE."

"Communications are also hugely important," Smith continued. "Radios are a constant source of frustration for teams in endurance races due to range limits caused by the terrain. But satellite systems are getting more affordable every day, and an

always-on connection can be the difference between a win and a DNF. For example, at the SCORE San Felipe 250, I think our satellite system was a crucial factor in our win. It's an extremely rough race, and you do have to save the car to a degree. We had two or three close competitors, but rather than trying to over-drive them and break the car because we were unsure of where they were, our team was able to track their progress and could communicate that to me in the car so I could conserve it when their pace slowed down. After the race was over, the front differential went out while we were putting the car on the trailer."

Regardless of what the future brings, one thing everyone can agree on is that the UTV craze shows no signs of slowing down. "For the most part I think that the 'race on Sunday, sell on Monday' philosophy remains true here," said Martinez. "Granted, having that racer there to do part promotion and show that it works is very important, but the

typical UTV buyer is still where the money is for these companies. Annual UTV sales are going great, and they're only getting higher and higher. Right now, product availability is the biggest problem for most of these manufacturers." **PRI**

SOURCES

CT Race Worx
ctraceworx.com

Shock Therapy
shocktherapist.com

Team Alba Racing
teamalbaracing.com

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BUSINESS PROFILE

SHOCK THERAPY

By Andy Heintzelman

This Arizona-based off-road suspension specialist has become a powerful ally to UTV and shock manufacturers while winning over racers with extraordinary product development and customer service.

Growing up in Southern California in the 1980s with a father who raced a fuel altered, Mickey Thompson as a neighbor, and So-Cal hot rod legend Pete Chapouris' son as a classmate, it is no surprise Justin Smith was fixated on "big power."

"That horsepower thing was just driving me—the need or the want to be in anything that was fast," he said. "I loved horsepower, period."

From his teen years rebuilding small

block Chevys and Fords to drag racing as a young adult, Smith's pursuit of speed suddenly went "off-track" in the early 2000s.

"I got a ride in an off-road truck," he said, "and I never looked back."

Power still mattered in off-road, but not as much as the ride. So Smith threw himself into learning all he could about suspension as he developed a business building sand rails and other full-size off-road vehicles.

The shock he and many others weren't prepared for, however, was the Great Recession. He lost everything.

As he battled back, his wife, Jeanette, broke her back in a boating accident, leading to a serendipitous start to Smith's current business, Shock Therapy LLC, in Phoenix, Arizona, a powerhouse suspension tuning and parts manufacturer that serves the surging UTV market.

"The way this company was started is that she could no longer ride in our UTV because it was too rough and abusive," he said. "And so I took the shock knowledge from years before in race cars and pre-runners and put a set of Walker Evans shocks on a (Polaris RZR) 900, valved them and sprung them, and made many changes to try to make it super plush."

It worked. Jeanette could ride again—and still does, 10 hours a day sometimes, even with 2 feet of titanium in her back.

The business name—Shock Therapy—is spot-on for the circumstances, though not planned.

"Actually, the name was just out of the blue, but after I mentioned it, it made perfect sense," Smith said. "The operation (on his wife), and physically improving shocks."

The two certainly go hand-in-hand for Shock Therapy. "I think with shocks you adjust rebound until it's perfect," Smith said. "In life you can rebound until you succeed."

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Rising from the ashes of his first company, Justin Smith has built a thriving UTV suspension parts business for Can-Am, Honda, Kawasaki, Polaris, Textron, and Yamaha vehicles.

UTVs and think, 'That's going to be the next gold mine,'" he said.

And yet today's UTV market is "insane," allowing Shock Therapy to roughly double its gross sales every year to hit \$20 million in 2020.

The company manufactures, sells, and services suspension parts and accessories for Can-Am, Honda, Kawasaki, Polaris, Textron, and Yamaha vehicles. Giving attention to the full suspension is necessary when you consider a well-traveled axiom of motorsports: Speed leads to weak points.

"You go faster because you can, then all of a sudden you break radius rods. Ah, we supply those," Smith said. "Then, if you

break the radius rod, the next thing in line is the tie rods go. Well, we supply those. And then the next thing, you destroy the rack and pinion because they're not strong enough for the big wheels and tires and driving that hard, and we build rack and pinion."

Today's inventory of parts belies Smith's motto of managing growth, but he did just that in Shock Therapy's early days. "You have to hold back for the inevitable shakeup; 2008 is always in the back of my mind," he said.

With that, he carries no debt. All equipment, vehicles, and inventory are paid for, which he acknowledged likely slowed the company's growth, including the employee count, early on.

"But if everything went to hell in a handbasket tomorrow," he said, "I've got \$12 million of inventory that's all paid for."

POWER OF CNC

Shock Therapy's 14 Mazak CNC machines—from a standard lathe to the seven-axis Integrex—perhaps best represent Smith's unique dichotomy of bold restraint: He's not afraid to invest, and yet every

machine was purchased used, ranging from \$30,000 to \$250,000 for the Integrex.

"But we're very, very careful about their past," he said of the machines.

And, he has stuck with one brand for the similarity in parts and computer language. "Our employees can be trained on one and know how to run them all," he said.

He's also found, as many others do with high-tech machinery, that he's not using the Integrex to its full potential, and yet its automation allows production of simple parts without human intervention.

Its versatility is valuable, too. "It has parts going through it as simple as a spacer for a rod end to as complicated as a rack-and-pinion main body," Smith said.

Justin Smith isn't afraid to invest in equipment, as evidenced by Shock Therapy's 14 Mazak CNC machines. Using one brand also helps simplify operations and reduce training.

The CNCs have been vital because they eliminate the middleman in designing parts, and Shock Therapy now has more than 400 part numbers and 24 patents.



EXPLOSIVE GROWTH

The modifications for his wife and other early developments took place in the Smiths' three-car garage, the first official location of Shock Therapy for its formal start as a business in 2014. It has progressed to a complex of three

buildings totaling 40,000 square feet, with 14 CNC machines and 60 employees.

The 50-year-old Smith admitted that as he rebounded into the shock and suspension business, there was no Nostradamus forecast.

"The last thing I did was take a look at

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Smith conveyed the potential of in-house CNC work through the following story: He was on an airplane waiting for takeoff when he had an idea for a clevis, used to attach a rod end to a rack and pinion for adjustability. He sketched it on a drink napkin, took a picture with his phone, and sent it to his machinist.

"By the time I landed," he said, "he had sent to my phone a CAD drawing of it, and we were making it that afternoon."

FREE UPGRADES

Customers come to appreciate Smith's proprietary information—"his special

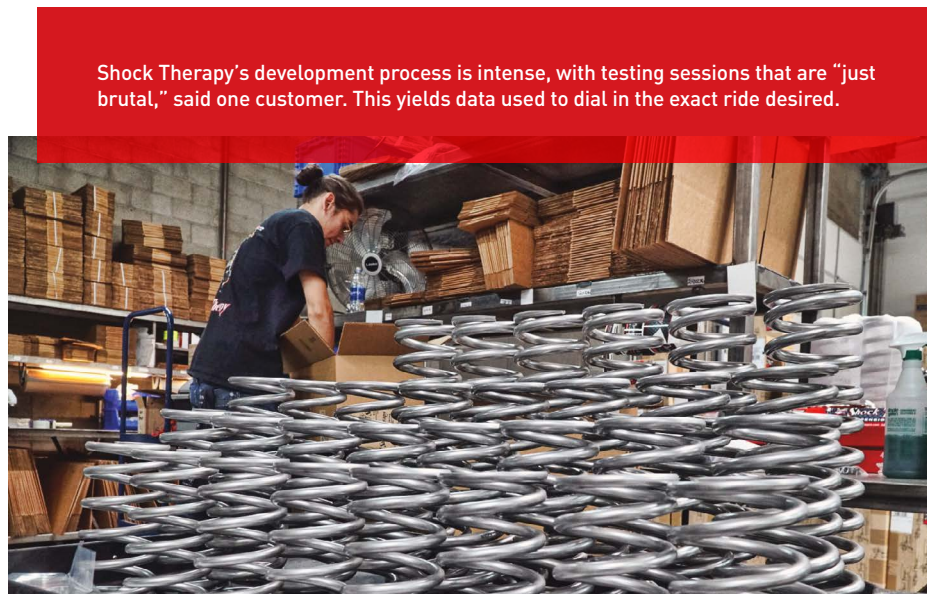
sauce"—gleaned through R&D, said Shayne Williams, a longtime customer of Smith's from Peoria, Arizona. He raced for years but now prefers simply to ride his Can-Am Maverick X3 and custom-built sand rails.

Williams has accompanied Smith on the very long test days he puts in for new parts, "and it's just brutal," he said, laughing.

"I'VE GOT \$12 MILLION OF INVENTORY THAT'S ALL PAID FOR."

"He tears them apart until he can get them perfect, then tears them apart and makes them go bad the opposite way just to make sure," Williams said, calling Smith a "geometry whiz. He spends an astronomical amount of time to be sure his stuff is the best that money can buy."

continued on page 100



Shock Therapy's development process is intense, with testing sessions that are "just brutal," said one customer. This yields data used to dial in the exact ride desired.

WHAT RESUME?

Justin Smith wasn't going to do it the same way this time.

"In the past, in all of my other businesses, I hired according to a resume and experience," he said. "That failed."

"You hire the best guy, but if he's a bad apple among 10 others—you have 10 other pissed-off guys," he said. "It was a lot of babysitting."

This time around, when founding Shock Therapy, he ignored resumes and hired personalities. "We chose the coolest guys we could find, the nicest people we could find, that got along with others, and then we just trained them," he said.

Today he manages all 60 without an HR person.

Videos shot in the shop show a lot of energy and fun, plenty of ribbing. Passion.

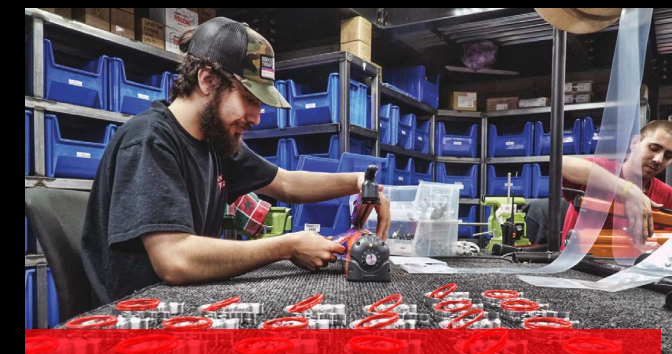
"They all know how to talk smack," Smith said, laughing. "But one thing they do know to take serious," he quickly added, "is you pull your own weight, or you get called on it."

Shock Therapy's website and social media exude energy. A slow-motion video of a UTV ripping through whoops is mesmerizing. Smith claimed he could watch it all day.

His unique approach has been successful in driving development through his employees. It's not something one or two people can

accomplish, he said.

"We're nothing without our crew," Smith said. "Our guys are badass, and they're the reason we get things done every day, and get them done right." —Andy Heintzelman



Shock Therapy owner Justin Smith (not pictured) isn't wowed by flashy resumes. Instead, he looks for prospective employees with good personal chemistry, then trains them as needed.

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continued from page 98

Customers appreciate that Smith keeps that information—spring rates, valving, rate of oil—in-house, and uses it to develop the specific ride a customer seeks.

Also valuable—and unusual—is that Shock Therapy, as it improves its products, upgrades customers' parts for free.

"Who does that? Who calls their customers and says, 'Let me rebuild it for free,'" Williams asked.

Retired from the fire service and riding a "play car"—a 2021 Polaris RZR Turbo S—in the desert west of Phoenix, John Huppertz has found great value in Shock Therapy's services.

"I like to be aggressive in my riding, but I like a comfortable ride, too," he said. "Once I had Shock Therapy revalve and respring my car, it made the ride a lot better, a lot more plush. I'm able to take bumps that if you hit before would be kind of jarring; now you just float over them."

Huppertz, who chased for a Baja 1000 team in 2019 and will do so again in November, said Shock Therapy refines for the aftermarket the products that OEMs

create for the masses.

It leads to the question for Smith: Why not just make your own shocks? "We could build our own shocks, but if we did we'd make enemies (of our partners)," he said.

Instead, Smith said his business is an ally to the shock—and UTV—manufacturers. "We are a business that makes them look better."

SEEING THE FUTURE

UTV manufacturers already use ECU technology, intuitive controls that work on the fly, to affect the suspension. "You turn left it stiffens the right shock," for example, Smith said.

it is, however, iQS now represents just the tip of the iceberg. "It doesn't have to wait for sensors to tell it what to do," he said. "It knows what's coming."

Such terrain-following technology to spot a whoop or potential full-compression "G-out" is not unlike automatic braking or lane departure warning systems in today's street vehicles, Smith said, and it will further help make UTV rides "amazing."

It's no pipe dream, either, he said in announcing that Shock Therapy late this year will offer a phone app where riders can pay for a suspension tune, not unlike what can

"THE OPPORTUNITY IS THERE FOR THE GRASPING FOR THOSE WHO CONTINUE TO DEVELOP, TEST, AND INNOVATE NEW PRODUCTS."

He raved about Fox's iQS (Intelligent Quick Switch) electronically controlled suspension and what it did for the market. Advanced as

already be done for an engine tune.

"We've already done the work to make it ride better, but now they can buy the app

Justin Smith's spring and shock work quickly revealed shortcomings in other components. He responded by developing better radius rods, tie rods, and rack-and-pinion units.

and do everything on the fly and make it more 'them,'" Smith said. "You can do it via Bluetooth when you get to where you're riding. If you're in the rocks, you put in your rock tune. If you're in the dunes, you put in your dune tune. If you're going to go racing or ripping with your buddies, you've got aggressive or desert fast."

OPPORTUNITIES ABOUND

Smith said no matter the racing business, new development is the secret to surviving, especially in uncertain economic times. "The opportunity is there for the grasping for those who continue to develop, test, and innovate new products," he said.

As with other parts for competitive



vehicles, suspension sales can be difficult until the customer experiences the advantage firsthand. "It's hard to get someone to spend money on that magic box; they're paying for air—until they ride in it," Smith said. "As soon as their friends have it, or somebody beats them through the

rough—then it's over."

So it's still about speed, but perhaps not like it used to be for Smith. "You can put all the power into it you want," he said about a vehicle, "but if you can't stop, if you can't go through the woods, if you can't hook a corner, it's pointless." **PRI**

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TALKING TRAILERS

An exchange of ideas and information helps manufacturers and dealers match racers with their dream hauler. Here are the important questions for both sides to ask.

By Drew Hardin

Transporting vehicles is just a small part of what racers want from their trailers. This multitool on wheels is also expected to carry a race shop and spare parts; provide food and shelter during down time; tote a mule or golf cart; serve as a motel room and/or lavatory; provide sponsors and other guests with a lounge and refreshments; and maybe even act as a concession stand for a racer's merchandise. Organizing all that into a narrow space between wheel wells requires foresight, planning, and a keen eye for spatial coordination.

Fortunately for racers, our industry's trailer manufacturers and dealers bring all those skills to the table and more. Many in the trailer business are racers themselves, so they have firsthand experience with the little details, like where to place D-rings or how many lights are needed at the loading ramp, that will make a racer's life easier.

All that knowledge, though, must be tapped. When shopping for a new trailer, racers should be prepared for a thorough discussion with a manufacturer's rep or dealer about what they carry and how they race.

"We're creating dreams, something very special for these customers," explained Brad Bell of Formula Trailers, Bristol, Indiana. "So it's valuable for us to ask as many questions as we can. It's fun to talk to customers about what their end vision is. A lot of them just don't know how to get there. They need somebody to ask those questions, and then we can dial it in."



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Trailers are a vital multitool for racers, serving as workshop, parts storage, hospitality center, shelter, and of course, transportation for cars. Photo courtesy of Capitol Renegade.

Q: What type of racing do you do?

"It sounds crazy, but one thing a lot of dealers miss is asking about what kind of racing they do," said Chad Stanley of Phil's Trailer Sales, Waco, Texas. "You have to know what the end user is doing with the trailer before we can decide what to put them in."

"Each discipline of racing has a little different trailer requirement," said Wayne Quackenbush of Capitol Renegade, Beltsville, Maryland. "We do a lot of sprint car trailers because we race sprint cars, and we know what it takes to be on the road for a four-day weekend. Drag racers are completely different. They're not pitting behind the car—they're generally next to the car—so they may need awnings, electrical

"You'd be surprised at how many napkin drawings I bring home from the PRI Show," said Todd Datweiler of T&E Enterprises Auto Haulers, Herscher, Illinois. "I'll go out to dinner with customers and bring home drawings on napkins to start a project with. All we need is

the concept, and we can go from there."

What follows are some of the most important questions trailer reps and dealers should ask a racer, and vice versa, to make sure the trailer the racer wants is the trailer he or she gets.

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and air outside, things like that."

"Knowing what type of racing they're doing so you know what to sell your customer is the absolute most important thing," added Mike Nichols of Haulmark, Elkhart, Indiana. "So many dealers skip that part of the process. They just want to hurry up and sell what they have pre-packaged."

Q: What are you carrying?

Tim Dibley of United Trailers in Bristol, Indiana, said that question "encompasses not only the vehicle that you're carrying, but what else are you taking to the track? Are you taking a pit box, a golf cart, a mule? Are you taking hospitality? Do you have the room and weight capacity to carry that in that trailer?"

In Dibley's experience, "if they've been in racing for a while, they know everything they carry with them. What they may not understand is, when everything's totaled up, what does that weigh?"

"If they sit down and add it up, they may be surprised at how much it comes up to," Quackenbush agreed. "So the first thing I tell people is to buy a trailer that has the



The right trailer can make a world of difference in convenience, satisfaction, and success for racers. "We're creating dreams," said our source at Formula Trailers.

capability of handling all that weight."

Too often, he said, "people are caught up on the price of the trailer, and they're not asking about the capabilities of the trailer. You see a lot of inexpensive trailers out there that only have a 10,000-pound GVW

(gross vehicle weight rating). But the trailer weighs 7,500 pounds, so they really have 2,500 pounds of cargo capacity. And they're trying to load 3,000 pounds of race car and another 3,000 pounds of equipment in it. If you overload a trailer, it can be very unsafe."

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Getting the ideal trailer configuration starts with an honest, accurate assessment of needs. Amenities for travel can be a big part of that. Photo courtesy of R&M Race Trailers.

Paying more attention to price than capability can be especially true of first-time trailer buyers, said Steve Hartman of Look Trailers in Middlebury, Indiana. "First-time users are looking at just the economics of getting the lowest price. But they may not get

the trailer they actually need or that is safe to pull, because they buy a trailer with axles that are too lightweight. It's important to get it spec'd right to begin with, otherwise you'll be needing a new trailer right away."

Once the racer has figured out weight capacity needs, "we need to see what their footprint is," Nichols said. "Before they come to the dealership, they should draw in their floor space, everything they plan to put in this unit, so they can find out if the trailer they want will cover that footprint."

United Trailers has downloadable floor plan grids on its website to help with this part of the trailer-buying homework. "You can print a grid of what the floor will look like and draw your car, your cabinets and where things will go, so when you go to the dealer you have everything mapped out," Dibley explained.

inTech Trailers of Nappanee, Indiana, also offers downloadable floor plan grids "to give them a rough idea if the layout will work for their needs," said Jim McConnell. "Sometimes it makes it easy for them to understand that they may want a 24-foot trailer, but it's going to take a 26 to solve their problem."

Q: What do you tow with?

On a basic level, this question is about having enough truck to pull the trailer.

"If a guy says, 'I want to haul two cars, plus this, that, and the other,' and he says he's towing with a half-ton pickup, then let's back up here, we're not getting anywhere," said Alan Cape of Flying A Motorsports, Cuba, Missouri.

"PRICE SHOULDN'T BE THE MOST IMPORTANT QUESTION."

"A lot of people are trying to pull way too much with a smaller truck," added Bruce Litton of Bruce Litton Trailer Sales, Indianapolis, Indiana. "That's a recipe for a lot of problems going down the road. So the very first question I ask is, 'What do you have to pull with?' That gives me an idea of what size of trailer will fit their needs."

On another level, custom work may be

needed for the trailer to accommodate the tow vehicle.

"When it comes to fifth-wheel and gooseneck-style trailers, those kinds of haulers are very unique, and the manufacturers need to build the trailer to match the tow vehicle," said Bell. "We need all the tow vehicle information: bed length, bed height, where the ball is placed, if there's a toolbox inside the bed. Then our engineering staff can make the CAD prints for that trailer to match that tow vehicle."

Similarly, "if you're towing with a motorhome or toterhome, you need an extended tongue on the trailer," said Rich Moline of R&M Race Trailer, Cushing, Oklahoma. "If you have a normal tongue on the trailer and you make a turn too sharp, the trailer will hit the back corner of that motorhome and damage both the motorhome and the trailer."

Moline orders all his trailers for inventory with extended tongues. "It doesn't hurt the guy who doesn't have a motorhome," he explained. "It just gives him a sharper turning radius with his pickup. It's not an expensive option, so I'd rather have it on there than not."

Q: What options do you want?

Because so many race trailers are built to order, "the sky's the limit as far as options we can do," said Hartman, echoing the comments of many companies. "They just need to spec it right the first time, so they don't have the regrets of, 'I wish I had done that.'"

Cabinets were near the top of the must-have list. "As racers, we never have enough storage," Moline said. "If you just get the basic L-shaped cabinet up front with a straight overhead, which is what you see in most stock units, you'll run out of storage fast. In every trailer I order, I put a wheelwell cabinet on one side or the other."

Lighting, too, was mentioned by many. "You can never have too much lighting," McConnell

Once racers specify what they plan to carry, the manufacturer can determine exactly what size trailer is required. "We need to see what their footprint is," explained our source at Haulmark.

said. "Customers will say, after the fact, if they could have done anything different, they would have doubled up their lights. It's not that expensive on the front end."

It follows, then, that "nine out of 10 racers need a power supply center to help them at the track," said Bell. "Not only to light up the area to work on their machine, but to power any type of tools they're using." Like many manufacturers, Formula Trailers can supply a generator for the trailer, or build an enclosure for a generator that a customer is moving from an existing trailer.



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As with so many trailer options, generator capacity varies depending on need. "We've put some diesel generators in these big semi-trailers that are crazy in size," said Datweiler. "Later we'll find out that not only is that generator running the trailer, but the client will also have a motorhome parked with the trailer and wants to use the trailer generator to also run the motorhome."

have the sag problems that come with the RV-style generator doors."

An option that Nick Godfrey of Equalizer Systems in Elkhart, Indiana, considers "the best-kept secret in the trailer industry" is his company's hydraulic tongue jack. (Hydraulic landing gear for fifth-wheel and gooseneck trailers is available as well.) "Instead of manually cranking a jack, you

"IF PEOPLE ARE THINKING ABOUT GETTING A TRAILER, THEY WANT TO GET IT ON ORDER AS QUICK AS POSSIBLE."

On the other side of the generator spectrum, Haulmark's popular Edge racing trailer is built with a top-hinged generator door, something Nichols highly recommends "if you're running a portable generator and have to open your generator door at every race. Make sure your manufacturer is putting in a top-hinged generator door, so you don't

just push a button, and the jack does the work for you."

Q: What are your long-term plans?

"I talk to my customers about the long term," Moline said. "You might be racing in this class this year and next. But if you're planning to move up in a couple of years,

instead of having to buy a new trailer, look at a trailer now that will fit those needs also. In the sprint car world, in a couple of years they may move up to a wing car and will need a taller trailer. It's cheaper to buy that taller trailer now than to buy a whole new trailer two or three years from now."

"One thing I know about racers, they change every other year," Stanley said. "So we've learned to ask, 'What other kind of racing have you done?' A drag racer may tell us he likes dirt track racing. So we'll recommend the Edge because of its 96-inch-wide ramp door opening. If you go with another product, it may only have the standard 89 inches. A Late Model car is going to need every bit of that ramp door opening. This way you don't have to replace the trailer if you decide to change."

CUSTOMER QUESTIONS

As for those questions a racer should ask the trailer companies, the first is obvious: How much is it?

"All too often, people are caught up on cost," said Quackenbush. "There are

Referred to as "the best-kept secret in the trailer industry," Equalizer Systems offers its hydraulic tongue jack and hydraulic landing gear. "Instead of manually cranking a jack, you just push a button, and the jack does the work for you," said a company source.

companies out there building cheap trailers with small axles, tires and wheels, all to get an inexpensive price, and people fall for it."

"Price shouldn't be the most important question," said Moline, "but the customer's first question usually is, 'Do you have a 28-foot trailer, and how much is it?' instead of asking what brand it is and what options are on it.

"Or they'll tell me, 'So and so is advertising a 28-foot trailer for \$1,000 less,'" Moline continued. "Is it a major brand that will be there for you warranty-wise? And why is it \$1,000 less? Are they using cheaper materials, like thinner-gauge steel in their upright posts and main frames? It's the old



saying: You get what you pay for."

In a similar vein, after "what kind of racing do you do?" Stanley said the second most important question he asks is whether the

racer stays local or puts a lot of miles on the trailer. That information influences the trailer model he recommends, as he will want to put a high-mileage team in a better-quality trailer.

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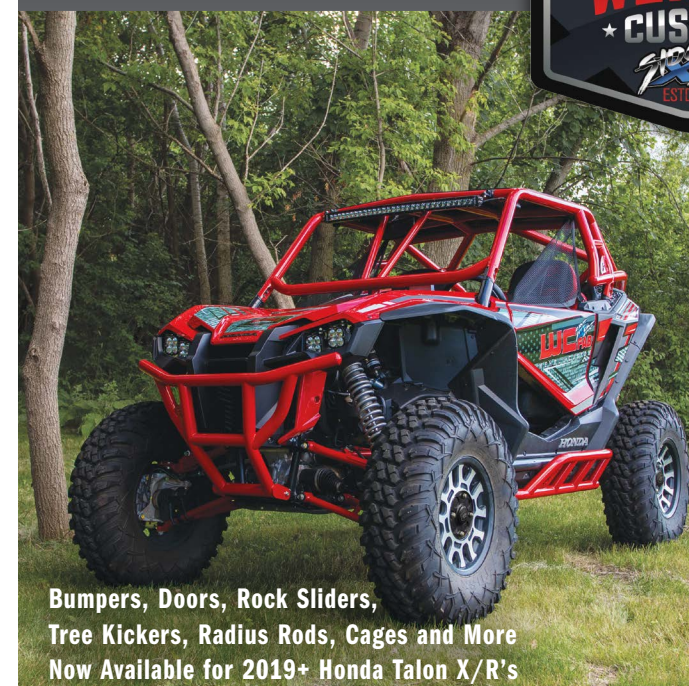
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Putting needs before price is vital for getting the right trailer. "First-time users are looking at just the economics...but they may not get the trailer they actually need," explained our source at Look Trailers.

"We do a lot with [the television show] 'Street Outlaws,'" he said. "When I found out they were traveling all over the place, I put a lot of them in our Haulmark Edge product because that's our higher-end race trailer. They're replacing models they picked up at

the best price they could and realized real quick that didn't work for them."

Nichols said Haulmark has models "that will work great for the weekend warrior, who races 10 to 20 times a year at his local track. But if you put a guy who's going to drive from

LA to Boston to make a race in that same trailer, the long-distance racer is not going to be happy. He would be in the wrong product. Many dealers are trying to sell price, price, price, and it's definitely not about price once you're at a certain level, or any level of racing, in my opinion."

Another important question a racer should ask a dealer, especially in post-pandemic America, is about lead time.

"COVID put a tremendous backlog into things," Bell explained. "Everything was going really well at the beginning of 2020, and then COVID pushed everything back."

"It's hard to get parts, hard to get people to build the trailers, everything is just harder right now," said Hartman. "Lead times are out further than I've ever seen them in 20 years. If people are thinking about getting a trailer, they want to get it on order as quick as possible. Typically, there's a longer lead time on race trailers anyway because they are labor intensive. It used to be 12 to 16 weeks, but right now we have some stuff that's nine months out. They're talking next season."

Formula Trailers is also "building through

the end of this year and into 2022," Bell said. "We're looking at next spring already. In a normal season, things would be winding down at the end of the year, and the PRI Show would start the next season of race

trailers. We're still picking up the pieces of last year, and it's bleeding right through. I think PRI will just continue that momentum through 2022."

"You can still get exactly what you want,

and it will still be customized to your needs," said Litton. "The important thing is to allow yourself plenty of time. It will all work out in the wash. We'll get through this pandemic and be back to racing like we were soon." **PRI**

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Motorhome Conversions**ELLIOTT'S CUSTOM TRAILERS AND CARTS****Booth 8718**elliottscustomtrailers.com
Trailer/Toter Home**EQUALIZER SYSTEMS**
A DAYS COMPANY

equalizersystems.com

CUSTOM HYDRAULIC LIFTING & LEVELING SOLUTIONS

- Universal three-hole bolt pattern for easy installation in A-frame trailers.
- 6,000-pound lifting capacity and 16 inches of stroke.
- Commercial single function pump with manual override, rocker style switch control with keyed lockout.

**inTech**

intechtrailers.com

ALL-ALUMINUM TRAILERS

- All-aluminum, all-tube construction.
- Exclusive customer portal for access to prints, construction photos, and much more.
- Meticulous attention to detail and quality.

**HAULMARK RACING TRAILERS****Booths 8201 & 8301**haulmark.com
Professional Grade Race Trailers & Stackers**INTECH TRAILERS****Booth 8701**intechtrailers.com
Enclosed Trailers**EQUALIZER SYSTEMS****Booth 8610**equalizersystems.com
Hydraulic Trailer Jacks

flyingamotorsports.com

RACE TRAILERS

- Flying A Motorsports has been in business since 1988 and has seen many changes during this time, but that hasn't changed how the company does business.
- Honest, fair, responsible.
- Offers great prices, financing trades, consignments, and knowledgeable people to help customers.

**JASON DIETSCH TRAILER SALES**

jdtrailersales.com

RACING TRAILER SPECIALIST

- Over 500 trailers in stock.
- Quick custom builds.
- Trades considered.
- Financing available.
- On-site repair.
- Delivery available.

**KB TRAILER SALES****Booth 8412**kbtrailersales.com
Trailer**FEATHERLITE TRAILERS****Booth 8719**fthr.com
Race Trailers**FLYING A MOTORSPORTS****Booth 8127**flyingamotorsports.com
Motorhome

formulatrailers.com

RACE TRAILER

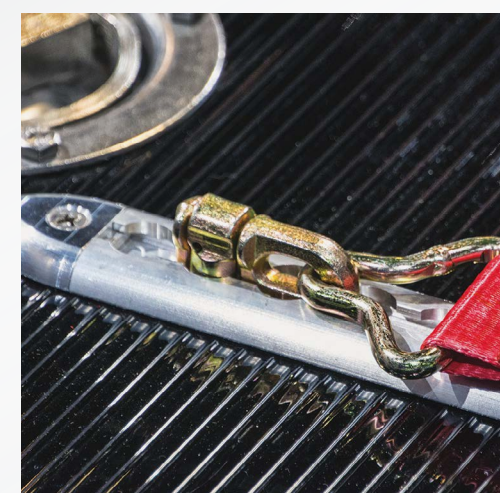
- Sleeker styling and more interior space than a standard enclosed trailer.
- Seven-foot interior height.
- Heavy-duty "truck body" top extruded trim, stoneguard and 16-inch OC full-height crossmembers.

**FORMULA TRAILERS****Booth 8500**formulatrailers.com
Race Trailer

macscustomtiedowns.com

CUSTOM TIE DOWNS

- Choose from four VersaTie track profiles (surface and recessed).
- Available in lengths up to 16 feet.
- Light- and heavy-duty VersaTie fittings adjust on 1-inch increments.

**R&M RACE TRAILERS****Booth 8313**rmtrailer.com
Trailers and Trailer Accessories**RACEWAY RV RENTALS****Booth 8327**racewayrentals.com
Class C RV

RPM TRAILER SALES**Booth 8213**rpmtrailersales.com
Custom Aluminum Trailerstande-racetrailers.com
**CUSTOM BUILT ALUMINUM
RACE TRAILERS**

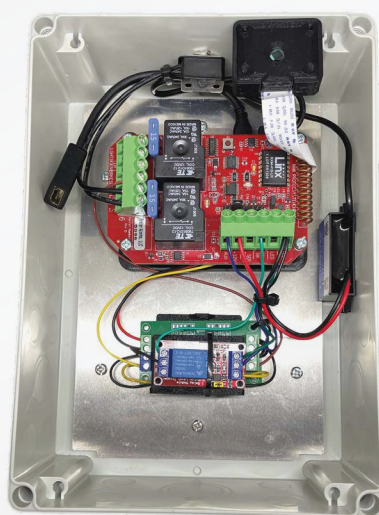
- Custom built by racers for racers with unmatched quality and trendsetting designs.
- The company designs and builds trailers for sportsman class racers as well as for the pro class racers.
- The lineup consists of Pull-a-Long Bumper Pull Trailers, Gooseneck/Fifth Wheel Trailers, Stacker Trailers, Sprint Car Trailers, Semi Trailers, Vending Trailers, and Coach Trailers.
- Offers personalized support and excellent customer service.

SHOWHAULER TRUCKS**Booth 8501**showhauler.com
Super C Motorhomes**UNITED TRAILERS****Booth 8427**united-trailers.com
Race Car Trailers for
All Types of Racingtrailer-cabinets.com
WHEEL WELL CABINET

- Three full-length shelves.
- Custom sizes available upon request.
- Wheel Well Cabinets provide ultimate storage using very little space.

**VICTORY CUSTOM TRAILERS****Booth 8527**victorycustomtrailers.com
Trailer and Coachtrailer-alarms.com
PTS-2W BY TRAILER ALARMS, LLC

- Video recording when alarm is triggered.
- Easy access through app.
- Remotely arm/disarm.
- Notification and video emailed when alarm is triggered.
- No monthly fees (Wi-Fi required).
- Flashes trailer lights.
- Sounds 120db siren.



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DECEMBER 9-11, 2021



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MORE THAN 1000 TOP RACE INDUSTRY SUPPLIERS

Exhibitor List As of August 6, 2021.

View Current List Online At: performanceracing.com/tradeshows

1 Way Technologies
3pConnect
4 Piston Racing
A&A Manufacturing
A.E.D. Motorsport Products
AAP Inc
Abbott Workholding Products
Abruzzi Racing Transmission
ABS Products Trader Magazine
ACC Performance Products Plus Inc
Accelerated Surface Finishing
Accu-Force Dynos & Testers
Accurate Cylinder & Sleeve Works LLC
ACE - Automotive Centre of Excellence
ACL Distribution Inc
ACP - Stahl Headers
ACP - Stahl Headers
Acumatica Cloud ERP
Adept Performance Products
Advanced Clutch Technology
Advanced Composite Products - ACP - Stahl Headers
Advanced Product Design
Advanced Racing Suspensions
Advanced Sleeve
Advantage Lifts
AED Performance
AERA Engine Builders Association
AERO Exhaust
AERO Race Wheels
Aeromotive Inc - Waterman Racing Components
Affordable Fuel Injection
AFR - Air Flow Research
AHDRA
AIM Sports LLC
AJUSA USA
Alcon Brakes
Aldan American
All Pro Cylinder Heads Inc
Allstar Performance
Alto Products Corp
Altronics Inc
American Electronics
American Race Cars
American Racer
American Racing Headers
Amick Associates Inc
AMSOL Inc
Anderson Composites
Andrews Products Inc
Antigravity Lithium Batteries
ANZE Suspension
AP Racing
ApexTurbo LLC
ARCA - NASCAR
ARE Dry Sump Systems - Spintronic Air-Oil Separators
Argo Manufacturing Co
Arias Pistons
Arizona Sport Shirts - Gotta Race
ARP Inc
Arrow Components
Ashcroft Inc
ASI Sportswear
ASNU Europe
ATC Trailers
Atech Motorsports
ATI Performance Products Inc
ATL Racing Fuel Cells
ATM Innovation
Atturo Tire Corp
Audi Sport Customer Racing
Audite Technology
AUS Injection Inc
Auto Rod Controls
Auto Verdi
Automatic Transmission Design
AutoMeter
AVIAD Oil Systems
AVIORACE
AVL
AXE Equipment
Bad Dog Tools
Badass Workbench
Baer Brake Systems
Barnes Systems Inc
Bassett Racing Wheel
Bazell Race Fuels
BBS of America Inc
BD Diesel
Be Cool Radiators
Behrent's Performance Warehouse
BelaK Industries
Bell Racing - Racing Force USA
Bend-Tech
Bernheisel Race Cars
Bert Transmission
Beyea Custom Headers
Bill Mitchell Products LLC
Billet Connection - Clear View Filtration
Billet Specialties Inc
BILSTEIN Shock Absorbers
Bishko Automotive Literature
Blaser Swisslube
Blast-It-all
Blower Drive Service
Blud Lubricants
Blue Demon Welding Products
Blue Streak Performance Wire
BMR Suspension
BMRS Wired
Boker's Inc
Bonifante - ProTorque - Kenny's Pulling Parts
Boose Aluminum Foundry
BOOSTane Octane Engineering
Boostline
BorgWarner
Boria Performance
Borowski Race Engines Inc
Bosch Motorsport
Boundary Racing Pumps
Boxo USA
Boyd Blit Fabrication
Brase 360 - Cleveland Motorsport
Braswell Carburetion
Brembo
Brian Tooley Racing
Briggs & Stratton Racing Engines
Briinn Transmissions
Brodx
Browell Bellhousing
Brown & Miller Racing Solutions
Bruce Litton Trailer Sales
BSB Manufacturing
BTE Racing
Buckeye Carbide
Cumatlica Cloud ERP
Bullett Racing Cams
Bullet Racing Engines
Bully Dog
Burr King Mfg Co Inc
Burromax
Butlerbuilt Motorsports Equipment
Buxton Engineering Inc
Buzzz Axles
C & S Specialties
Calico Coatings
Callies Performance Products - Energy Manufacturing
Cam Motion Camshafts
Canton Racing Products
Capitol Custom Trailers and Coaches
Carbon Raptor by IHC
Cargo Equipment Corporation
CCA Racing Products
CCW
Centroid Performance Racing
Champ Pans
Champion Oil
Chassis Engineering
CHE Precision Inc
Chevrolet Performance
Chico Custom Trailers
Chillout Systems
Chosen Payments
Chris Alston's Chassisworks
ClampTite LLC
Clarendon Specialty Fasteners Inc
Clark Copper Head Gaskets Inc
Classic Dash
Classic Instruments
Classic Motorsports Magazine
Clevite
Clinton Aluminum
Cloyes
Coan Engineering
Cobra Seats
Coker Tire
Coleman Machine Inc
Collector Tethers
Comtec
COMP Cams
Comp Turbo Technology
Composite Fabrics of America
Concept Performance
Cool-A-Zone
COOLSHIRT Systems
Corghi USA Inc
CORSA Performance - Volant Performance
CorteX Racing
CP-Carrillo
Creative Racing
Crower Cams & Equipment Co Inc
CRW Finishing Inc
CSF Cooling - Racing & High Performance
CSI Shocks
CTECH Manufacturing
CTEK Inc
CTK Automation
Cunningham Precision Group
Curto-Ligonier Foundries Co
Custom Performance Engineering
CVF Racing
CWT Industries LLC
Cylinder Head Abrasives
D&J Precision Machine
Daido Engine Bearings
Dale Engineering
Dakota Ultrasonics
Dan Olson Racing Products
DANA Inc
Daniels Manufacturing Corporation
Dart Machinery
Darton Sleeves
Dave Poskes Performance Parts
Davis Technologies LLC
DAYCO Products Inc
Dayton Lamina - DAYLube
DeatschWerks Fuel Systems
Decal Shop - Racer Walsh
Delta Custom Tools
Delta PAG
Deralte Performance
Design Engineering Inc
Diamond Racing Products
DIESEL Motorsports
Diode Dynamics
Dirt Car Lift Inc
Dirt Empire Magazine
Dirt Track Digest TV
Diversified Cryogenics Inc
DJ Safety - Deist Safety
DMI Racing Components - Bulldog Quick Change
DMP Warner
Doria Performance
Dorowski Race Engines Inc
Dosh Motorsport
Boundary Racing Pumps

Dominator Race Products
Dontyne Gears Ltd
Draco Racing
Drag Illustrated Media LLC
Drag Racing Edge Magazine
DragRaceResults.com
Drain Daddie
DRC Race Products
Drexler Motorsport USA
Driven Racing Oil
Driven2SaveLives
DRP Performance Products
DSC Sport
DSI - Autodesk Advanced Manufacturing VAR
DSS Racing
DTS
Duco Performance
Dura-Bond
Dyer's Top Rods LLC
Dynabrade Inc
Dynamic Drivelines
Dynapack Dynamometers
Bravo Trailers LLC
Brembo
Brian Tooley Racing
Briggs & Stratton Racing Engines
Briinn Transmissions
Brodx
Browell Bellhousing
Brown & Miller Racing Solutions
Bruce Litton Trailer Sales
BSB Manufacturing
BTE Racing
Buckeye Carbide
Cumatlica Cloud ERP
Bullett Racing Cams
Bullet Racing Engines
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Burromax
Butlerbuilt Motorsports Equipment
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Buzzz Axles
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Cam Motion Camshafts
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Capitol Custom Trailers and Coaches
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Coan Engineering
Cobra Seats
Coker Tire
Coleman Machine Inc
Collector Tethers
Comtec
COMP Cams
Comp Turbo Technology
Composite Fabrics of America
Concept Performance
Cool-A-Zone
COOLSHIRT Systems
Corghi USA Inc
CORSA Performance - Volant Performance
CorteX Racing
CP-Carrillo
Creative Racing
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CRW Finishing Inc
CSF Cooling - Racing & High Performance
CSI Shocks
CTECH Manufacturing
CTEK Inc
CTK Automation
Cunningham Precision Group
Curto-Ligonier Foundries Co
Custom Performance Engineering
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Cylinder Head Abrasives
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Daido Engine Bearings
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DANA Inc
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Darton Sleeves
Dave Poskes Performance Parts
Davis Technologies LLC
DAYCO Products Inc
Dayton Lamina - DAYLube
DeatschWerks Fuel Systems
Decal Shop - Racer Walsh
Delta Custom Tools
Delta PAG
Deralte Performance
Design Engineering Inc
Diamond Racing Products
DIESEL Motorsports
Diode Dynamics
Dirt Car Lift Inc
Dirt Empire Magazine
Dirt Track Digest TV
Diversified Cryogenics Inc
DJ Safety - Deist Safety
DMI Racing Components - Bulldog Quick Change
DMP Warner
Doria Performance
Dorowski Race Engines Inc
Dosh Motorsport
Boundary Racing Pumps

Green Bay Anodizing Inc
Green Filter - GROUND FORCE
GRIDLIFE
Group-A Engineering
GRP Connecting Rods - Winberg Crankshafts - Gibtec
Pistons
GST Racing Seals
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Hagerly Motorsports
Haltech
Hammer Concepts and Designs
Hammerhead Performance Engines
Hammond Motorsports
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HappsNow
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Harrah Enterprise Ltd
Harrop Engineering USA
Harts Turbo
Hastings Manufacturing
Haulmark Racing Trailers
Hawk Performance
Headershield
Hedman Performance Group
HEIDENHAIN Corporation
HEM Inc - HE&M Saw Inc
Hepfner Racing Products - HRP & Streeter Super
Stands
HMS Motorsport
Holinger America
Holley
Hondaata Inc
Hooker Custom Harness Inc
Hoosier Pattern
Hoosier Racing Tire
Hubbco
Hughes Performance
Hunter Engineering Company
Hussey Performance LLC
Huth Ben Pearson International LLC
Hylift Johnson Lifters
Hyperco an MW Industries Company
IAC Acoustics
IDIDIT
Ignite Racing Fuel
IHRA
IMCA
Impact RaceGear
Impact Racing Inc
Indiana Oxygen Company
Industrial Hard Carbon LLC
Indy Cylinder Head
InEarz Sport
Inline Tube
Innovate Motorsports
Innovators West Inc
inTech Trailers
Intercomp
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IPG Photonics
IPM Inc
Ironfite Products - Kwik-Way
ISC Racers Tape
ISKY Racing Cams
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Jesel Inc
JET Performance Products
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Jett International Ltd
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Fluidampr - Buffalo Turbine
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FLUIDYNE High Performance
Flying A Motorsports
Ford Performance Parts
Forgeline Motorsports
Forgestar
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FTI Performance - McLeod Racing
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Fuel Safe Systems
FUELAB
FuelTech ECU
Full Spectrum Power
Full Throttle Battery
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Fytton - Automotive Machine Shop Software
Gale Force Suspension
Gamma Electronics
Gandrud Parts Center
Garmin International
Garrett Advancing Motion
DeatschWerks Fuel Systems
GB Remanufacturing Inc
Geddex LLC
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GFB Go Fast Bits
GForce Performance Engineering
G-FORCE Racing Gear
G-Force Transmissions
Giant Finishing
Gibtec Pistons
GingerMan Raceway
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Goodson Shop Supplies
Goodyear Racing
GPRAF Gearboxes
Grams
Grassroots Motorsports Magazine
Graymills Corporation

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Kwik-Way
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Laris Motorsports Insurance
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Laser Precision Cutting Inc
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Liberty's High Performance Products Inc
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Lincoln Electric
Line2Line Coatings
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LIQUI MOLY
Lite Metals Company
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LOCK-N-STITCH Inc
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LSM Racing Products - Logan Smith Machine Co Inc
Lubelcar
Lucas Oil Products
Lunati
M&K Sport Coach
M&M Competition Engines
M1 Concourse
Mac's Tie Downs
Machined Concepts Inc
MACGID USA
MagnaFuel Products Inc
Magnecor
Magnus Motorsports
Magnus Performance Products
Magnuson Superchargers
Magtech Ignition
MAHLE Motorsport
MAHLE Original Gaskets
Manley Performance
Manton Pushrods - Manton Rockerarms
Manton Rockerarms
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Martin Generators
Marwin Sports
MASS TRACTION
Mast Motorsports
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Masters Entertainment Group
MaverickCNC Plasma Tables
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Maxima Racing Oils
Maxwell Industries
MB Metal Technologies LLC
MBRP Performance Exhaust
McGunnegill Engine Performance
ME Raming Service AB
MEGA-Line RACING ELECTRONIC GmbH
Melling Performance
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Mikes Racing Heads
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Millennium Technologies
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Miller-Haufen Tool Co
Milonod
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Modular Cabinets
Molecule
Molnar Technologies LLC
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Monit
Monster Transmission
Morimoto Lighting
Moroso Performance Products & Competition
Engineering
Moser Engineering
MOTEC USA Inc
Motion Control Suspension
Motive Gear - Richmond
Motor State Distributing
MPD Racing - Ti22 Performance
MPI USA Inc
MPM Marketing
MR RACE Oils - Cam-shield
RACE TECH Magazine
MS Racing Components LLC
Race Tools Direct
Race Winning Brands
RaceCals
Racecar Engineering Magazine
RACEceiver - Flagger
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Racecom
RaceQuip
Racers For Christ
RaceTec Pistons
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Raceway RV Rentals
Racing Electronics
Racing For Veterans
Racing Optics
RacingJunk.com
Racingrivets.com
Radial Bearing Corportion
Radical Race Gear
Radium Engineering
Randy's Racing Filters
Raybestos Powertrain
Rayfast USA
RC Components
RCI - Racer's Choice Inc
RCV Performance
RE Suspension
Real Racing Wheels
Reaper Off-Road
RECARO Automotive
Red Camel Racing Inc
Red Line Synthetic Oil
RedHead Valves
Redhorse Performance
Redline Ace
RedTide Canopies
Regis Manufacturing

Oliver Racing Parts
OmniWall by Noble Industries
Online Resources Inc
Optic Armor Windows
OPTIMA Batteries
OptiMate High Performance Battery Chargers
OptiTorque Technologies LLC
OTR Filters
Outerwears Inc
Outlaw Diesel Super Series
PAC Racing Springs
Pace American Trailers
PAGID Racing
Painless Performance Products
Pakelo Lubricants - Risi Performance Oils
Palmgren
PANCHO's Racing Products
Parella Motorsports - SVRA, Trans Am & FR-F4
Patriot Race Engineering
PBM Performance Products
PDRA Racing
PE Racing
Pedders Suspension & Brakes
peel 3d
Pegasus Auto Racing Supplies
PEM Racing
Penn Grade 1 High Performance Oil
Penske Racing Shocks
Performance Automatic
Performance Bodies and Parts
Performance Design
Performance Electronics
Performance Plus Global Logistics
Performance Plus The Leading Edge
Performance Trends Inc
Permatex
Perfomix Performance Brands
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Pit Weld U
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Pit-Pro Custom Carts
PJH BRANDS
Plazmanan Racing
Plymouth Tube Co
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POR-15 - American Icon
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Power Automedia
Power Cool Systems
Powerhouse Racing
Powermaster Performance
PowerMist Racing LLC
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Precision Products Performance Center
Precision Turbo & Engine - Turbonetics
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Premier Performance Products
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ProCharger Supercharger Systems
ProFabrication
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Pro-Tint Inc
Pro-werks
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PWR Advanced Cooling Technology
PXP Racewear
Pyrotect
QA1
Quaker Houghton Connect
QualCast
Quantum Machinery Group
Quarter Master - Custom Floaters
Quick Drive LLC
Quick Performance
QuickCar
Quicksilver
R&M Race Trailers
Race Canopies Division of Eide Industries Inc
Race Engine Technology
Race Jugs
Race Monitor
Race Parts Liquidators
Race Star Wheels
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Racetech USA
Racetrronics
Raceway RV Rentals
Racing Electronics
Racing For Veterans
Racing Optics
RacingJunk.com
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Radial Bearing Corportion
Radical Race Gear
Radium Engineering
Randy's Racing Filters
Raybestos Powertrain
Rayfast USA
RC Components
RCI - Racer's Choice Inc
RCV Performance
RE Suspension
Real Racing Wheels
Reaper Off-Road
RECARO Automotive
Red Camel Racing Inc
Red Line Synthetic Oil
RedHead Valves
Redhorse Performance
Redline Ace
RedTide Canopies
Regis Manufacturing

Reid Racing Inc
Reid Rocker Arms
Rem Surface Engineering
Remflex Exhaust Gaskets
Renegade Performance Fuels & Lubricants
Revchem Composites
RevMax Performance
Richmond Gear
Right Foot Performance Products
RJ Race Cars Inc - Quarter-Max
RMC Engine Rebuilding Equipment Inc
Roadrunner Performance
Robert & Sons Aluminum Inc
Rocket Track Products
Rockett Brand Racing Fuel
Rod End Supply
Rottek Transmissions
Ross Racing Pistons
Rottler Manufacturing
Rowe Electronics Inc
Royal Purple Synthetic Oil
RPC
RPM Trailer Sales
RT Sales
Russell
Ruthman Companies - Gusher Pumps - Fufflo
Hydraulic Valves
Ryno Classifieds
S&S Diesel Motorsport
S.B. International
Sabelt
SADEV Transmissions Inc
SAFECAFT
Safety-Kleen
Saidana Racing Products
Samsonas Motorsport
Sawblade.com
SCAT Crankshafts & Connecting Rods
SCE Gaskets - Athena-SCE
Schaeffer's Specialized Lubricants
Scheid Diesel Service Co Inc
School of Automotive Machinists & Technology
Schroth Racing
Schultz Engineered Products
Schumann's Sales & Service
Scoggin Dickey Chevrolet
Scorpion Racing Products
Scott Performance Wire
Scribner Plastics
SCS Gearbox - Probell Racing Products
SCT Performance - Bully Dog
SCW Driveline Australia
SDI E-CLIK
Sesle-It
SEMA Data
Serck Motorsport
Serdil
Serdil - Comec
Service Precision Grinding Inc
Setrab USA
Shaftech Ltd
Shaver Wesmar Gear Drives
SHAVIV USA
Shell
Shepherd Insurance
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SHIELDS Windshields
Shirt Works Racewear
Shockwave Motorsports
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Silver Seal Products
SimCraft Motorsport Simulations
SimGear Motion Simulators
Simpson Performance Products
SKF Racing
Skunk2 Racing
Slade Precision Shocks
Smith Brothers Pushrods
Smith Systems Inc
Sonmax
Southern Adrenaline
Southern Drag Boat Association LLC
SPA Technique Inc
SPAL USA
SPC Performance - Peterson Fluid Systems
Specialty Auto Parts - Proform
Speed Seat Factory
Speedy Chair
Speedbear Fasteners
Speedflow
Speedmaster
Speedway Illustrated
Speedway Motors
Speedwex Inc
Sports Car Club of America
Sports Insurance Specialists LLC
SpringRhythm
Springtools
SRI Performance
SSP Weld
Stainless Headers Manufacturing Inc
Stainless Works
Stand 21 Racewear
Stiffers
Stilo Helmets
Stop Loc
Strange Engineering - Strange Oval
Strapworks Automotive
Straub Tech
Street Car Fabrication
Stroud Hand Tools
Stroud Safety
Summit Racing Equipment
Suncoast Performance
Sunnen
Sunoco Race Fuels
Sunoco Racing Lubricants
Supercharger Systems Inc
SuperFlow Dynamometers & Flowbenches
Superior Bearing & Supply
Supertech Performance
Surf & Turf Instant Shelters Inc
Survain Tech Industries Inc
SWAY-A-WAY Inc
Sweet Manufacturing
Swift Filters Inc
Swift Springs
Swift-Cut
System 1 Filtration
T&D Machine Products
T&E Ent Auto Haulers
Taylor Motorsports Products
TBM Brakes - RIFE Sensors
TCI

TEAMTECH Motorsports Safety Inc
Tech Line Coatings
Technocraft Cabinets LLC
Tekton
Teller Design Inc
Temprel Inc
Texas Speed & Performance
TEXYS Sensors
The Custom Mat Co
The Brumos Rug Collection
The DriveShaft Shop
The Joie of Seating Inc
The Original Slidelite
THE SHOP Magazine
The Tuning School
Thermal Zero Heat Insulation Products
Thermo-Tec Inc
Thitek
TI Automotive - Walbro
Tick Performance
Rottler Manufacturing
Rowe Electronics Inc
Tiger Quickchange
Tillotson Racing
Tilton Engineering
Titanium Processing Center
Titus Performance LLC
T-Man Performance
TMS Titanium
Top Street Performance
TopSolid
Torco Oils & Fuels
Torqued Distribution
Total Power
Total Seal Piston Rings
Total Venue Concepts
TotalSim US
Toyo Tire U.S.A. Corp
TracTive Suspension
Trailer Alarms LLC
TransGo
Transmission Specialties
Trend Performance
TriboDyn Lubricants
Trick Flow Specialties
Trick Race Parts
Trick-Tools
Triple X Race Components Inc
TRIUMPF Inc
Tub 'O Towels
Turbonetics
Turbosmart
Turbostart Batteries
Turn 2 Racing Communications
Turn 14 Distribution
Turn One Steering
Turner Technology
TW Metals LLC
TYCA Technologies
U.S. Legend Cars International
UCoat It
Ultimate Awning
Ultimate Headers
Ultra Lite Brakes and Components
Ultra Shield Race Products
Ultradyne Racing Cams
UltraSonic LLC
UMI Performance Inc
UniSteer Performance
United Engine & Machine Co
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POWER CHANNELS

CUSTOM, PURPOSE-BUILT INTAKE MANIFOLDS ARE STILL A PRIORITY FOR HIGH-END RACERS, BUT SERIOUS DEVELOPMENT WORK FOR PERFORMANCE PRODUCTION INTAKES SHOULD RESUME AFTER COVID-19 DELAYS.

By Mike Magda

Mike Weinle of Weinle Motorsports in Cleves, Ohio, has worked with a Super Stock racer in Sweden to develop the induction system for his drag racing 440-cubic-inch six-pack Mopar. Rules allow a sheetmetal intake manifold, but the owner had a height restriction.

Weinle said most of today's high-tech engines have found improvement in shorter runners and larger plenums. "But on this Super Stock car, it was a smaller plenum and longer runner that made it happy," he noted, adding that he also morphed a round runner into an oval shape. "It was almost a 7-inch runner. It will not run down the track with a big plenum because the car is 3,800 pounds. If the plenum is too big, you'll lose your acceleration."

"We don't build much stuff like that—a three-deuce tunnel ram—but I've done something like five manifolds for him over the years," continued Weinle. "You're always trying to build something better. We've ended up 10 or so horsepower better each time, but it's trial and error. Luckily, the last three have been better each time."

A little better each time. That's a game plan much of the intake manifold industry has been following for the past 18 months. Sure, there are one-off custom fabrications for specific racing applications, and sophisticated performance designs are finding a way into catalogs (see sidebars). However, production concerns have sidelined many R&D projects, so much of the development work is focused on incremental improvements.

"From last year to this year, we've been so busy and so far behind that we've had no time for development work," said Mark Fretz of Brodix, Mena, Arkansas. "We're always fine-tuning and refining what we have as we find little things that customers need or discover things that work."

"I've had my hands full trying to keep up with what we have right now," agreed Bill Mitchell of Bill Mitchell Products (BMP) in Edgewater, Florida. "We're doing minor tweaks here and there."

"We've got a lot on the drawing board,"

added Eddi Pinegar of Trick Flow, Tallmadge, Ohio. But a number of complications, including COVID-related backlogs, has delayed new product implementation. "Plus our orders have gone through the roof, so we really can't develop anything. We probably won't have anything new coming out until next year." Trick Flow also lost its foundry, "so we had to go to a different one, and that's a whole hassle in itself."

If there was one massive hangover for the performance industry from the COVID experience, it was all the production setbacks that manufacturers had to overcome. Numerous "mom and pop" foundries that served racing interests had to shut down during the pandemic because of worker shortages and trouble obtaining raw materials.

As the manifold industry found new foundries to work with, new tooling had to be made to complement the intricacies of that foundry's process. That meant test runs, inspections and tooling adjustments. However, with fewer foundries operating, the workload doubled for some. What normally would be a three-week turnaround to test tooling or start a production run turned into a three-month ordeal or even longer.

"You're looking at another year to get an intake manifold out to the customers that you introduced a year earlier," said one company official who wanted to remain anonymous.



Despite the emergence of more modern engines, demand remains strong for intake manifolds to fit classic V8s, like this one for big block Chevy from Bill Mitchell Products. Its integral brass water jacket resists corrosion in saltwater.

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INTAKE MANIFOLDS

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The labor problem was so severe that another company had to gather up a posse of its own shop employees and fly them to a foundry to pour the castings in order to meet its orders because the foundry had lost so many workers.

On the upside, racing has resumed, fans are returning, and big boost is still making rousing headlines, especially at the drag strip.

DRIVING THE MARKET

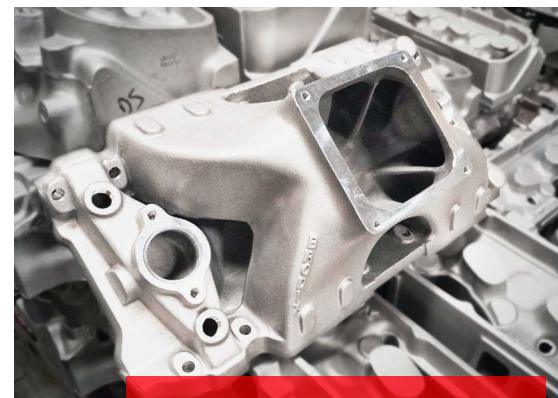
"They're going up to 75 pounds of boost now, so that really has changed intake manifolds," said Keith Wilson of Wilson Manifolds, Fort Lauderdale, Florida. "We need to strengthen them and improve distribution, because they're trying to jam so much air in there. The velocity coming in is really creating havoc on distribution. Everything packs up in the back. Now you have to put in burst panels in case there's a backfire. You've also got to have two injectors for each cylinder to supply the sheer amount of fuel they need. Just a lot more goes into the design with boost."

"Edelbrock Victor-style manifolds used in conjunction with one of our EFI elbows has always been a boost-loving combination available for many different engines," noted Brent McCarthy of the Edelbrock Group, Olive Branch, Mississippi. "If you want more runner length, plenum volume, and a look that can't be beat, our FAST HR series polymer manifolds for LS engines are the way to go. We have tested them to well over 45 psi, so leakage is not an issue."



Intake development continues, even while companies work to meet pandemic-fueled demand. "We had several pallets of prototypes," said our source at Edelbrock Group.

The upward trend in boost has been driven by a few factors, including reasonable cost per horsepower, the Outlaw drag movement and, most importantly, huge strides in electronic fuel injection and fuel management. Intake manifold design followed these trends with dedicated designs, or manufacturers found ways to adapt existing product.



With a larger plenum, Brodix's BM2028 series, pictured here, is "the manifold we would run...if there's any type of power adder or a large cubic inch with high air demand," our source noted.

Improvements in bolt-on, throttle-body EFI systems have also allowed manufacturers to continue development of carburetor-style intake manifolds.

"It looks like a carburetor, especially when you have the air filter on, but you have the modern conveniences," said Tim Torrecarion of Air Flow Research, Valencia, California. "We have dual-plane and single-plane intakes, and with the popularity of these EFI conversions where you still have the old-school look, I think this trend will be around for several years."

Currently in AFR's development plans is a line of big block Chevy intakes to fit conventional cylinder heads. The company offers a single-plane intake with a 4500-series footprint designed to complement AFR's 18-degree Magnum BBC heads.

"But that's not something your average street guy would put on a 454," noted Torrecarion. "So, we're tossing around ideas for a conventional intake: how many and what versions as far as carb heights and applications."

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INTAKE MANIFOLDS

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COYOTE BOOST

Divide and conquer. That's the strategy behind the Bulldog intake from Frankenstein Engine Dynamics of Weatherford, Texas, that's designed for Ford Coyote applications.

"The original inspiration was our Iceman manifold that we make for LS and LT platforms," explained Jesse Meagher. "That uses a single, large inner core. Due to packaging restraints, we really scratched our heads trying to get a large enough core to support the horsepower goals."

The team penciled out the math and discovered two smaller air-to-water cores—one for each bank of cylinders—would meet the tight packaging restrictions and cool down the intake charge.

"We're seeing more and more ProCharger style builds, especially on the race car side" added Meagher. "The street car side is still dominated by turbos. Our Coyote line is where we're really trying to design groundbreaking product."

Constructed from 6061 billet aluminum, it's available with single or dual injector bosses and comes complete with an SFI burst panel and

More companies, such as Frankenstein Engine Dynamics, are using CFD analysis. "That lets us look at what's happening dynamically throughout a complete combustion cycle," said a company source.

fuel rails. The Bulldog can be ordered in natural finish or black anodized.

"Billet has a number of advantages over castings," stated Meagher. "The raw material itself is inherently stronger, and it's more machinable. Also, there's tens of thousands of dollars needed to invest in tooling for a casting—especially for a product that may not be as popular as we think it should. So, there's far less risk in billet." —Mike Magda

"At the end of the day, it's all about sales and market potential," summed up Torrecarion. "That's why we have three manifolds for the small block Chevy. We have growing SKUs for small block Ford and even our big block Ford. Now, the next one in line is going to be the conventional big block Chevy. I think we have three designs to give us the widest coverage."

"The Ford Cleveland-head small block is crazy because we do a ton of carburetor and fuel-injected manifolds for them," said Pinegar. "We also have a dual-carb tunnel intake for the Ford FE that's coming back out. We introduced that earlier and it went over really well. Then we lost our foundry."

"No one makes that FE intake any longer," continued Pinegar. "When we're at the shows, we listen to what people are asking for. It seems they like the FE. We did a single-carb intake and sold more than we expected. Basically, it looks like the factory medium-riser intake, but we redesigned the plenum and runners to get more power."

Carbureted small and big block Chevy applications remain strong sellers at BMP. "More and more guys are getting small block intakes for different applications, especially circle track," said Mitchell, noting that he's been able to keep orders filled and is picking up ground where other suppliers have struggled to meet demand. "We have a couple of marine part numbers for the big block Chevys, and they love those."

The BBC marine intakes feature cast-in bronze water jackets to reduce corrosion in salt water environments. "Season to season, they had to change manifolds because they all rotted out," said Mitchell.

CARBURETOR VS. EFI

In the end, there will be pros and cons to the carb vs. EFI debate.

"With increases to displacement and rpm, the same principles to manifold design apply," explained McCarthy. "It is easier to execute ideal runner lengths and areas in an EFI manifold than a carb manifold. But

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INTAKE MANIFOLDS

carbureted manifolds still have the benefits of a cooler air charge and more time for the fuel and air to mix."

Even high-tech engines like the Gen V LT, which was designed with direct injection (DI), have users who prefer carburetors, or at least more conventional port injection. Mast Motorsports in Nacogdoches, Texas, has a two-piece carburetor intake for the LT1 and LT4, which requires plugging the DI holes in the cylinder head. The intake could also be used to build a conventional port-injected EFI system. But why would a customer take a theoretical step backwards in engine efficiency?

"DI is harder to manage for the guy who wants to stick with the old school and is comfortable tuning it," said Mast Motorsports' Perry Kiritsy. "He doesn't necessarily know the new Gen V system. It allows you to utilize the Holley Dominator or Terminator systems."

FEEDING 3,000 HORSEPOWER

Wilson Manifolds of Fort Lauderdale, Florida, built a custom billet intake for Jerry Groves' LS-powered Cadillac CTS-V drag car. YouTube videos show this car making 3,000-plus horsepower on a hub dyno.

"They wanted max horsepower and the best distribution," said Keith Wilson. "A lot of people in drag racing overlook distribution, thinking that you're running only a few seconds, but it is critical. If you've got your engine on kill and one or two cylinders are way off, you can only tune around the worst cylinder."

The intake was designed with Wilson's new 123-mm Hi-Boost throttle body that will seal up to 100 psi of pressure.

"Some of the Pro Mod guys will pick up two pounds of pressure by getting away from leaks in the throttle body," noted Wilson. "We use a 5/8-inch shaft that is much more robust. The blade is constructed out of 70-series aluminum and cut on a taper, so it's very aero. We lost no flow even though we went to a much bigger shaft."

With twin turbos providing the boost,

Mast has three lines of intakes that appeal to a wide range of users: Moez (the all-out racing product), Black Label and Factory Mast. The company recently updated its popular Moez LSX intake, made from a hybrid construction of a cast lower base with a billet lid and throttle-adaptor.

"We changed the intake port layout from our first Gen I design, and it has a little bit of a different port shape," said Kiritsy. "It has an increase in plenum volume, and we offer it with the burst plate now. You can get two sets of injectors, and we do 105-mm and 125-mm snouts. The market really needed that for grudge racing, specifically the guys who run 50 pounds of boost. They tend to split welded manifolds, and we came out with a really robust casting."



This custom Wilson intake for a large-displacement, twin-turbo big block Chevy uses two 105-mm high-boost throttle bodies and twin injectors per cylinder. It has a billet aluminum base and a sheet metal top.

three injectors per cylinder were needed to supply enough methanol to the engine. Two injectors are fed by the lower fuel rail, and a single injector is fed by the upper rail.

"Three injectors give him more tuning flexibility and a small droplet size to keep a sharp tune," said Wilson.

The manifold is machined from 6061 billet aluminum. Wilson said the design elements leverage past experience. "The idea was simply to make as much horsepower as possible." —Mike Magda



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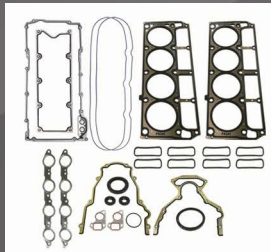
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The FAST LSXHR intake manifold, with adjustable-length individual runners, is "ideal for generating maximum power in boosted and naturally aspirated engines," said our source from the Edelbrock Group.

IR DYNAMICS

Built for a wide range of performance applications using GM LS engines with cathedral-port cylinder heads, the FAST LSXHR intake manifold features adjustable-length individual runners (IR) so racers can find the ideal tune.

"The LSXHR is designed to be a tunnel ram-style intake manifold, ideal for generating maximum power in boosted and naturally aspirated engines," said Chris Potter of the Edelbrock Group, Olive Branch, Mississippi. "It's rated for up to 45 psi of continuous pressure."

The lightweight polymer construction is durable and eliminates power-robbing heat soak that can affect aluminum intakes. The removable, reversible top allows for forward- or rear-facing throttle body installations. It also gives access to the individual intake runners that can be swapped out with different lengths.

"The LSXHR manifold ships with the standard 'long' velocity stacks, and we offer 'medium' and 'short' stack options that can be purchased separately," noted Potter. "This allows interchanging of the various runner lengths so racers can experiment with finding which combination makes the most power in their application."

Other features include dedicated fuel rails, a fuel-injector angle optimized for ideal atomization from the spray pattern, two nitrous bosses per cylinder and a mount pattern for a 103-mm throttle body that can be bored out to 105 mm. The HR is also available for LS3 rectangular port and LS7 raised rectangular port applications in addition to the cathedral port.

"The design was fairly straightforward, as much of the envelope followed that of the LS3 and LS7 versions of the LSXHR," said Potter. "The lower plenum of the manifold is unique to the cathedral port version to ensure optimal flow and performance with the different port shape. A different fuel rail was also required to ensure optimal position for the fuel spray toward the back of the valve." —Mike Magda

In addition to developing product for the Gen V platform, Mast is also targeting a new Ford product.

"Godzilla is the buzzword of late," said the company's Jason Youd of the new Ford 7.3-liter V8. "We have a CNC-ported cylinder head for Godzilla, so we're working on an intake. The factory one is pretty darn good, though, so it's hard to make it better."

Cylinder head development is always a driving force for intake manifold manufacturers. Brodix will release a new cylinder head in the near future but is not disclosing the application or target market.

"I have to be really careful on this one," noted Fretz. "Yes, there will be an intake manifold that has to be designed specifically for that particular type of head when we get it. I don't know that it will be ready for the PRI

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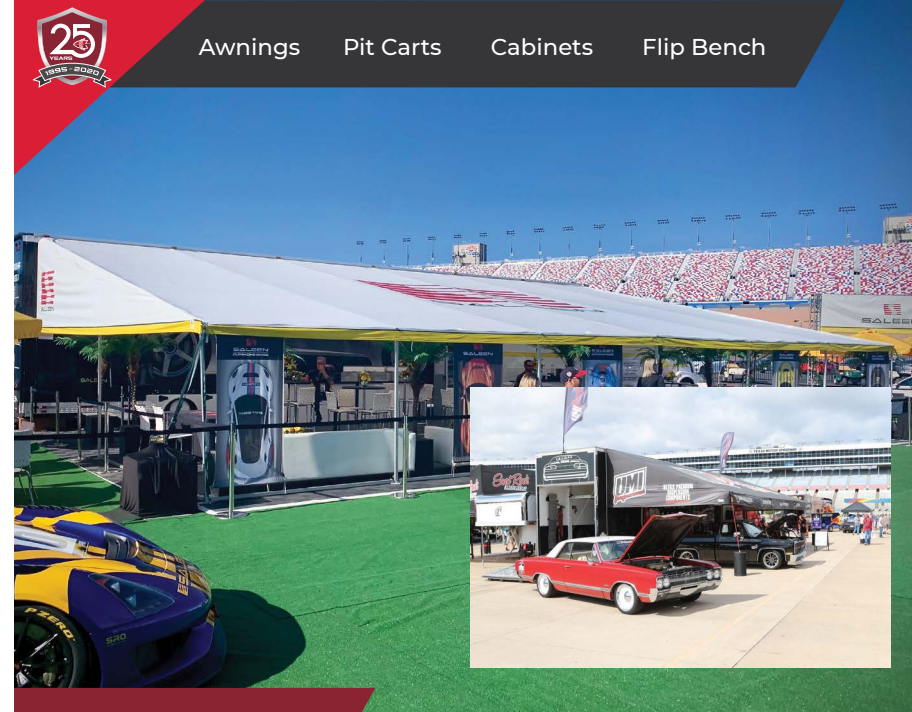
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INTAKE MANIFOLDS

DESIGN TECHNIQUES

Many of the leading intake manifold manufacturers design their products using old-school techniques, such as hand-porting prototypes by experience, measuring flow-bench results and crunching the numbers by hand. Others have adapted computer design and analysis tools.

"It's a combination of all the above," said Jesse Meagher of Frankenstein Engine Dynamics, Weatherford, Texas. "No single tool really gives you the whole picture. Based on years of dyno and track testing, we have our own formula for what we like in plenum volume. That may change depending on rpm goals, engine displacement and whether it's naturally aspirated or turbocharged.

"Then we look at runner length and use some of the more old-school calculations, again dependent on rpm range," continued Meagher. "The icing on the cake for us then is the CFD (computational fluid dynamics). That lets us look at what's happening dynamically throughout a complete combustion cycle, taking into account all the valve and cam-timing events. Then we look for distribution issues that we can correct. We're not only looking to get equal distribution across all of the runners, but we're also looking to optimize the velocity of

the air in each different portion. It's really a combination of those three factors that leads to our successful manifolds."

"For us, it's every bit of experience," countered Wilson. "We've worked with companies on CFD. It's a good tool, but it was like a flow bench. It's not everything. It all depends on the information you put in."

With so much pent-up enthusiasm to develop new production intakes, the future will be interesting for the induction market. And there will still be a few specialty intakes that will be curious in nature, in addition to engineers pursuing fresh concepts.

"We build old-style manifolds," said Weinle. "Right now, we're working on a blower manifold for a 302 Ford with D3 heads."

"Once in a while, designers get to work on a fun and radically different idea," concluded Edelbrock's McCarthy. "We had several pallets of prototypes in Torrance that even with the highest of hopes did not run well enough to see production." **PRI**

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wilsonmanifolds.com



Mast Motorsports' Mozez intake manifold is designed to work with Mozez cylinder heads, and it supports single or dual fuel injectors per cylinder.

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By David Bellm

It starts as just a pile of tubes. Bit by bit, expert fabricators piece it into a spidery jungle-gym-like sculpture. The driver is wrapped in a cocoon of heavy metal hoops. The pieces are tied together into a cohesive whole, and a race car takes shape.

At this point races are already won or lost. That's how important a chassis is.

At a glance, chassis fabrication for most race cars might look like it hasn't changed much in recent years. But a number of subtle, incremental developments have come along to make race car chassis safer and stronger, while at the same time more economical and less time-consuming to build.

To learn about these changes, we talked to leading experts in the fields of fabrication, materials, and welding. Their insights provide valuable lessons on what it takes to get the ideal race car chassis.

DIFFERENT BARS FOR DIFFERENT CARS

When it comes to chassis design and fabrication, the needs of different forms of motorsports vary widely. Whether its drag, dirt track, or drifting, every type of racing creates different stresses and potential dangers that chassis fabricators have to take into consideration. Crashes in rally competition, for example, are completely different from practically any other type of motorsports.

"A unique aspect of rally is that we have a very high potential for point loading our cars," said Ryan Thompson of Thompson Racing Fabrication, Cedar, Michigan. "That means you can hit a tree at 100 miles an hour, and all the energy that your car had carried with it is really focused in that 8- to 24-inch area of the tree. That puts a tremendous amount of energy in that one small spot."

In contrast, road racing has its own unique mayhem when things go wrong, explained Tony Colicchio at TC Design in Campbell, California. "In road racing, we're generally hitting big tire walls, which rip stuff. So our problem is that if you hit a tire wall head on, it likes to move wheels into your foot area. The other thing we see are big side-to-side impacts—a whole car hitting

you in the door bars."

Given these complex, dynamic forces acting on a chassis, it might seem prudent to simply err on the side of more bracing, adding extra bars wherever forces could possibly act. But this can build too much weight into a car, and often rules don't permit it. So fabricators have to carefully consider node placement, the location where tubes meet each other on a chassis.

In such cases, fabricators typically try to reinforce the structure as much as possible to improve handling and crashworthiness.

"In some classes, if it's allowed, we do seam welding on the car," said Colicchio. "A lot of the seams of the unibody would be stitch-welded every inch or so just for extra stiffness on the chassis itself, and then the roll cage would be added to that. Then we try to do as many things as possible with the stock

"IF IT'S 4130 CHROMOLY TUBING IT HAS TO BE TIG WELDED, PER NHRA RULES."

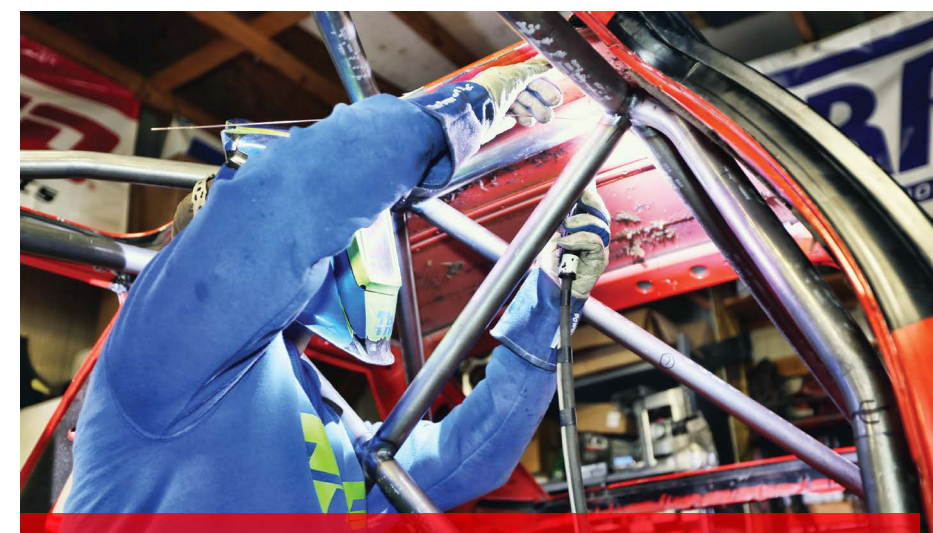
"A lot of the lower classes in SCCA and NASA have rules that say you can't add too much bracing or structure within their minimum standard of cage," said Colicchio. "They're trying to keep the cost down. So we'll look at where we are going with the tubing nodes, to improve safety."

Worth noting is that while many race car chassis are full, purpose-built, tube-frame designs, many forms of motorsports don't allow such comprehensive structures. This is particularly true in entry-level classes.

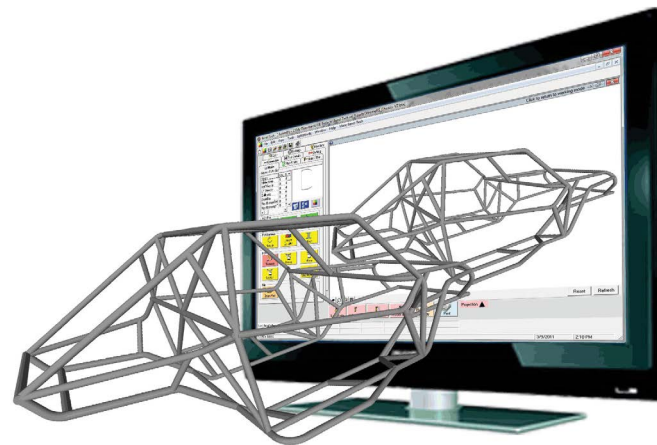
mounting points. If we can go to a mounting point that's safe, like the rear shock tower, that helps make the whole chassis stiffer."

DIGITAL DISCOVERIES

To handle the complex needs of building modern race car chassis, shops are increasingly relying on highly specialized digital tools. These allow fabricators to design more effective chassis and assemble them with greater precision, less waste, and fewer mistakes.



The effectiveness of a chassis often comes down to subtle details. "Sometimes the proper load path isn't the easiest path to construct," said our source at Thompson Racing Fabrication.



Digital tools like bending software are increasingly a part of chassis fabrication. "You can lay out your entire frame and then print out a build sheet on how to make each part," explained our source at Trick Tools.

CAD software has long been a part of high-volume shops, especially production chassis manufacturers, because of the ease in which digital designs can be integrated into an ongoing fabrication line. Now, thanks to lower cost software, it increasingly makes sense for smaller shops and even for do-it-yourselfers. One of the handiest types of

CAD programs for chassis builders is tube-bending software.

"With that software, you can lay out your entire frame and then print out a build sheet on how to make each part, and it'll spit out a materials list," said Carter Vos of Trick Tools, Pella, Iowa. "You know how much material to order, and it can really simplify the tube-

bending process. One of the most popular for us is Bend-Tech Pro, which sells for around \$300. You don't have to know CAD to understand how to use this program. Most of our users are productive the first time they ever use it."

Some chassis fabrication shops are taking the CAD revolution to the next level by incorporating 3D scanning to precisely image the cabin of cars and design roll cages and other structures. "I really think that's where the high end of this industry is going," said Colicchio. "Late last year we purchased a brand-new FaroArm that does blue laser 3D scanning, and then also probe scanning as well. It's extremely accurate. From there, we have plug-ins that will bring that information and data set into SolidWorks."

"Most of my cages are for the same 10 cars over and over," added Colicchio. "So if I spend the time scanning them and getting the design to where I want it, it makes us more efficient and much more consistent. I've got a part that's laser cut and CNC bent,

and it will always fit in the same spot. Once we have that file, we can change things like door bars really easily."

HOT METAL MASTERY

For chassis builders, there are basically two types of welding, MIG and TIG. MIG welding is one of the fastest, easiest forms of welding. It utilizes a gun with filler wire automatically fed from its tip. Although it still requires proper training and technique, MIG welding is largely a matter of pushing a button and keeping the gun moving.

TIG welding, in contrast, is one of the hardest forms of welding. It uses a stationary electrode for the arc, which demands precise, steady hand positioning while welding. The amperage is varied continuously with a foot pedal by the operator, who manually adds filler rod to the molten metal pool. Tremendous coordination is required.

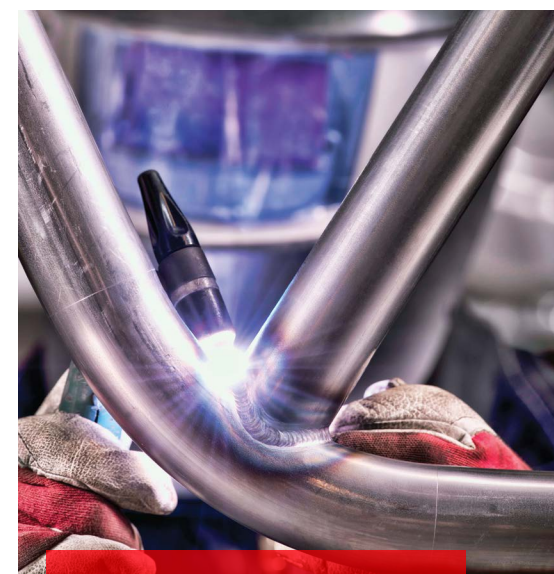
Because of this, MIG welding is usually much faster than TIG welding, making MIG a natural choice for companies that mass produce standardized chassis designs.

But there's also an aesthetic factor to be considered. Even in the hands of the very best welder, the look of MIG welds can't match the flat, tight, rhythmic looping of an expertly done TIG weld.

For some situations, there's no choice. The material dictates the type of welding. "If it's 4130 chromoly tubing it has to be TIG welded, per NHRA rules," noted Lon Damon from Lincoln Electric, Cleveland, Ohio.

All these things said, both types of welding can produce equally strong welds when done properly. And so, different shops often prefer one over the other for their own unique reasons. Some fabricators switch back and forth to optimize costs for customers. "We do mainly MIG welding, and then on the higher-end projects we do TIG welding," said Colicchio. "It's strictly for cost. There's no strength difference given the materials we're using. With MIG welding, customers can spend their money on our engineering and fabrication rather than having the prettiest weld."

continued on page 140



TIG welding (shown) generally makes more visually appealing welds, but MIG welding is faster and can be just as strong. Photo courtesy of A.E.D. Motorsport Products.

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STEEL WITH APPEAL

Except for those in a relatively small handful of top motorsports series, race car chassis are still usually fabricated from welded tubular steel, as they have been for decades. For that, there are two common choices of material: mild steel or chromoly. Both have advantages in terms of weight, working methods, and safety in specific applications.

Chromoly is an alloy steel that gets its name from chromium and molybdenum, two of its main alloying elements. This type of steel is often referred to as 4130, its American Iron and Steel Institute designation.

Developed in the early 20th century, chromoly was readily adopted by the aviation industry for its light weight and high strength. Today, 4130 chromoly is widely used in race

cars for many of the same reasons. However, the choice often comes down to tradeoffs between weight and crashworthiness. Chromoly is lighter, but it tends to be more rigid. Mild steel, by contrast, is heavier, but it yields more in a crash before breaking, thereby absorbing more energy.

For this reason, the choice of one over the other is often dictated by sanctioning bodies. Rules typically specify welding methods as well. Mild steel can be readily welded using MIG or TIG, but 4130 tubing usually has to be TIG welded. Its thinner walls require more precise heat control.

Along with these tried-and-true materials, new advanced high-strength steels are gaining popularity among fabricators. One

that's getting considerable attention lately is Docol R8, made by Swedish company SSAB and marketed in the US by A.E.D. Motorsport Products in Indianapolis, Indiana. "We use a lot of Docol R8 tubing," said Ryan Thompson of Thompson Racing Fabrication in Cedar, Michigan. "It was made for motorsports. With it, we can use thinner, lighter material that allows us to put in a few more tubes without adding extra weight."

Docol R8 is said to blend the best characteristics of mild steel and chromoly. "Docol is stronger than 4130 by 10% or 15%," said Al Lowe at A.E.D. "But it's made with chemical and metallurgical properties that are much more like a mild steel. Because it's a mild steel, we don't see the

deviation in the heat-affected zone that you do with a heavily alloyed product, so the chemistry and the mechanical properties stay much more consistent. That generally leads to a better fabricated car with less tension, less stress. It gives us a better joint for deformation and impact."

Some of Docol R8's advantages come from the method used to form it into tubing. "Chromoly is an extruded type of product, and Docol is rolled from flat product into a tube," said Bruce Wilkinson of SSAB. "So the consistency and the flatness, the gauge control and the overall dimensions are stronger. The fatigue behavior is much better, much more consistent."

Along with this advantage, Docol

R8 is said to have much of the same compressibility as mild steel. "I'll use stock cars as an example," said Lowe. "In the event of a collision, a heavy right front impact transfers a lot of energy to the left rear. Docol steel absorbs that energy. You don't find the structural failures in other areas of the car that are common with a 4130-built car."

According to Lowe, Docol can be worked with the same methods as traditional steels, including MIG and TIG welding. It can also be welded to dissimilar metals such as 4130 and stainless steel. He also noted that most sanctioning bodies allow Docol R8 for chassis fabrication, and they typically specify the same wall thicknesses for it as they do for 4130. —David Bellm



Docol R8 combines the strength of chromoly and the compressibility of mild steel. "It gives us a better joint for deformation and impact," said our source at A.E.D. Motorsport Products.

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THE DEVIL IN THE DETAILS

With so many subtle nuances and variations in different race car types, specialization is vital to getting an effective chassis. The best chassis fabrication shops usually serve just one form of racing and often work with the same handful of basic car designs. This enables them to obsess over the details that separate the safest, winningest cars from the less desirable ones.

"We have probably two families of cars we work on, with BMW being our biggest one," said Colicchio. "Mazda is the next, because of its support of club racing. So we're very efficient at those builds. That gives us a competitive advantage. Customers don't have to do the R&D."

On the flipside, chassis builders who aren't familiar with a particular type of car or

racing series often saddle customers with subpar workmanship, dangerous design compromises, or cars that won't pass tech. "We see the biggest problems from shops that come from a different form of motorsports," said Colicchio. "I've seen beautifully TIG-welded cages come to me, but the safety for a road race car, and the hits that we're going to see, just weren't addressed."

GREAT EXPECTATIONS

For all the importance that individual shops play in building safe, competitive race car chassis, the process of chassis fabrication all stems from racers' demands and expectations. Unfortunately, those can be surprisingly low, according to our sources. "There are a lot of people who don't see a rollcage as a safety device," said Thompson. "Their motivation is, 'How cheaply can I get through tech? This is just an obstacle I need to overcome.' They're probably not going to end up in our shop."

Much of the difference between subpar chassis designs and effective ones comes down to the details, which in many cases

aren't immediately obvious. "Sometimes the proper load path isn't the easiest path to construct," said Thompson. "Compound joints are very difficult to assemble, where you have four, five, six, seven tubes all hitting in one node. If you're looking for a price point, you start spreading those pieces out. That's a lot faster, a lot easier to put together. But we're willing to do the extra work because we want that best quality product possible."

Unfortunately, there are some fabricators who simply haven't mastered the basics of their craft. "I still see bad welds," said Damon. "I've seen some stuff that kind of raises your eyebrows. But I don't see as much as I did years ago. Now it's mostly the backyard guy who does a chassis for someone or an update on a professionally built chassis—they added some bars and stuff."

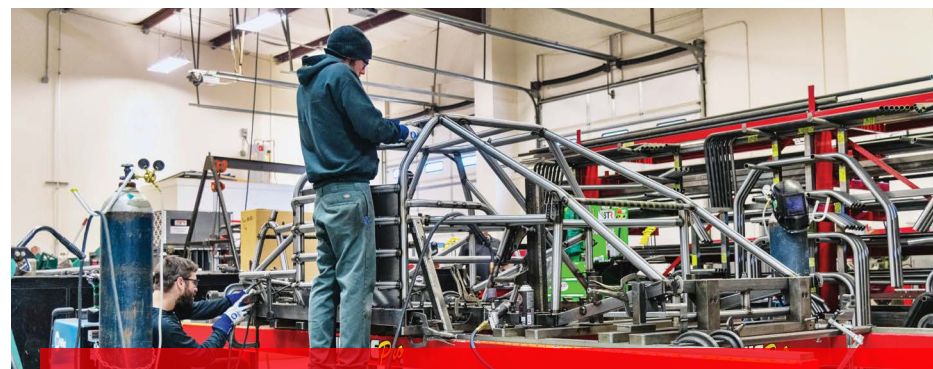
This has prompted some fabricators to call for standards that would apply to all chassis builders. "In Europe, there are shops that are FIA certified," said Colicchio. "They've gone through steps to prove that their welding is up to spec, that their joint building is up to spec,

and so on. In the US, we don't have that for the most part. It's really just up to the sanctioning body to tech whatever it is at that point. And as you know, whether that car passes or not can vary wildly depending on who techs it."

In general, the sources we spoke to noted that customers are getting more savvy about the importance of a good chassis and what it takes to get one. "I see a trend that people are getting better educated," noted Colicchio. "We're seeing people willing to spend the extra money. And they're starting to realize that it takes time as well. A fabricator you can

just hire next week maybe isn't one you want. If a fabricator isn't busy, there's probably a reason why he's not."

Ultimately, the quality, safety, and success of a race car chassis comes largely down to the competence and commitment of the shop that builds it. It's a matter of pride and peace of mind for many fabricators. "I have this mantra: Every roll cage we build should be the very best cage we've ever built," said Thompson. "I'm very aware that people are relying their lives on what we build. I want to sleep well at night." **PRI**



Specialization is an important element in effective chassis fabrication. Most good chassis builders focus exclusively on only one or two types of racing.

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aedmotorsport.com

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lincolnelectric.com

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EASTERN PENNSYLVANIA'S DIRT SQUIRTS
KART CLUB BALANCES LAID-BACK FUN
WITH ORGANIZED COMPETITION.

By David Bellm



There's a tiny revolution going on in Eastern Pennsylvania. It isn't a multi-million-dollar racing series. There aren't any superstar drivers, clamoring autograph seekers, or worldwide sponsorship deals. It's just some average guys having the time of their lives, in a racing series they crafted themselves from scratch, using the best cars they can hammer together on a working-man's budget.

These are the Dirt Squirts. And they can teach all of us something about racing.

There's an innocent charm about the Dirt Squirts Kart Club. For the most part, its members aren't experienced racers. Few of them had ever even driven on a race track before they joined the club. Yet they've quickly built a small but truly exceptional racing organization that masterfully balances laid-back fun with healthy, organized competition.

In fact, their relatively limited prior experience is probably the source of this organization's magic. Its members aren't locked into one particular type of car or one style of racing. And they don't know what can't be done. They just go out and do it.

THE BIRTH OF A RACING SERIES

Dirt Squirts began in 2018, the way so many racing endeavors are launched—somebody gets a taste of on-track excitement, starts dreaming, and things take on a life of their own.

"It started when I did one of those Rusty Wallace driving experiences," said club co-founder Peter Austin. "When I got back, I thought, 'Man, I gotta do something like that because it was so much fun.'"

Austin originally planned to prepare a car for organized dirt-track competition, but some co-worker friends threw a cold wet rug on the idea with talk of how expensive that can be. "So we decided to just buy go-karts, hop them up a little bit, and race them by ourselves," recounted Austin. "We just kind of raced around my buddy's yard. And then the next thing you know, we got four or five other guys who were like, 'Hey, that looks fun. Can we come out with you?'"

It proved to be contagious. They gained 10 more members the second year. Around that time, the club got its scrappy-clever Dirt Squirts name. "It just kind of rolled off our tongue," said club co-founder Jeff Conklin.

At that point, the initial group of racers became the club's official leadership, and they took on the name Founding Five. A few of those five leaders dropped out of the club fairly quickly, but elections were held to replace them, and the Founding Five leadership structure continues today.

The group also began developing rules, with care taken to balance necessary regulation with the casual spirit of the club. "We ended up with about an eight-page rulebook," said Austin. "I wasn't intending to do that, but I just kept getting asked question after question: 'What about this? What about that? How do we handle this?'"

EASY SPEED

Equipment isn't much of a big deal for the Dirt Squirts. It's all about maximum fun for minimum cost. Their machines are relatively inexpensive recreational-grade karts bought used on Craigslist or Facebook Marketplace. Austin races a Yerf-Dog, while Conklin and many other club members drive Manco karts.

The feisty performance and reckless fun of racing these single-speed karts comes in large part from the classic hot-rodding formula of engine swapping. Originally equipped with engines putting out around 6 or 7 horsepower, Dirt Squirts karts are fortified with engines putting out roughly three times that. "These are little karts, and they're not really meant to do what we're doing with them," said Austin.

Dirt Squirts rules specify a maximum of 20 horsepower. A lot of the racers reach that by going to the local Harbor Freight store and plunking down \$400 for a 13-horsepower 420cc Predator engine, the kind of general-use four-cycle units you see powering generators, water pumps, and garden tractors. To that foundation, they add a few aftermarket parts and do a few tuning tricks, which brings power up to the 18–19-horsepower range, according to Austin. To enforce the horsepower rule, a competitor has to file a complaint with the Founding Five, who review it and pass judgment based on what modifications the racer has done to the engine.

Other rules for Dirt Squirts karts are similarly loose. Suspension isn't required, but it's recommended. "We've got a couple of

guys who race without it, but it's rough," said Conklin. "You'll see their back end get over two feet off the ground sometimes."

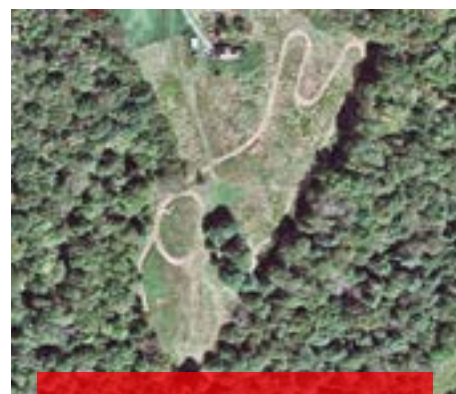
That said, the rear suspension has to be live axle. "You can't have independent rear suspension, which is what really kind of defines a go-kart from something else," noted Austin.

Austin said he has about \$2,500 in his kart but pointed out that many club members do just about as well for much less money. Repair parts and consumables are said to be available inexpensively online. "A tire on a rim will show up at your front door in a week for 30 bucks," he said.

PLACES TO PLAY

The club races on a series of small tracks built on members' property. The courses typically start out as short-mowed grass, then wear down to mostly dirt as cars lap them. With members having no prior allegiance to any particular form of motorsports, the tracks are designed in whatever shape the racers collectively feel like. There are ovals, a semi-rectangular track, and a road course that winds between trees. One oval track is run clockwise, just because the drivers like it better that way.

Equally colorful are the names given to the tracks, including BlueStone Oval, Ridge Run, and Endless Mountains Speedway. The club's Conklin Glen road course is the longest Dirt Squirts track; it's estimated to be about 1/4 mile. The others are roughly 1/8 mile or less. The tracks are spread out among members' homes in northeastern Pennsylvania and New



Most of the Dirt Squirts' tracks are homegrown efforts, built on the property of club members. The most ambitious of them is Conklin Glen, shown here.

York state. Most of the action centers around Susquehanna, Pennsylvania, but the longest distance between tracks is said to be only about an hour's drive.

The club even experimented with a night race last year, by fitting lights on the karts and illuminating the track with a 10-pack of shop lights. "It was interesting, to say the least," recounted Austin.

Eight races are scheduled for 2021, from late April through mid-October. Together they make up the series championship, which awards trophies to the top-three points finishers. "Most everybody runs for the championship," said Austin. "To try to entice people into making every race, we have something called the Wash Rule, where you get to wash your worst race. And then, to counter people just picking a race and taking it off, we give a Perfect Attendance Bonus. You get bonus points if you're at every event, even if you can't race."

To ensure necessary manpower for running races smoothly, the club has come up with a simple but effective solution. "When you draw your starting position, you're also drawing your duty for when you're not racing," explained Austin. "So if you draw the pole for the first heat, you're going to be running flags for the second heat. Second and third do scorekeeping, and then fourth is the backup flagman."

Although the general vibe is pretty mellow, this is still racing. Tempers flare and personalities boil over. Dirt Squirts' rules are pretty lenient in that regard, but they

nonetheless have a zero-tolerance policy ready for extreme situations. "If you throw a punch, you're out of this club. No ifs, ands, or buts," explained Austin. Fortunately, they haven't had to invoke this rule yet, with most incidents limited to shouting and various hand gestures between drivers.

SMALL CLUB, BIG ACCOMPLISHMENTS

Despite the club's homespun flavor, it's already making some pretty sophisticated moves. As of May 2021, Dirt Squirts Kart Club is legally registered as a Limited Liability Company (LLC). And the club has signed a number of local sponsors, including an electronics store, a beer distributor, and a chainsaw business. "I put together a promo pack, so it looks like we're legit," said Austin. Sponsorship packages typically include a trackside banner, T-shirts, stickers on karts, and a website link.

Most of the sponsorship money right now goes toward the club's next big goal of getting a transponder system for scoring. "Up until now we've done all paper scoring," said Austin. "And it sucks."

Although the club's races don't cost a lot to put on, there are inevitably expenses. These are paid mostly through voluntary donations from club members. The donations are put into a drawing in which members can win \$100. Some winners immediately donate the cash prize back to the club. There aren't any dues required from members.

Although racers are obviously excited to be part of the club, enthusiasm surrounding Dirt Squirts is also starting to extend into the spectator area, too. "We have 30 spectators at some races," said Austin. "At the night race last year, there was easily 100 people. It may have been closer to 200. One of the guys knows a local fireworks distributor, so we had about \$600 worth of fireworks to finish off the night. He's a professional, and he put on a whole show."

Next on the club's agenda is a move to established race tracks for at least part of the season. It's not that they've lost interest in their own tracks. They just want to spend more time racing and less time getting tracks ready. "Setup and teardown are a real bear," said Austin. "So one of our biggest goals is to split the season up between half homegrown tracks and half tracks like Action Park East and Champion Speedway."



The club has developed a simple system for staffing races: When drivers draw their starting position, they also draw jobs such as flagging or scorekeeping between races.

The club is already scheduled to run an event at one such track this season, at Action Park East Speedway in Greene, New York. "It'll be great," said Austin. "We don't have to have a flagman, we don't have to have a scorekeeper, we don't have to put hay bales out. We don't have to do anything."

ROOM TO GROW

With its combination of rowdy trackside merriment, keen competition, and just enough structure to keep things running smoothly, Dirt Squirts has achieved a somewhat rare balance: organized racing that feels serious and satisfying, yet deeply casual.

And while Dirt Squirts has the potential to grow much larger, they're cautiously trying not to get too big too quickly. The club currently has 14 members, and they've set a maximum of 18 for now. "We don't want it to grow so fast that we can't keep things under control," said Conklin.

In the meantime, the club will continue to evolve with much of the same inspiring sense of wonder it began with. "Last year at the night race, Peter and I were in the pits," recalled Conklin. "We looked up at the crowd of spectators, and the feeling was like, 'Wow, how did this happen?'" **PRI**

SOURCES

Dirt Squirts Kart Club
dirtsquirtskartclub.com

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2021 RACES & EVENTS

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DIRT CAR SUMMER NATIONALS / INDIANAPOLIS, IN	07.14
KINGS ROYAL / ROSSBURG, OH	07.16 - 07.17
RALLY NORTH AMERICA / GINGERMAN MI	07.22
NMRA/NMCA POWER FESTIVAL / MARTIN, MI	07.23 - 07.25
NATIONAL TRACTOR PULLING CHAMPIONSHIPS / BOWLING GREEN, OH	08.19 - 08.22
CRANDON WORLD CHAMPIONSHIPS / CRANDON, WI	9.03 - 09.05
GRIDLIFE / SOUTH HAVEN, MI	09.09 - 09.12
HOT ROD DRAG WEEK / MARTIN, MI	09.13
HOT ROD DRAG WEEK / NORWALK, OH	09.14
HOT ROD DRAG WEEK / INDIANAPOLIS, IN	09.15
HOT ROD DRAG WEEK / BYRON, IL	09.16
STREET CAR TAKEOVER / ST. LOUIS, MO	09.17 - 9.18
SUPER DIRT WEEK / OSWEGO, NY	10.07 - 10.10
INDY AUTONOMOUS CHALLENGE / INDIANAPOLIS, IN	10.22 - 10.23
DODGE/SRT NHRA NATIONALS / LAS VEGAS, NV	10.29 - 10.31
SEMA SHOW / LAS VEGAS, NV	11.2 - 11.5
MINT 400 / LAS VEGAS, NV	12.3 - 12.5
PRI SHOW / INDIANAPOLIS, IN	12.9 - 12.11

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INDUSTRY NEWS

AFR ACQUIRED BY PRIVATE EQUITY FIRM

Air Flow Research (AFR)—the manufacturer of high-performance cylinder heads, intake manifolds, and related components—has been acquired by Taglich Private Equity (TPE) in a partnership with AFR's founding family and management. The company's 42 production and office employees based in Valencia, California, will remain with the current executive team and staff.

"Completing this sale marks the beginning of an exciting new chapter in the history of AFR," said AFR President and Owner Rick Sperling.

TRACKHOUSE TO ACQUIRE CHIP GANASSI'S NASCAR OPERATION

Chip Ganassi Racing (CGR) has sold its NASCAR Cup Series operation to Nashville, Tennessee-based Trackhouse Entertainment Group, which was founded by Justin Marks and is co-owned by Grammy-winning musician Armando Pérez, also known as Pitbull.

Following the Cup Series Championship race at Phoenix Raceway on November 7, CGR will transfer its NASCAR assets to Trackhouse Racing, which plans to field two full-time Cup Series entries in 2022.

INTELLITRONIX PURCHASED BY EVERGREEN COOPERATIVES

Intellitronix Corporation—the manufacturer of digital and analog LED gauges and related automotive and high-performance motorsports electronics in Eastlake, Ohio—has been purchased by Evergreen Cooperatives.

"This transaction strengthens the development and growth of our other companies for US Lighting," said Paul Spivak, CEO of US Lighting Group, the parent company of Intellitronix.

GARRETT ADVANCING MOTION TO EXPAND CHINA PRODUCTION FACILITY

Garrett Advancing Motion—a differentiated technology provider for the automotive industry—has announced plans to expand and modernize its existing production facility in Wuhan, China. The plant first opened in

2013 and currently serves major local and global automakers. The expansion, expected to increase its state-of-the-art facility by 50%, is scheduled to be completed in the first quarter of 2022.

BREMBO OPENS FIRST 'CENTER OF EXCELLENCE' IN SILICON VALLEY

Brembo—the Italian manufacturer of high-performance automotive brake systems—has announced that its first "Center of Excellence" will be built in California's Silicon Valley. The new facility is expected to strengthen the company's expertise in software development, data science, and artificial intelligence, and is slated to open in the fourth quarter of this year.

MCLEOD RACING ADDS 'MR. CLUTCH' AS SPECIALIST

McLeod Racing—the provider of aftermarket driveline components based in Anaheim, California—has announced the addition of Will Baty as its new off-road and R&D specialist. With the announcement, McLeod plans to continue the engineering and R&D of off-road products for its customers.

"I've always had a lot of respect for Will, and his knowledge of our driveline market, and particularly the off-road segment, will help continue to grow McLeod," said McLeod Racing President Paul Lee.

INDUSTRY VETERANS JOIN RACE WINNING BRANDS

Race Winning Brands (RWB)—the manufacturer of high-performance engine components for the automotive and powersports aftermarkets—has announced industry veteran Steve Reed as the new powersports brand manager for its subsidiary Wiseco Performance Products, the Mentor, Ohio-based manufacturer of forged pistons, connecting rods, valves, crankshafts, and

more. Reed will help develop existing initiatives and support powersports growth for the company through product management and development, business platform and partnership support, marketing initiatives, and direct customer visits.

RWB has also named industry veteran Vic Wood as its regional tech support manager. Wood will service automotive engine builders, performance shops, and distributors throughout the Midwest, and will be based out of the Kansas City area.

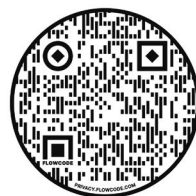
AEROMOTIVE APPOINTS NEW NATIONAL SALES MANAGER

Aeromotive—the Lenexa, Kansas, manufacturer of aftermarket fuel systems and accessories—has announced the hiring of Phillip VanBuskirk as national sales manager. In his new role, VanBuskirk will be responsible for sales functions, including managing internal and external sales, overseeing sales representative agencies, and communicating and executing new sales objectives.

TEXAS MOTORPLEX ADDS CHARLES MYERS AS OPERATIONS MANAGER

Texas Motorplex—home of the new Stampede of Speed event and the NHRA Texas Fall Nationals—has hired Charles Myers as operations manager. In the newly created position, Myers will work on new sponsor recruitment and sponsor support for the Ennis, Texas, facility. He will also focus on production aspects of events, including planning, creative, and staff and promoter management.

For up-to-the-minute racing industry news, scan the QR code below or visit primag.com/industrynews.



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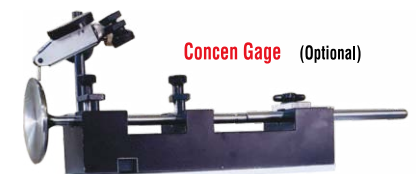
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ADVOCACY CORNER

Tracking legal, legislative, and regulatory developments impacting the racing and performance industry.

Edited by Laura Pitts

PRI's dedicated advocacy team based in Washington, DC, works nonstop to protect motorsports. We are currently tracking several initiatives on the federal and state levels, including an update on the vital RPM Act designed to protect racing, a look at the motorsports industry's presence at the 2021 SEMA Washington Rally, and a critical notification for parts manufacturers regarding emissions compliance.

SUPPORT FOR RPM ACT GROWS IN HOUSE OF REPRESENTATIVES

Support for the bipartisan Recognizing the Protection of Motorsports Act of 2021 (RPM Act), H.R. 3281, continues to expand as members of Congress receive an outpouring of support for the bill from racers and the motorsports parts industry.

"Support is increasing in the form of RPM Act cosponsors because the motorsports industry has flooded members of Congress with letters requesting their support. The PRI/SEMA SAN's letter-writing campaign has resulted in over 1.35 million letters sent

to Congress in 2021 in support of the RPM Act," Director of Congressional Affairs Eric Snyder said.

A top priority for PRI, the RPM Act is designed to protect against overreach from the Environmental Protection Agency (EPA) and clarifies the motorsports-parts industry's ability to sell products that convert street vehicles into dedicated race cars. As of late July, 30 additional House members, listed below, have agreed to cosponsor the bill; at press time, the bill had 95 total cosponsors.

PRI and SEMA are lobbying Congress on the RPM Act, regardless of whether Congress is in session or lawmakers are back in their districts. Congressional recess presents a great opportunity for members of Congress to meet with their constituents. Rep. Patrick McHenry (R-NC), the lead sponsor of the RPM Act, recently visited SRI Performance, the provider of racing and street performance products in Mooresville, North Carolina. During the visit, Rep. McHenry spoke with industry members—including SRI Performance owner Greg

Fornelli, *Speed Sport* Owner and President Ralph Sheheen, and David Miller, executive director of the North Carolina Motorsports Association (NCMA)—about the importance of passing the RPM Act.

"It was great to visit SRI Performance," said Rep. McHenry. "Racing has a long and storied history in North Carolina and is an important part of our economy. I was proud to [recently] reintroduce the RPM Act to protect grassroots motorsports and the industries that support them."

PRI encourages race tracks, racing businesses, motorsports parts manufacturers, race teams, and related entities to voice their support of the RPM Act on social media using the assets found at performanceracing.com/rpm-act. PRI applauds the efforts of those that have already spread the word, including Selinsgrove Speedway and Clinton County Speedway in Pennsylvania. To send a letter to lawmakers and see a current RPM Act cosponsors list, visit performanceracing.com/rpm-act. For more information, contact Eric Snyder at erics@sema.org.

NEWEST RPM ACT COSPONSORS IN US HOUSE OF REPRESENTATIVES (AS OF LATE JULY)

David McKinley (R-WV)
Robert Latta (R-OH)
Ann Kuster (D-NH)
Morgan Griffith (R-VA)
Jim Hagedorn (R-MN)
Scott DesJarlais (R-TN)
David Kustoff (R-TN)
Glenn Thompson (R-PA)
Carol Miller (R-WV)
Matt Rosendale (R-MT)

Trent Kelly (R-MS)
Jared Golden (D-ME)
Elise M. Stefanik (R-NY)
Andy Barr (R-KY)
Jay Obernolte (R-CA)
Michael Cloud (R-TX)
Austin Scott (R-GA)
James Comer (R-KY)
Brett Guthrie (R-KY)
Bill Huizenga (R-MI)

Don Bacon (R-NE)
Warren Davidson (R-OH)
Mary Miller (R-IL)
Mark Green (R-TN)
John Curtis (R-UT)
Liz Cheney (R-WY)
Jim Banks (R-IN)
Dusty Johnson (R-SD)
Larry Bucshon (R-IN)
Carlos Gimenez (R-FL)

PRI, SEMA CONNECT WITH CONGRESSIONAL REPS FROM DC

PRI and SEMA representatives have escalated their advocacy efforts by participating in nearly 100 meetings with Republican and Democratic lawmakers from Capitol Hill in June and July. As part of the virtual 2021 SEMA Washington Rally, more than 60 industry companies joined PRI and SEMA in a record-high number of meetings with officials from the US House of Representatives and Senate.

Discussions focused on hot-button industry issues, challenges, and concerns, including opposition to electric vehicle mandates, support for protecting motorized off-road recreational access, tax credits for businesses participating in trade shows, and more initiatives for the automotive aftermarket.

"UNFORTUNATELY, MANY LAWMAKERS ARE UNAWARE OF THE CHALLENGES FACING OUR INDUSTRY, AND WE MUST WORK WITH THEM TO ENSURE THAT MOTORSPORTS BUSINESSES CAN CONTINUE TO OPERATE."

Chief among meeting topics, however, was passage of the Recognizing the Protection of Motorsports (RPM) Act.

"It was great to meet with lawmakers who seriously considered the RPM Act, which allows street vehicles to be converted into racing vehicles," said Braden Liberg, director of compliance and calibration engineering at Edelbrock Group. "Without the RPM Act, there is a threat to the motorsports industry. Unfortunately, many lawmakers are unaware of the challenges facing our industry, and we must work with them to ensure that motorsports businesses can continue to operate." **PRI**

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MSD

msdignition.com

The MSD Ford Coyote Crank trigger is available with a Hall-Effect sensor, making it an accurate way to trigger EFI. The kit is available with an adjustable pointer with a 12-degree range of movement for finding that precise timing. The kit installs easily and uses rigid aluminum mounting bracketry and stainless hardware that will not flex and cause timing fluctuations.

Contact: 866-464-6553



MOROSO

moroso.com

Moroso introduces its small block Chevrolet 4.5 Rox billet aluminum valve covers that fit SBC 4.5 Rox Bore Space Cylinder Heads. They are 2 3/4 inches tall, so they clear Jesel and T&D rocker shaft assemblies and allow for greater hood clearance. Each valve cover is CNC machined from a billet aluminum bar. The flat, sturdy rail provides airtight sealing.

Contact: 203-453-6571

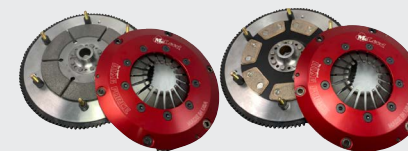


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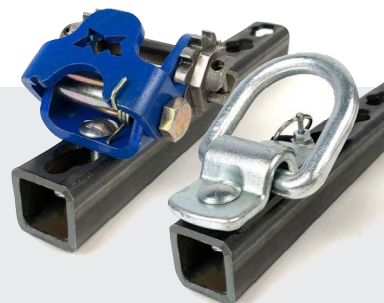


MCLEOD RACING

mcleodracing.com

The Mag Force Single Discs for Honda B-Series and K-Series are rated to 450 torque and are 8-inch sintered iron discs for race use only. They feature 6061-T6 aluminum pressure plates, easy pedal effort, SFI-rated billet aluminum flywheel, and strapped pressure ring clean release and smooth engagement.

Contact: 714-630-2764



MAC'S TIE-DOWNS

macscustomtiedowns.com

The HD Tube Track (patent pending) is specifically designed to replace a partial strip of a trailer's wood decking. Attachment holes hit common trailer cross-member center lines and can be bolted or welded in place. It accepts the Low-Profile Lashing Winch or a D-Ring.

Contact: 800-666-1586



CORNWELL QUALITY TOOLS

cornwelltools.com

The Platinum 56-inch 8-Drawer Double Bank Cabinet features cage frame construction. Drawers are supported by 260-pounds-capacity ball bearing slides with integrated TLC mechanism. Each drawer features a 4-mm thick non-slip liner and a full-length pull with decorative end caps. The polished electronic lock with built-in cam provides keyless security.

Contact: 330-336-3506

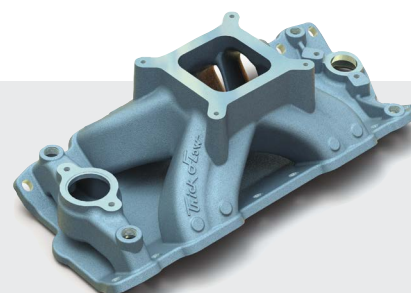


HOOKEER BLACKHEART

holley.com/brands/hooker_blackheart

The Hooker BlackHeart transmission crossmember is part of a comprehensive line of Gen III Hemi swap components for the Mopar E-body. This BHS591 crossmember adapter plate allows for installation of the popular 8HP90 eight-speed automatic transmission when used with the BHS567 crossmember.

Contact: 866-464-6553



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trickflow.com

The Trick Flow R-Series intake manifold for small block Chevrolet is designed for engines using aftermarket 23-degree cylinder heads with 230cc or larger intake runners and making power in the 3,500-7,500+ rpm range. It features a one-piece single plane, spider-type design with raised plenum floor, integral bosses that can be drilled and tapped for nitrous nozzles, and more.

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HOLLEY

holley.com

Holley EFI CAN Input/Output Module can be added to Holley EFI HP, Dominator, Terminator X, and Terminator X Max EFI installation. The CAN module will add eight inputs and eight outputs to the system, which can be used to control additional accessories, or provide critical sensor inputs. It's ideal for those wanting to enhance the capabilities of their current ECU.

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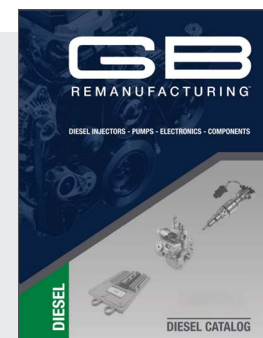


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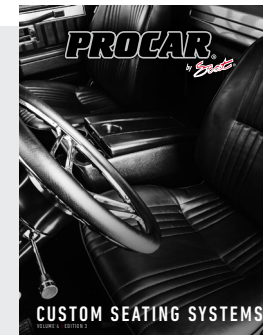


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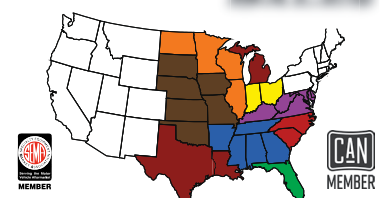
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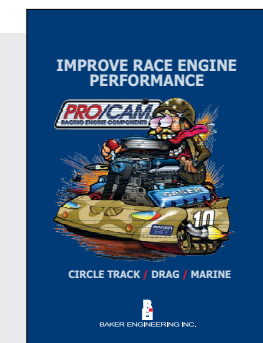


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SOCIAL STATUS

A closer look at racing and performance industry members' winning strategies on TikTok, Instagram, Facebook, and more.

Because TikTok is unlike any other social media platform out there today, we're going to follow up last month's column with a deeper dive here, speaking with FuelTech USA's marketing coordinator, Nathalia De Leon.

FuelTech created its TikTok account in March 2020 right after the COVID-19 lockdown. "We figured TikTok was becoming really popular during the lockdown, so we created the account to analyze if our customers/audience would be there and if it would be worth it for us to invest time on it in terms of entertainment, advertising, and marketing strategies," De Leon explained. In the beginning, TikTok was a bit of a mystery for FuelTech, but now the company has nearly 30,000 followers and truly understands several of TikTok's "secrets," De Leon noted.

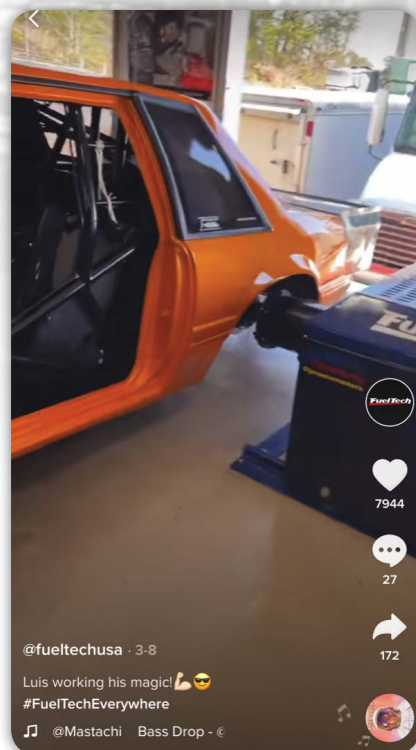
"TikTok's mission is to bring joy and inspire creativity, connecting all users, so they designed a recommendation system to help all users have a more personalized experience based on each one's interests, adjusting

content you prefer to skip and based on the user's interactions with the app," De Leon said.

If you want more followers, remember what the algorithm likes: hashtags, captions, music, focus on your audience, content, and consistency, according to De Leon.

"Different from other platforms, TikTok has a short space for the captions, so you have to try to be more assertive on what you write. Tip: Consider asking a question or create something mysterious," De Leon advised. "Try to use trending sounds or attractive music. Try to be unique, creative, and show what represents your brand. Exploring the new features is always good for the algorithm as well."

FuelTech aims for one to two posts per day in order to not flood the feed, but at the same time have something every day for its audience. Regarding which content to post, TikTok can be tricky. Sometimes a poor-quality cell phone video goes viral, while great videos can be slow. "Each social media has its own secret, and in the case of TikTok, I believe if the content is really attractive, it will go viral

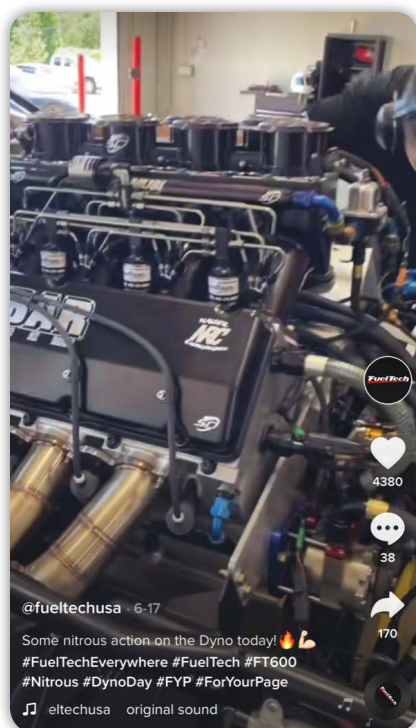
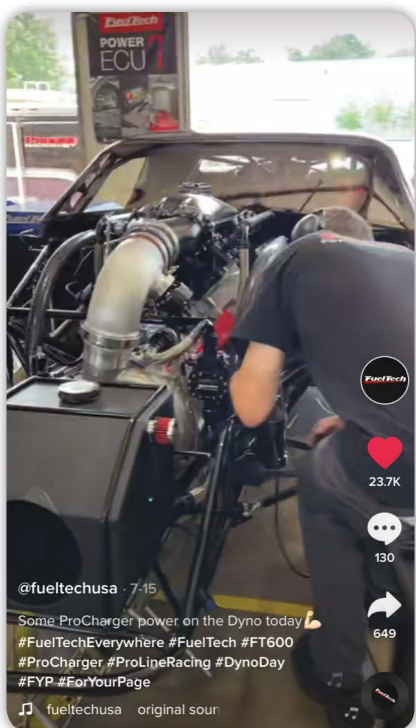


at some point. It's just a combination of using trending hashtags, using the same sound as someone else's video that recently went viral, or following the trends."

De Leon continued, "You also need to be patient. Sometimes TikTok could wait a couple of days to bump your video. There is no formula—you need to keep trying, keep posting new content, using new features, following the trends, and you will succeed."

FuelTech tries to stick to its niche, which is attractive race cars, high-horsepower engines, drag racing, burnout videos, and other cool content related to the brand. "We have a lot of customers bringing cool cars to our shop daily since we have a dynamometer in-house where we offer advanced factory training. We also go to a lot of cool events, which helps us come up with great content," De Leon said. "We have a lot of videos with good reach showing flames, nitrous extinguishers, high horsepower, huge turbos, wheels up, etc."

De Leon offered some final words of wisdom: "It doesn't have to be perfect from the beginning. You just need to be there, and you will start learning from it. After setting up the account and working on all settings, you can start posting. Don't expect to have crazy reach on the first post, just keep going and you will see more and more followers. Follow the trends, be creative, use the hashtags, and be consistent." **PRI**



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