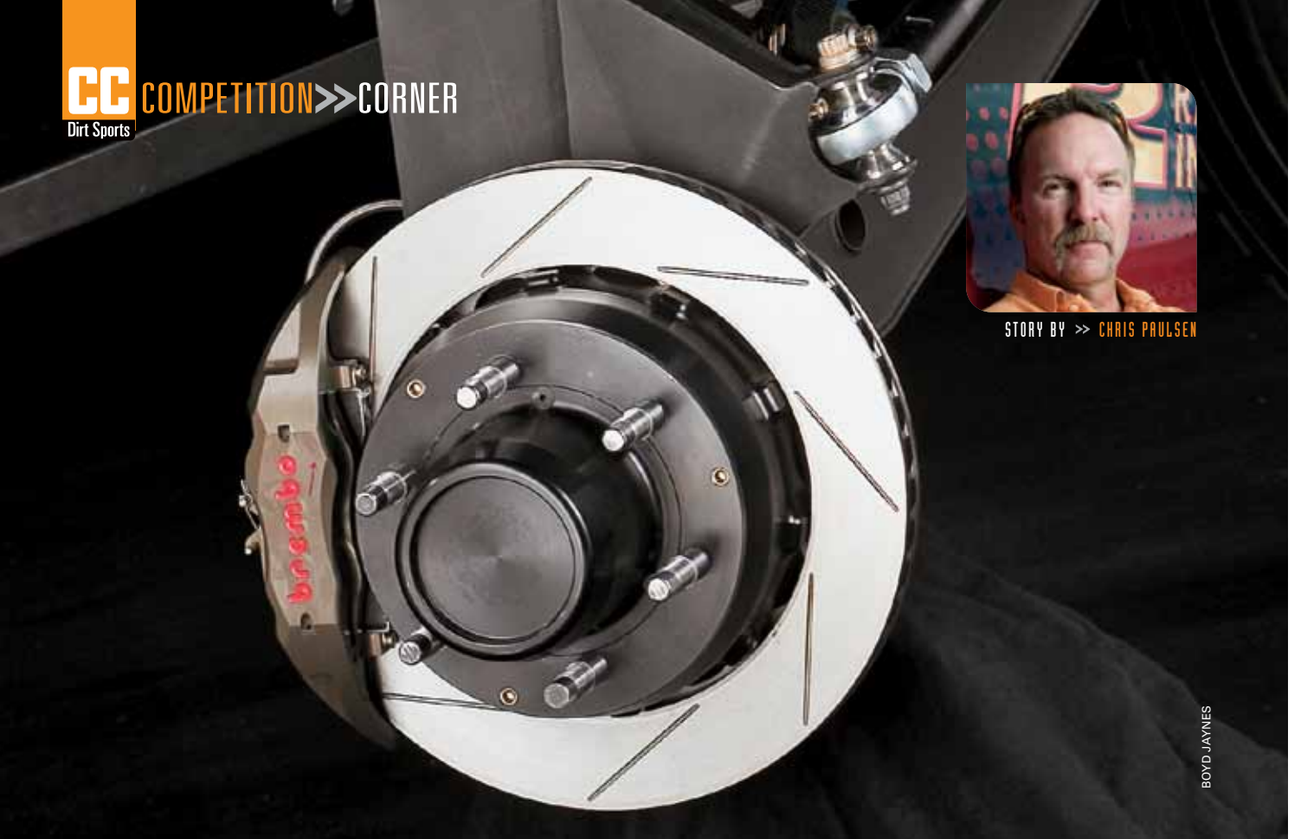

STORY BY >> CHRIS PAULSEN

BOYD JAYNES

FIND SPEED IN SLOWING DOWN

Many racers don't take into consideration how important brakes are to not only stopping their cars but also in going fast. Imagine how many turns, hazards, and situations you have to brake for in the SCORE Baja 1000. Truth be known, you probably get on the brake pedal at least 1000 times. Now, let's imagine that brake pedal is an instrument. If it is well tuned and you play it right, it will make that car or truck faster. It will let you drive deeper into the corners and make the vehicle handle better and be more balanced.

If you could brake 20 to 50 feet deeper in every corner what would that mean over the course of a 1000 mile race? Not only that, in an off-road environment where you're in dirt, sand, and rocks, that brake pedal is a key part of balance in regards to handling. Too many people don't take this into consideration when building an off-road race vehicle.

In NASCAR or IndyCar racing brakes are vital; so vital, in fact, that most teams have at least one engineer dedicated to braking. The brake systems are expensive and very high-tech. Brake pad compounds are being tested all the time, brake fluid is under constant scrutiny and master cylinder size is always being changed for various conditions.

Why should the off-road racing community take a similar view? After all, the vehicle is typically heavier and the corners go from high speed to hair pins and everything in between. Miss a high speed corner and, instead of hitting a concrete wall, you might be going over a 500 foot cliff. That is the obvious view on braking but let's keep our focus on speed and handling.

Off-road race vehicles are very expensive. In some cases, they are more expensive than any car in NASCAR or IndyCar. Why is the trend to so often go with the least expensive brake packages? I feel most of that is a lack of knowledge on what's available. The premium brake companies are Alcon, Brembo, and Performance Friction. These companies build brakes for every major form of racing in the world. They are the best of the best.

Mike Julson of Jimco started using Alcon about two years ago and now that's all he uses on his "upper end" race cars. Let's look into the advantages of using a product like Alcon and highlight the reason the extra money spent will pay off in the end.

PREMIUM BRAKES.

What makes these brake companies the best? It is several things such as the level of engineering in the components, proprietary materials in the calipers, the cast iron used in the rotors is more crack resistant and the rotors are stress relieved. These rotors are designed with cooling in mind and the caliper designs are optimized for weight and strength. Alcon's calipers utilize a dirt seal in the pistons and that is unique to them. The ports are internal so there's no bridge pipe to get knocked off by that bush or rock you may run over. The bleeders are recessed so they are less susceptible to damage. Companies like Alcon engineer the entire package to work at the highest level. They don't just have brakes sitting on the shelf labeled "Off Road."

When Alcon engineers a brake package for any race car, they look at several things such as the overall weight of the vehicle as well as the front to rear weight percentages. They look at what the braking needs to accomplish in that type of racing. Does it need extreme cooling? What does the balance of the race car need to be, more front or more rear braking force?

I spoke with Phil Stubbs, managing director of Alcon USA, who explained: "We engineer the entire package for overall performance. From the master cylinders, pedal ratio, brake line size, calipers and rotors. Everything is taken into consideration to optimize the brake package."

Alcon's Trophy-Truck package consists of the same six-piston caliper for both front and rear. That's a little unusual because most racing calls for much more front brake than rear. With the front to rear weight percentages in that type of race car and the way you want it to react when braking that worked out to be the best package. The rotor is a 14" diameter and 1.375" thick. Alcon chooses a 7/8" master cylinder for both front and rear also.

Premium braking components, such as the Alcon pieces, are not cheap but are worth the extra expense for their increased reliabiltiy and performance. Great brakes are critical pieces to going fast and should not be overlooked. Brakes also must be thought of as a complete system with the calipers, rotors, master cylinder, balance bar and even fluid all playing vital roles.

MASTER CYLINDER SIZING

Do you understand what master cylinder size to choose and why? Let's talk about the dynamics of cylinder sizes and how the brake system reacts to various cylinder diameters. From this it will give you the idea on what diameters will work for your application and give you the pedal feel that suits your style of braking.

Basically the smaller the master cylinder, the more pressure is applied to the caliper pistons for a given brake pedal ratio. Along with this, there will be more pedal travel. In essence, the smaller cylinders will give more of a "power brake" feel and stopping. The effort is less by the driver for more stopping power. A larger diameter cylinder will make the pedal very hard but there will be less stopping power.

With that said, that pedal travel must be taken into consideration. Are you in a situation where the brakes are used constantly and don't have time to cool? Will a soft pedal, created by excessive heat, end up going to the floor? Watch a NASCAR race at Martinsville someday to get the extreme. The driver is on the brake constantly for 500 laps. The rotors are glowing red and don't have a chance to cool. Even the best fluid will boil and make the brakes fade. This is where the longer travel created by the smaller cylinder size may be a problem. You will lose your brakes sooner.

BRAKE FLUID

To have a good working brake system, it's of the utmost importance to use a premium racing brake fluid with a high boiling point. Along with that, there is something you must understand: brake fluid draws moisture. It will suck moisture out of the air, especially in a humid environment. Even with the good racing brake fluids, the boiling point will go down when they draw moisture. I can't stress enough how important bleeding is and the procedure you use when bleeding. Don't just crack the bleeder a couple times and say "we have all the air out." Flush all the old fluid out and replenish it with new fluid out of a new bottle. Brake fluid is cheap compared to the consequences of running out of brakes during a race.

Castrol, Brembo, AP, NEO, and Wilwood all make very good brake fluid. Use these above any typical store bought fluid. The boiling point is very high and the resistance to moisture is better than most.

BALANCE BARS.

The balance bar obviously lets the driver adjust the brake bias from front to rear. It can have a dramatic effect on handling and the cars characteristic during cornering. Too much front brake and the front end will plow while turning into the corner. Too much rear and it will have a tendency to be loose in the back end and want to spin. When the balance bar and brake bias adjuster are working properly, it will give the driver a consistent balance, front to rear, every time you apply the brakes. This system must be well maintained to do this consistently. Believe it or not, most balance bar systems purchased don't do this job consistently. They bind, they attract dirt, they just don't repeat every time you hit the brake pedal or they change depending on how much brake is applied.

Alcon has designed the first balance bar I've ever seen that is truly consistent and is built in such a way that the dirt stays out of the critical parts. Just about every car in IndyCar and a lot of the NASCAR cars have adopted this Alcon balance bar. I'm not here to sell parts but let you, the reader, know what we test and make you aware of the findings.

As you read this, take every aspect of the brake package into consideration. It must all work together to give you the optimum braking and it is the "secret to going fast." ds