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# 2 x4

**MOTORCYCLE POWER**

**Engines Designed  
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**ADJUSTING  
IMPROVED  
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PERFORMANCE**





# 2x4

## Motorcycle Powerplants Prove Their Worth in Four-Wheel Racers

### Racing Technology

by Peter Stark

In the short span of the last couple of years, motorcycle-powered Sports Racing cars have ascended far beyond the ranks of car-crazed college student engineering projects and now exist as full-on, purchasable race cars capable of delivering big thrills, big speed and big reliability at a reasonable buy-in. With trick new, motorcycle-friendly C- and D-Sports Racing cars available from the likes of ADR, Merloy, Racing Concepts, Radical, Stohr, TraXstar and Van Diemen, and the current crop of liter-sized motorcycle mills laying down horsepower numbers north of 150—to the ground!—these little

screamers have to be taken seriously. And speaking of screaming, have you heard the glorious, F1-like music made by today's sportbikes? Even if you lack the talent to drive a motorcycle-powered race car fast, you'll certainly sound and feel like you're going fast! Fast, fun, reliable and cheap are all good things....

"It's really amazing," says two-time and defending D Sports Racing National Champion Mark Jaremko, "because I've got tens of thousands of dollars in my Formula Ford engine and it needs to be torn down or tuned or tweaked all the time; but here's a family of motors that make more power, weigh a lot less, cost a fraction of the price, and you'll never have to think about it for at least two

seasons." He continues with his opinion that "there's no reason why you can't spend a few grand on a used motorcycle motor, drop it into a competent chassis, and win the Runoffs. Built motors are nice, but even with a stock motor you can win races and win the Runoffs."

Long regarded as prototype-like classes of cars sporting questionable reliability and intense maintenance needs, C- and D-Sports Racing field sizes are generally pretty small, despite the fact that the cars offer blinding speed for a relatively reasonable price. The influx of cheap and reliable motorcycle-derived motivation and low-buck, high-tech turnkey cars from proven manufacturers could well change all that and bring the masses back to the Sports Racing classes.



## THE LITER CLASS

The boomer class of modern, thermonuclear sportbikes is known in the two-wheeled world as the "liter class," based on their approximate displacement of, well, one liter or 1000cc. This is the big dog class, home to ridiculous power-to-weight ratios and—save for a pair of exceptions in Suzuki's all-drag-racing-all-the-time GSX-1300R Hayabusa and Kawasaki's hyper-GT bike, the ZX-12R—the place that all the big motorcycle horsepower calls home.

The *de rigueur* recipe for the liter class currently calls for an inline-four displacing about 1000cc, a pair of overhead camshafts, at least four valves per cylinder, myriad bits of race-derived internal trickery such as piston-cooling oil squirters and titanium wherever possible. All variety of electronics and acronyms lead to a basic spec sheet sporting peak horsepower numbers of between 150 and 180hp, a redline that'll shame anything this side of Schumacher's company car and a total package weight—including a cassette-type, sequential transmission—of less than 100lbs.

In short, these motors make as much or more power than the car-based lumps, weigh

far less and offer a 50-percent-larger usable rev range. That one can scoop a complete modern open-class sportbike engine for no more than \$3000—with used examples available for even less—makes this source of motor-ation one of the cheapest around, particularly when one considers the power-to-displacement-to-weight benefits inherent to motorcycle engines. Don't worry about not being able to find a suitable, low-mileage used motor...riders with wallets bigger than their skill set throw these bikes away as often as George Steinbrenner does his employees.

## A SUBSTITUTION FOR CUBIC INCHES

According to the ponderous and potentially depressing opus more commonly referred to as the General Competition Rules & Specifications (GCR) book, this is where SCCA stands with regard to motorcycle engine eligibility for C- and D-Sports Racing cars: "Motorcycle-based engines with 4 valves or less per cylinder, 1615cc maximum, 42mm venturis or intake restriction, minimum weight 1300lbs. Motorcycle-based engines with more than 4 valves per cylinder, 1310cc maximum displacement, no intake restriction,

Thanks to the low buy-ins, lower weight, big horsepower and even bigger reliability of motorcycle engines, many C and D Sports Racing cars, such as the back-to-back Runoffs-winning Stohr DSR (LEFT), are now engineered specifically for bike powerplants. The ultra-stout 1-liter found in Yamaha's flagship YZF-R1 (RIGHT) packs 5 valves per cylinder, a 13,750rpm redline and 180 ram air-assisted horsepower into an 85lb package!



**"[THESE] MOTORS MAKE MORE POWER, WEIGH LESS, COST A FRACTION OF THE PRICE, AND YOU'LL NEVER HAVE TO THINK ABOUT IT FOR AT LEAST TWO SEASONS."**

Mark Jaremkó







**EVERY CONSTRUCTOR WE'VE  
SPOKEN WITH CLAIMS THERE  
TO BE NO REAL OBSTACLES OR  
CHALLENGES IN BUILDING  
MOTORCYCLE-RECEPTIVE  
CHASSIS.**

The Yamaha R1 motor looks right at home in this Merloy DSR (ABOVE), more so than it does in the cramped confines of its original and intended home (BELOW). Considering the speed 1000-plus-pound cars are capable of with this motor, imagine how wild a ride the 379lb bike is with this kind of power! Hang on....



minimum weight 1300lbs. Cars prepared to DSR specifications may compete in CSR with the following exceptions: minimum weight—chain drive or belt drive 1000lbs, minimum weight—all other drive types 1100lbs." Good stuff for budget-minded speed junkies desirous of sky-high redlines and bulletproof reliability; even better news for Yamaha fans as the 5-valve per cylinder layout of its top-shelf YZF-R1 motor seems best suited to take advantage of the rules for D Sports Racing machines.

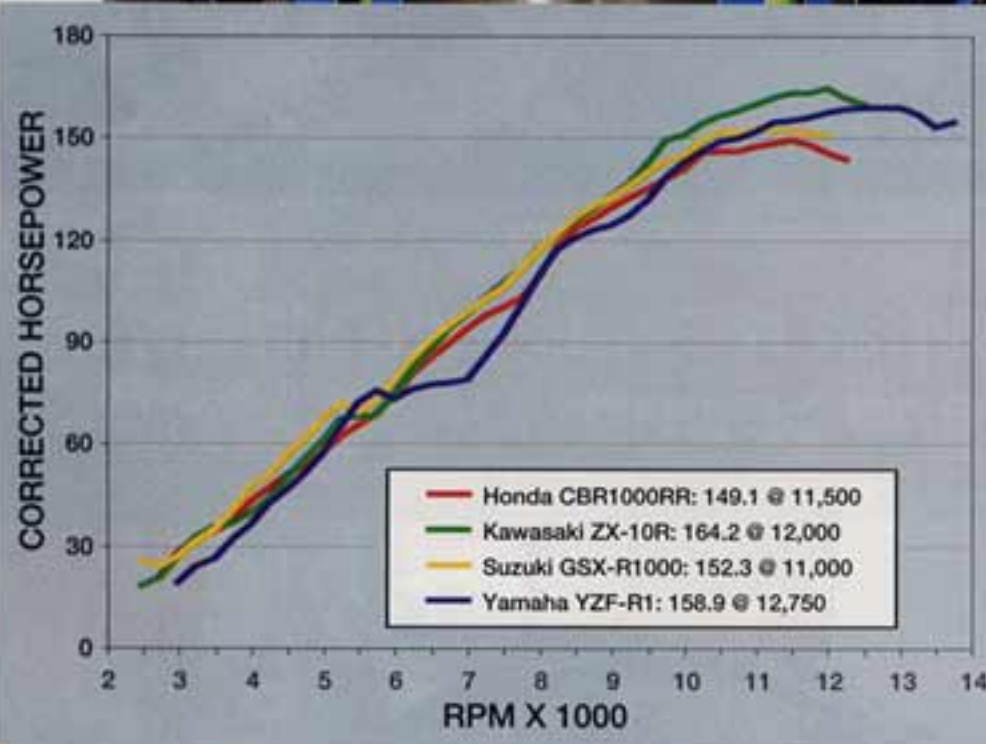
As nice as that 1615cc maximum displacement for 4-valvers may look on paper, these extremely oversquare motors are designed to deliver maximum power in the absolute minimum amount of real estate (read: size and weight) and thus cannot dimensionally support a much larger bore and/or stroke. That said, regardless of SCCA rules, physical packaging constraints prohibit the more popular, higher-revving liter-sized motorcycle mills to grow much larger than 1300cc. The 1300cc Hayabusa motor and 1200cc Kawasaki ZX-12R lump can be bored, stroked and cajoled into the 1500-1600cc range; but water jackets become mighty small at this stage in the game and, considering that in CSR or DSR duty these motors will be lugging around 2-3 times the weight God and the factory intended them to, this route could well jeopardize the reliability factor that makes motorcycle engines so damn appealing in the first place.

Moreover, with today's crop of liter bikes craving air with a voracity that rivals a frat boy's appetite for beer, the 42mm intake restriction levied against 4-valve equipment means that extra displacement isn't going to be much help to an engine that can't ingest enough air to effectively exploit its power potential.

A stock Suzuki GSX-R1000 motor inhales by way of a quartet of 50mm throttle bodies (as measured at the airbox)—and while these pieces taper down to 42mm at the actual point of intake into the engine itself, the rules clearly call for a maximum intake diameter of 42mm at the throttle body. A source from deep within the multiple championship-winning Yoshimura Suzuki Superbike effort claims that this 8mm, or 16 percent, reduction in throttle body size would be akin to "giving away at least 25 percent of peak power and tons of midrange torque." He also points out that such a reduction on the intake side of things would necessitate a wholesale remapping of the fuel injection, smaller injectors and an all-around pile of work and headaches. With that in mind, it seems wisest to follow the path laid down in the GCR and forego extra cubes in favor of extra valves and the associated lack of intake restriction.

"We use the R1 motor because it's light, small, makes good power and it what Stohr chose for their [D Sports Racing] cars," says Arnie Loyning, owner of Loyning's Engine Service and all-around engine builder par excellence. "The Hayabusa motor makes sense





By virtue of its 5-valve-per-cylinder head design, Yamaha's 998cc R1 motor bypasses the curious set of rules which impose intake restrictions upon engines with 4 valves or less. Beyond this, the R1 mill relies on heavy doses of trickle-down MotoGP and F1 technology such as titanium valve train, ultra-lightweight camshafts and reciprocating bits, as well as cylinder-wall oil cooling and other techno-trickery to develop nearly 160 horsepower to the ground—bone stock and with a warranty!

**"[THESE MOTORS] ARE CHEAP, RELIABLE, MAKE GREAT POWER OUT OF THE BOX... THEY'RE THE CHEAPEST WAY TO GO REALLY FAST."**

Arnie Loyning

in C because it makes the most power." Loyning's R1 motors don't grow beyond stock 998cc displacement, but they do inherit higher compression forged pistons, stronger and lighter rods, extensive headwork, flat-slide Keihin carbs in place of the factory injection (though demand has now forced Loyning to begin to work with injected motors), and custom camshafts designed to "broaden the powerband and get away from the peakiness of the motorcycle engines," Loyning explains.

For the heavier C Sports Racing cars, Loyning says he and Stohr are more than happy to deal with a little more weight for a lot more horsepower; a built 1000cc R1 motor will put out right around 185 horsepower in race trim,

while they're seeing numbers in the 220 range with the 'Busa mill. Loyning claims reliability doesn't take too huge a hit with his motor mods.

"A race motor can still easily last a full season," he says. Reliability is that much better in the C cars because the heavier minimum weight requirements make the use of a dry sump a feasible reality.

Loyning loves the fact that motorcycle engines are gaining such popularity in these classes because they "are cheap, reliable, make great power out of the box and can be built to make even more, and with the power-to-weight ratio of these cars with these motors, they're the cheapest way to go really fast." Can't argue with logic like that!

#### THE CARS

Many chassis and car constructors have recently awoken to and taken notice of the benefits—in terms of power, packaging, cost and reliability—of motorcycle-derived powerplants. Several manufacturers are now offering turnkey, ready-to-rumble, bike-powered racecars. Every constructor we've spoken with claims there to be no real obstacles or challenges in building motorcycle-receptive chassis, and all are excited that the reliability inherent to these powerplants has opened up CSR and DSR to myriad enthusiasts who would've previously ignored the classes because of cost and reliability concerns.





In addition to bringing high doses of high-revving, reliable horsepower, lightweight and low cost to the party, motorcycle powerplants offer the added benefit of cassette-type, sequential 6-speed transmissions that allow for quick and easy ratio changes.

**"THESE CARS ARE MUCH FASTER THAN YOU'D EXPECT... IT ACTUALLY HAS A WIDER WINDOW OF POWER THAN ANY FORMULA FORD, IT'S JUST FARTHER UP THE TACH."**

Mark Jaremko

Motorcycle-engined sports racing cars are nothing new, as numerous races have been won in A-Macs and Cheetahs with motorcycle power. However, only recently have manufacturers been offering complete ready-to-race packages on a big scale, and the number of motorcycle-powered cars on American racetracks has risen rapidly.

Radical was the first large-scale manufacturer of turnkey motorcycle-powered sports racing machines to launch a major effort in the U.S., starting with a C and a D car, with Hayabusa and Yamaha YZF1000 power, respectively. The manufacturer now offers a full range of cars, including two-seaters designed for track day use as well as racing. Its latest offering is the SR4, a Bentley-inspired racer powered by a 1300cc Powertec Suzuki, with a 1500cc engine an option. Radical was near the top of the C Sports rankings last year with 12 National wins and scored another five in D. In Europe, Radicals fill big fields in a one-make series.

Stohr jumped into the two-by-four game a couple years ago and has found considerable success with its Yamaha R1-powered D Sports Racing car, racking up National Championship wins at the 2002 and 2003 Runoffs complemented by a dominating run and win at the 2003 June Sprints. \$48,500 buys a soup-to-nuts, ready-for-the-grid, Stohr D-Sports Racing car. If the stock Yamaha mill isn't hot enough for ya, Stohr will happily take some more of your money in trade for a wild Loyning's Engine Service-built motor.

This year, Stohr has added to its lineup with the new-for-'04 C-Sports Racing car. Borrowing heavily from lessons learned and techniques honed on their D-Sports Racing car, this ride packs the same features and same price as the D-car, with power coming from a 1300cc Suzuki lump that brings more power and more weight—most of which has been added intentionally so that the finished product tips the scales at an even 1000 pounds, 150 pounds below the minimum

weight for chain-driven, motorcycle-powered C-Sports Racing machines! While not yet homologated for CSR competition by SCCA, factory driver Jaremko is looking to uphold the company honor this year in the faster CSR class.

With its hot new Merloy GDSR1 Sports Racer, Maloy Racing—owned by Mike Maloy, Alan Mertens and some little-known racer by the name of Al Unser Jr.—was created to sell motorcycle-motivated race and track day cars. Forty-five large nets a brand-spanking new Merloy GDSR1, which, as the name cleverly integrates and asserts, is a D Sports Racing car (also legal and homologated for CSR) powered by the 998cc, liquid-cooled, 20-valve, DOHC, inline-four plucked straight from a Yamaha R1. The Merloy had a strong debut at the 2003 Runoffs, running as high as third under the command of Al Beasley Jr. before contact cut the day short. The car won its next race, A Feb. 1 National at California Speedway.



Similar machines can be found in the Racing Concepts' Speads RS04, traXstar Supercars' prototype D Sports Racing car, ADR Engineering ADR1000, Diasio D962, Downs Engineering Realm Runner, OMS DSR1 and SISTech SportsRacer S-1. That doesn't even take into account the hundreds of inexpensive 600 Racing Legends and Bandolero cars, and the offshoot Thunder Roadster and GP Roadster, legal in C Sports. In most cases, complete cars ring the register to the tune of mid-to-high forties, which, when viewed in light of the performance these machines deliver and the brilliant reliability—engine life is measured not in the number of hours one will last, but rather the number of seasons one will survive—is nothing if not a reasonable way to get into safe and trouble-free equipment that's proven capable of running up front and winning in DSR and CSR.

#### DRIVING A FOUR-WHEELED MOTORCYCLE

Motorcycle-powered D- and C-Sports Racing cars are appropriate for anyone who likes the idea of going fast in high-tech, safe, sorted, race-proven and race-winning cars, but doesn't like the idea of worrying about engine reliability and parts availability. Specifically, one name jumps to the top of everybody's list of motorcycle-motivated hustlers, and that's Jaremko. Jaremko's been racing for nearly a quarter of a century (and probably now loathes me for making him feel so old...), having gotten his start in karts in 1980. Since then, he's tried his hand at damn near every SCCA class from Showroom Stock to Formula Ford 2000, before moving to Sports Racers at the beginning of the 2002 season—a season in which Jaremko "won the Championship in borrowed racecars!"

"These cars are much faster than you'd expect," Jaremko says, before backing it up with some hard numbers. "I have a very fast Formula Ford, and this car (a Yamaha R1-powered Stohr D Sports Racing car) is always 4-5 seconds a lap quicker." Impressive, sure, but how is it to drive—other than fast?

"Way easier to drive than, say, a Formula Ford or a production car." He goes on to explain that "you'd think it'd be real peaky and require a lot of effort to keep it up on the pipe, but it's not like that. It actually has a wider window of power than any Formula Ford, it's just father up the tach." That's an understatement in light of the fact that most Formula Fords make power between 4000 and 6500rpm, while the motorcycle engines handle their business from about 7500rpm all the way to and through 12,000rpm!

On behalf of the rest of us who are simply enamored by the idea of five-digit redlines and the magical symphony that comes with such stratospheric revs, Jaremko's last words to me will be the last words of this story: "When it comes to motorcycle engines in Sport Racers, it's real world speed and it's cheap." ●

# Racing... Without Restrictions

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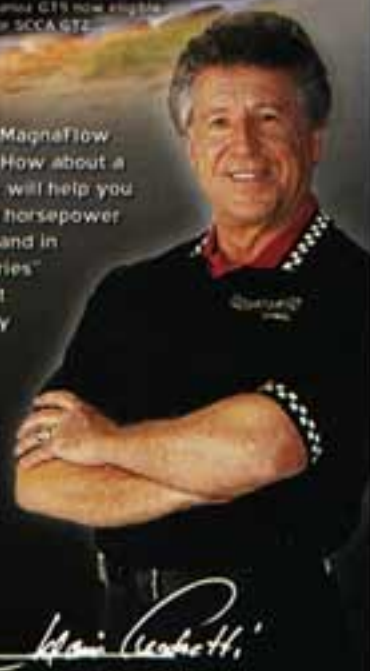
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*John Jaremko*

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