

FAIRY TALES COME TRUE — 1,000 MILES ON A VINTAGE BMW SIDECAR RIG

# MOTORCYCLIST

MOTUS  
MST

- AMERICAN MADE
- 1,650cc V-4
- 165 HP
- \$31K
- READY TO ROCK!

☛ A BOXER IN BRIEF(S)  
BMW'S ALL-NEW NAKED R1200R

☛ BLOW PAST TRAFFIC  
ON HONDA'S SUPERCHARGED COMMUTER

☛ THE LITTLE ENDURO THAT DID  
YAMAHA'S DT-1 PUT A GENERATION ON THE TRAIL

**ELECTRONIC SUSPENSION**

- WHAT YOU NEED TO KNOW ABOUT DIGITAL DAMPERS

# MOTUS MST



**THEY SAY**  
"Performance.  
Comfort. Range."

**WE SAY**  
"Damn straight.  
You betcha. Hell  
yeah!"

## The American Sport Tourer is Ready... Finally!

**EVOLUTION**  
A clean-sheet design with an engine bearing some resemblance to a small-block Chevy and a frame that could almost come from Ducati.

**RIVALS**  
BMW K1600GT, Honda ST1300, Kawasaki Concours 14, Triumph Trophy SE, Yamaha FJR1300

→ Say "American-made motorcycle" and think Harley, right? Indian and Victory, too, and perhaps Confederate. All burly, very traditional cruisers and tourers in this group, plus, well, the Confederate, which is its own thing. Then you have Erik Buell Racing, now a truly international concern with a design aesthetic that's close to European and product that's decidedly sporty. EBR is as proud to be an American product as anything (else) from Wisconsin, but you wouldn't call it traditional.

Motus Motorcycles joins this group with a very unconventional entry, which, yes, you have seen before. A straightforward genesis brought this US-designed and -built sport-touring machine to fruition: Co-founders Brian Case and Lee Conn, longtime two-wheel enthusiasts, were in the right place with the right mind set, even if it was at the wrong time—ending stints as design chief and business owner, respectively, in 2008. Despite the economic free fall, Case and Conn collaborated on what they each felt was their dream bike and started a business to build it.

This motorcycle had to be comfortable. It had to be fast. It had to be uniquely American.

This is not a new story. After initial drawings, querying 1,200 potential customers about what they wanted most in a sporty sport-tourer (as opposed to a touring sport-tourer), and the construction of two prototypes, Motus gave a few lucky mugs the chance to ride it. The boys in Alabama began setting up a small dealer network and eventually began taking deposits. In 2011, the first prototypes were traveling the country, being shown at races and other events, and a small number of enthusiasts with \$30,000 to spare began lining up. Crickets followed. Time chugged on and no new Motuses ever appeared.

From the outside, it appeared that Motus had hit a wall, either in design, federal approval, or money. The truth is a bit more mundane. Development of the initial prototypes—including one that's

really a rough-hewn mule—proved that while the underlying concepts were good, there were areas to improve. For example, the system started with conventional fuel injection but wears a custom ride-by-wire setup. Exhaust manufacturers changed. The location of the starter and many of the accessories changed to accommodate new and more durable parts. When you park the original prototypes next to the production-spec MST, the differences are plain to see. This "design frozen" bike has changed radically since the beginning, which is exactly as every all-new motorcycle does; you just don't get to see it.

One part of the MST that hasn't changed a great deal is the steel-tube chassis. Case confirms that a Triumph Sprint ST was used as a very loose configuration guide for things like wheelbase, swingarm angle, and countershaft location. But as development continued, these measurements changed. Now the MST has a 26-degree rake and 4.25 inches of trail—almost exactly what a Yamaha FJR1300 has, though the Motus' wheelbase is 2.8 inches shorter, at 58 inches.

Motus' designers didn't want the bike to feel as large as something like the FJR, so many of the design aspects reflect that desire. The fiberglass fairing—built by BST Composites in South Africa—is slim and the standard shield is low enough that it never gets in your way, visually. (A taller accessory screen is available.) In terms of fairing size and coverage, think Multistrada rather than FJR.

But the riding position is more FJR, especially thanks to the Heli Modified-built handlebars, which have unusual "knuckles" that allow the bar ends to rotate and change pullback; by mixing adjustments here and rotating the whole bar assembly in the bar mounts, you can change the riding position pretty radically. A seat made by Sargent can be ordered with a heating element installed and has been designed with a very narrow front section to reduce effective seat height without sacrificing too much surface area. Typical of Sargent's wares, this seat is firm

“Motus felt a large displacement V-4 would fulfill the promise of a torque-rich, understressed engine perfect for sport-touring.”



and only slightly dished. Completing the picture are low-set footpegs that help form a moderate, very ST-like riding position.

All this talk about designing for a long-distance tourer with a sporting bent ignores the possibilities of a 1,650cc V-4 between your kneecaps (ahead of them and not in them, thanks to the engine's 15-degree forward cant, which has been with the design since day one). First impressions reveal little of the beast. The MST fires up willingly, settles into a placid idle, and only rocks the chassis when you blip the throttle hard. About like a strong-running Guzzi. Nothing like you'd expect "half a small-block Chevy" to do.

But rev it up and there's something special waiting. Because it's big, the MST engine doesn't spin up like, say, BMW's K1600 six-cylinder, but it is lively and very, very strong. Factory claims are 165 hp at 7,700 rpm and 123 pound-feet of torque at 5,000. Probably that'll be about 140 hp and 105 pound-feet at the rear wheel, which would put it at the top of the ST class.

It would be folly to describe when the power comes in because it's always there. Allow it to drift down to 2,000 rpm in any gear, roll the throttle open, and the bike lunges ahead. True, there's a bit more urgency when you're near the 5,000-rpm torque peak, but it pulls so well from the

bottom that you can short-shift all day long, and it still has enough moxie at the top end of the range that you might find yourself testing the rev limiter until you develop an ear for the revs.

Part of the Baby Block's deception is both its smoothness and its unusual configuration. A 90-degree vee angle works with crankpins offset 75 degrees, giving a 0-345-435-630 firing order. Early versions of the engine used counterbalancers, but they were deemed unnecessary. No disagreement here; this V-4 is as smooth as anything Honda's ever produced and has an offbeat, thoroughly engaging vibration signature under power. If you don't fall in love with this engine, you just don't get the whole internal-combustion thing.

Good manners help win affections. Throttle response is exceptionally good, with no obvious glitches or hang-ups anywhere in the rev range. From a light, progressive clutch engagement to smooth, positive shifts and commendably little lash, the driveline does its part. Only a difficult-to-find neutral leaves a negative impression. For a brand-new engine developed by a very small engineering team, the Baby Block's manners are a major victory.

From the chassis side of the equation, the Motus continues to impress, though mainly because very little stands out.

High-quality components from Brembo brakes, Braking rotors and master cylinders, to an Öhlins fork and Progressive shock help make this so. Motus has the bike in the sweet spot for setup with the fork, though the bike we rode remained a little soft at the back despite adding spring preload several times during the day. Rear ride height can be adjusted independently and probably should have been cranked up a bit before we hit the Alabama hills. Often enough, and well before the chassis signaled any discomfort, the heat shields guarding the catalyts touched down with a soft *ting*.

There's little doubt the Motus could stand a bit more rake, since it was dead stable up to triple-digit speeds. Steering response is right down the middle, lively enough to encourage back-road antics—and it turns very well while on the brakes—but also stable enough that you don't have to mind the bike on those inevitable highway stints. We'll put the Motus between the hyperactive BMW K bike and the more sensible Kawasaki Concours 14 and Yamaha FJR1300. Our primary complaint? Not nearly enough steering lock. Practice your 17-point turns now.

In the broader sense of a traveling machine, the Motus scores well, thanks to a very good saddle, sufficient weather protection that's thankfully free of turbulence,

# INSIDE THE BABY BLOCK



In a very general sense, the Motus V-4 is half a Chevy V-8 in the same way you'd consider today's Panigale engine to be half a Desmosedici's. Related, sure, but sharing few if any parts. Similar technologies, you could say, but not exact parts.

Why this design? Motus felt that a large-displacement (for a motorcycle) V-4 would fulfill the promise of a torque-rich, understressed engine perfect for a sport-touring application. It would be charismatic if done right and crank out enough power to make the MST thoroughly entertaining without having to go to the ragged edges of engine tune—the harder you push an engine, the more likely it is to fail, and that's not something a small start-up company can afford to have happen.

And because the emphasis was predetermined to be sport-touring—rather than full-on supersport—weight was not as much of an issue, though that's not to say Motus didn't sweat the details to keep the engine light. The point is that another 10 or even 25 pounds in the powertrain would not be a deal killer.

When you start with a Chevy V-8—sort of—you begin with decades of production-line engineering and race development already done for you. Things like combustion-chamber design, bearing sizes and composition, valve train geometry and cam profiles, and crankshaft development can all be leveraged off of the tens of thousands of engineering efforts charged to Corvettes, rental cars, and NASCAR cabs. Why buy the cow when you get the milk for free?

Eventually, though, the Motus "Baby Block" morphed from an engine that used a great deal of off-the-shelf components to one that required a large number of specific pieces, many built in-house by Motus. Even something as substantial as the cylinder heads have changed since the early prototypes, which used conventional parallel valves. In the production Motus, the valves are splayed from one another; an indication is the extra ridge in the valve cover needed to clear the exhaust rockers. Not

only are the valves on a different vertical axis, but they are canted with regard to the combustion chamber. By spreading the tips of the valves apart, they can be larger for a given bore and not have interference at the valve head.

Yes, the engine still uses two valves per cylinder operated by pushrods from a central camshaft, which is manufactured by Andrews to Motus' spec. The roller-tipped hydraulic cam followers mean no valve adjustments are needed, and the shortness of the block means relatively small, light pushrods, so the redline is a reasonable 8,500 rpm. (In fact, the rev limiter doesn't kick in until 8,800 rpm.)

If the front half of the powertrain is familiar, the rest is all new. Designed in conjunction with Pratt & Miller, the Motus' transmission is unique. From the crankshaft, power flows through a bevel gear, which turns the power 90 degrees. The receiving end of the bevel gear is on a short intermediate shaft running laterally above the clutch/input shaft axis; one end gear-drives the clutch basket and the other drives an accessory pack on the left rear corner of the engine.

From there, power flows through a conventional six-speed, constant-mesh gearbox after a wet, multi-plate clutch made up of some parts that would also fit a Suzuki Hayabusa. Because of the gearbox configuration, simple splash oiling was deemed insufficient—and the design of the package makes a shared oil supply undesirable—so the trans has its own oil pump that circulates conventional engine lubricant.

Final drive is by chain. Sure, you could easily do an ST1300 or Moto Guzzi given the MST's longitudinal crankshaft and have the bike be shaft driven, but that wasn't part of the original mandate, and, besides, it would mean even more specialized castings. (Chains and sprockets are a dime a dozen.)

Wet weight of the engine alone is said to be 150 pounds—or 225 pounds with the gearbox. If you have a special project or just want to really enliven your snow blower, Motus will happily sell you a Baby Block without the rest of the motorcycle.



Burly V-4 power defines the MST character. Brembo and Öhlins components make the Motus competitive.





“In the broader sense of a traveling machine, the Motus scores well.”

and standard 35-liter Givi hard saddlebags that ride close to the bodywork on Motus-designed mounts. A comprehensive LCD instrument panel gives you a ton of things to watch while pushing to the last fuel stop, which should be a reasonable distance given the 5.5-gallon fuel tank and the promise of good mileage from a tall-g geared, torquey, two-valve engine.

After a day in the saddle, we're pleased to report that the MST is a strong performer with excellent manners and in no way feels like a half-finished prototype. Where it diverges from industry norms, it does so by intention; in all the important ways, this is a fully competitive, modern motorcycle.

So two questions remain: Is it finally for real, and what about that price? Second answer first: The \$30,975 price tag for the basic MST was explained by Conn very simply: "It's a summation of the component costs, an allowance for assembly, and a little bit more to keep the lights on. That's it. That's what it costs to make this motorcycle." Naysayers will point out that a bike as expensive as a BMW K1600GTL Exclusive doesn't even have ABS or traction control or ride modes or a radio. Nor

are these things options. But the Motus is unique on the ST landscape, promises to be fairly rare, and there are certainly 300 or so riders a year willing to pony up for the privilege of being the only ones on the block. Maybe the whole county.

Is the Motus for real, after years of watching the machine evolve and tease? Yes, we think it is. We spent three days at the Birmingham facility and saw engines, frames, swingarms, bodywork, and boxes of things like switchgear, brakes, and other miscellanies—which you definitely wouldn't have purchased if you didn't intend to build motorcycles. Fact is, the long development process undertaken by all of six guys and a host of subcontractors is not the work of a moment. Case and Conn both knew they had to get it right the first time and kept the development cycle open longer than it might

otherwise have been. You can't fault them for that. Especially considering what they've created: A genuinely new "all-American" motorcycle.

## TECH SPEC

PRICE	\$30,975
ENGINE	1650cc, liquid-cooled V-4
TRANS/FINAL DRIVE	6-speed/chain
CLAIMED POWER	165.0 hp @ 7600 rpm
CLAIMED TORQUE	123.0 lb.-ft. @ 5000 rpm
FRAME	Tubular-steel trellis
FRONT SUSPENSION	Öhlins 43mm fork adjustable for spring preload, compression and rebound damping; 5.1-in. travel
REAR SUSPENSION	Progressive shock adjustable for spring preload; 5.5-in. travel
FRONT BRAKE	Dual Brembo four-piston calipers, 320mm discs
REAR BRAKE	Brembo two-piston caliper, 200mm disc
RAKE/TRAIL	26.0°/4.25 in.
SEAT HEIGHT	32.0/33.5 in.
WHEELBASE	58.0 in.
FUEL CAPACITY	5.5 gal.
CLAIMED WEIGHT	585 lb. wet
AVAILABLE	Now
MORE INFO AT	<a href="http://motusmotorcycles.com">motusmotorcycles.com</a>



A comprehensive TFT LCD instrument panel uses eight waterproof buttons around the face to manage information displays as well as the optional heated grips and seat.

## VERDICT

America's sport-touring machine is fast, capable, and fun to ride. Rarity is offset by a high price tag.



# THE DEFINITION OF INSANITY

Can you imagine anything crazier than setting out to build your own motorcycle today? And we're not talking here some latter-day Rickman frame up or even pulling a Bimota—starting with an existing engine and building a unique bike to amaze your friends. And we *are* talking here about building for general consumption, not garage-cobbled “some-offs” sold to incautious riding buddies.

Starting fresh rarely happens, and there's good reason for that: It's extremely difficult.

Just ask Brian Case and Lee Conn, co-founders of Motus Motorcycles. The MST-1 has been visible since the first drawings left Case's hand in 2008, and, in 2011, very early machines were ridden and reported on as though the model was nearly ready to produce. In truth, the very first pair of Motuses (Moti?) were little more than proof-of-concept machines, hand-built with components never intended to be economical to produce.

Everything that had to be proven was done on these two, over the course of five-plus years, and then two pre-production examples were built. So the actual production version of the MST-1—just recently given EPA approval—was set to begin its slow ramp up in December 2014, with a goal of building 10 bikes before the end of the year. Ultimately, the plan is to build 300 a year.

“Starting fresh rarely happens, and there's good reason for that: It's extremely difficult.”

None of this would have been possible without the clear-eyed resolve of Case and Conn, who started by asking what kind of bike they themselves wanted to own. “We'd all done sportbikes and cruisers,” Conn says. “We're true enthusiasts here, but we also realized that there was some value in doing a genuinely American bike with great performance credentials. But it also had to be comfortable, and that drove us to the first ideas behind the MST-1.” Deconstruct this statement to see the wisdom of avoiding direct competition with the Europeans and the Japanese in the supersport realm. Only engineering budgets underwritten by myriad other product lines allow that kind of intensive, continued development.

In large part, the delay following the initial showing at Laguna Seca in 2011 and today's quiet start of production can be blamed on the engine—but in a good way. While the 1,650cc V-4 shares parts with Chevy's LS-1 V-8, they are fewer in number than you'd think. And in no way is this a small-block Chevy run through a massive bandsaw; it's an engine developed specifically for this application. The reasoning behind starting with Chevy parts? Pretty simple, actually: So much is known about combustion-chamber design, valve train geometry, bearing sizes, and other factors that a fair portion of the engineering was, in essence, already done.

But there was still so much to do, and when I spent the better part of a week in Birmingham, Alabama, with Case and Conn and the Motus team of half a dozen, it became clear that a small amount of Stockholm syndrome was at work. Through all the late

nights and lost weekends working through engineering challenges alongside development partner (and stakeholder) Pratt & Miller, through the days spent refining the shape of the machine in clay and steel tube, and through all the weeks finding suppliers who would support a small-scale effort (and building their own for the parts without a worthy source), the guys have put so much of themselves into the product that I don't think even they see it.

Now, it's all about pushing to the finish line, silencing the critics who have called the Motus “vaporware” (or worse), and making happy those “couple of hundred” depositors who bet on a small upstart. Having

spent the day on a conforming, production-spec MST-1, I can say they'll be delighted. Plus, Case and Conn might actually get to take a vacation. They deserve it.



Motus co-founder Lee Conn stands with the “first production” MST-1R at the Barber Vintage Motorsports Museum. Motus' facility in Birmingham is actually the first location for the Barber museum.

MARC COOK