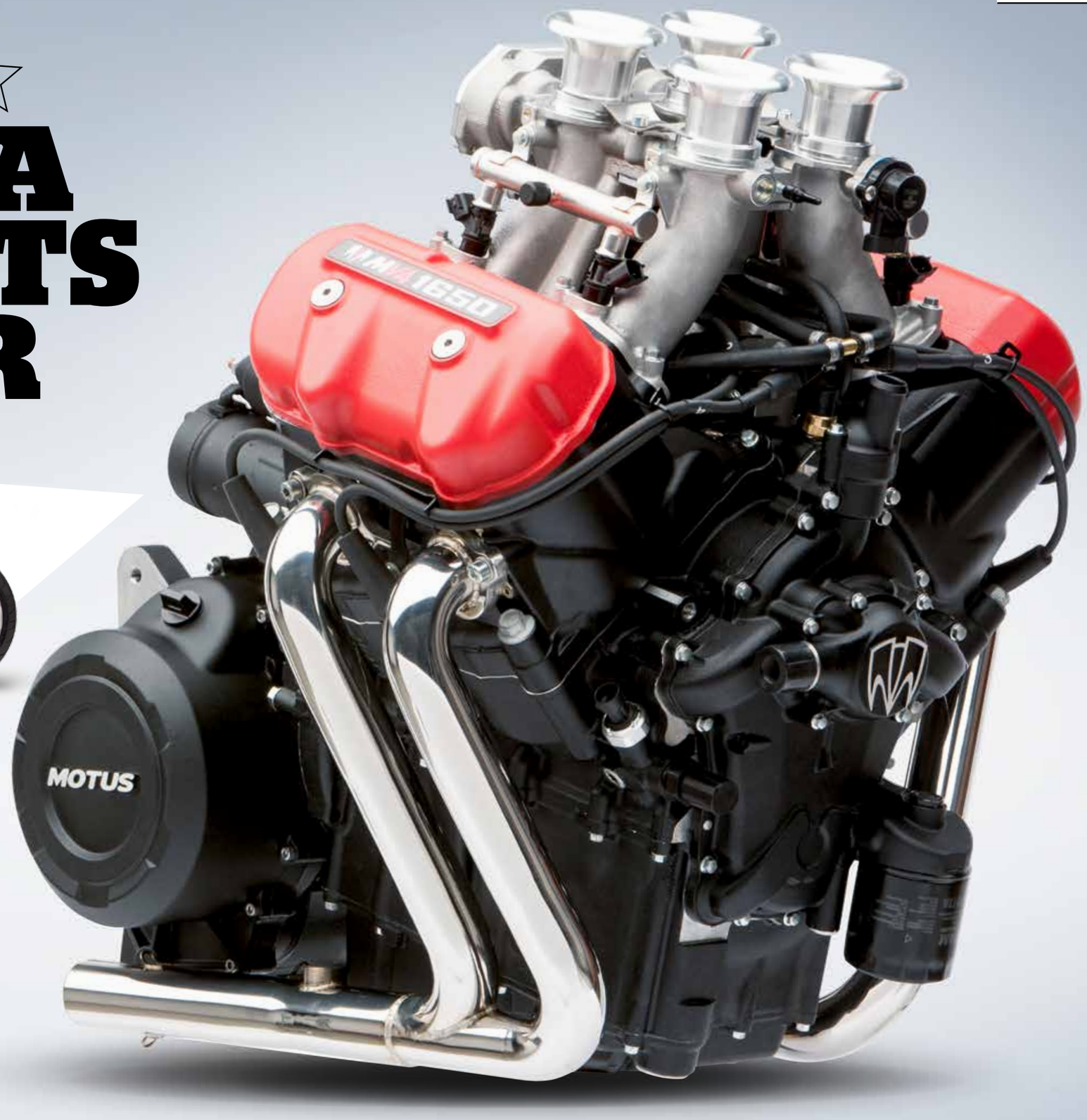
AMERICA REINVENTS THE VFR



As the first Motus is about to be imported into the UK, *Bike* samples the most exciting new American engine for a generation

By John Westlake **Photography** Trace Taylor

MAKING AN ENGINE from scratch is unimaginably difficult. It's one of the main reasons most motorcycles (and cars) are made by gargantuan corporations – to develop and build a half-decent engine takes money and expertise far, far beyond the reach of your everyday company. It's why even gifted engineers such as Erik Buell and Simon Sanders (of Ariel) choose to use someone else's motors. It's why Norton should take a bow just for getting a new engine to market, and why they had so many difficulties doing so. And it's one reason why John Britten is rightly considered a genius.

It's also why I'm astonished by the Motus MST I've just blasted along a freeway near the company's HQ in Birmingham, Alabama, USA. Having already had a tour of the premises, I know Motus are by no means a gargantuan corporation. Nine people work there, building three of the sport tourers a week, and for a long time the company consisted of just two people – Brian Case, the design chief, and his business partner Lee Conn. And yet their engine is as impressive as any I've tried in 25 years of road testing, a modern

Motus: not your huge motorcycle building conglomerate, but their bike is none the worse for it

Half a V8 hot rod motor. We're in

day hot-rod version of that sports touring classic, the VFR. It's that good.

Primarily this is down to torque, of which there is a laugh-out-loud amount. At 2500rpm the MST's 1650cc V4 produces as much of the stuff as a GSX-R1000 at its peak. And, as anyone who's ever ridden a GSX-R1000 will tell you, they're not exactly gutless. So it's got big twin grunt? Hardly. By 3500rpm it's making more than a Ducati 1198 at peak. By 4000rpm it's out-torqued Yam's VMAX and the supercharged Kawasaki H2. From 5000rpm, the MST's torque curve slowly drops from 123 lb.ft (the same as the 1800cc flat six Goldwing) to 116 lb.ft at 7750 and then down to 100 at the 8000rpm redline. On dyno paper, the Motus is like nothing else.

Ditto on the road. For everyday riding the MST's acceleration is hysterical – much more so than a ZX-10R or even a big Ducati. You don't have to keep the motor spinning to make things go backwards, you just nudge the throttle round a fraction, whatever the revs. You're dawdling along behind a car at 3000rpm, you see a gap, you're past.

In my two hours on the bike I never tired of twisting the throttle. At walking pace it'll pop accidental wheelies like a trials bike, on freeways it will snap from 70 to 90mph in a car length, out of corners it will drive so hard you'll wonder why it hasn't got traction control (we'll come to that).

What's especially clever though is that despite the colossal thrust, the throttle response is remarkably civilised above 3000rpm. Below that it's possible to make the MST lurch forward if you're not smooth, but it's no more lumpy or difficult to ride than a Ducati Monster. Ten minutes of town riding and you're used to it. And, because of the ride-by-wire, the throttle is deliciously light.

By usual rules, all that torque means the Motus will run out of puff as the revs rise. That's partially true, as the redline is far lower than litre sportsbikes. But at 7750rpm, the MST makes a claimed 165bhp. With its pointier cams and remapped fuelling the hotter version of the MST, the MST-R, makes 180bhp. 'The MST-R motor spins to 8600rpm,' says design director Brian Case. 'But it's reliable, so we can give a two-year unlimited-mile warranty. We've come close to 10,000rpm in testing.'

With those peak power figures and rev ceilings sloshing round your head, now seems like the time to mention the most discombobulating fact about the MST engine: it has only two valves per cylinder and they are operated by push-rods. For those too young to remember the machines ridden by cavemen as they chased woolly mammoths across the plains (or vice versa), push-rod engines have a camshaft down near the crankshaft which actuates the valves in the cylinder head using rods. The advantages are that it's simple and reliable (no faffing with valve gears and timing chains), helps keep engines compact because the camshaft doesn't have to go on top of the cylinders, and is lighter for the same reason.

WHY NO ELECTRONICS?

The official line from Motus is that the bike doesn't need ABS, traction control and rider modes. The Brembo brakes have enough feel to stop you locking them up, the engine generates ample traction to prevent slides and is so flexible that rider modes are irrelevant. True enough, but we suspect the real reason is the massive cost of development. It's a shame because the lack of ABS will stop Motus importing bikes into Europe from next year.

A bespoke bike and this time you can actually spot where the money has been spent

Electronic gizmos are the norm on top-end bikes. Their lack is the only thing likely to put buyers off the Motus

The downsides, which eventually led to the design's demise in all but a few American motors, are that eventually it's harder to make more revs because of all the rods and levers flying up and down, and you're restricted when you can open and close the inlet and exhaust valves. The result is less power and lower efficiency.

So why push-rods for the Motus? 'We wanted a design that was rooted in American culture,' says Brian, referring to the classic push-rod V8 engines that have powered muscle cars for 50 years and still do the job for new Corvettes. The Motus is, in crude terms, half a hot rod V8. 'Our V4 is very automotive, very American,' says Brian. 'It's an all-aluminium block made from 20 castings, every one of which we designed and had made in the US.'

> 'Your sports tourer sounds like the General Lee at full boot-legging chat'

So with a promising idea, Brian and Lee had to get the pushrod engine to make serious power. Fortunately, hundreds of engineers had spent the last half century doing that with NASCAR engines. By partnering with Katech, who develop motors for Chevrolet, Motus found the knowledge they required.

The Katech engineers then borrowed ideas from the bike world, the main one being the firing order. Instead of firing evenly across all cylinders like a traditional V8, the Motus is a big bang engine like the Desmosedici. The uneven firing order theoretically gives better grip but the main advantages I noticed were the gutsy low frequency vibration that makes you feel like you're riding something unsanitised and edgy (this is no sewing machine), and the gorgeous off-beat exhaust note.

At low revs this manifests itself as a slightly menacing, deep throated gurgle with a background rattle (apparently this is the torque absorber plate Motus had to fit to stop the engine breaking everything it turned. Once under load, the rattle disappears). As revs build the gurgle turns into a roar and by 6000rpm your sports tourer sounds like the General Lee at full boot-legging chat.

While developing the engine with Katech, Brian and Lee were also getting on with the frame, gearbox and other such details. For bespoke manufacturers such as Bimota, NCR and Vyrus, that is the entire job, and no simple one at that. But for Brian and Lee it felt almost easy. 'All the other components might seem like the daunting tasks, but for us the engine superceded everything.

Doing our own engine was way more difficult than we could have anticipated. Jobs such as finding headlights and switchgear were relatively easy because we spent years developing the motor and by the time that was done we had found all the parts we needed.'

Back on the road I'm trying not to get distracted by the engine and concentrate on everything else. The Brembo brakes are just the right side of fierce, the Sargent saddle feels promisingly comfy with loads of room to shuffle about, and the riding position is surprisingly upright. Because of the semi-sporty look of the bike I was expected a semi-sporty crouch, but it actually can't be far off a GS riding position. If you want more weight on the front you could of course adjust the Helibars which come as standard and allow you to move the 'bars in every direction.

The ride quality is that of a well-sorted, Öhlins-suspended sports tourer – it's a bit firm if the road surface is dreadful, and perhaps a bit soft if you want to ride it like you stole it, but for everything else it's a delight, with a light, frisky feel once above walking pace.

The clocks are good too, using a remarkably info-laden LED screen which shows all the usual stuff plus everything from engine load (as a % of maximum) to service minutiae. Niggles? The paltry steering lock can catch you out if you're not prepared, the low rpm judder might irritate some riders, there's no option to have ABS or traction control (see box-out) and the frame welding visible below the yokes looks snotty compared with the rest of the finish, but apart from that it has the well considered feel of a production bike from a high-volume manufacturer.

At £23,300 ($30,975) for the MST and £27,800 ($36,975) for the MST-R, these are expensive motorcycles. But whereas some bespoke bikes make you wonder what you're paying for besides exclusivity, it's very clear what your money gets you here: the nine years it took Brian Case and Lee Conn to create one of the best road bike engines in existence. American VFR? Definitely. ***Bike***

SPECIFICATIONS	MOTUS MST (MST-R)
Contact	motusmotorcycles.com
Price	£23,300 (£27,800)
Typical finance	n/a
Engine	8-valve OHV push-rod V4
Bore x stroke	88 x 67.8mm
Capacity	1650cc
Transmission	6-speed, chain
Power	165bhp @ 7750rpm (180bhp @ 8400rpm)(clmd)
Torque	123 lb.ft @ 5000rpm (126 lb.ft @ 5000rpm) (clmd)
Frame	steel tube trellis
Front suspension	43mm telescopic fork, adj. preload, comp, rebound
Rear suspension	monoshock, adj. preload, comp, rebound
Brakes (f/r)	2 x 320mm discs, 4-pot calipers/200mm disc, 2-pot caliper
Rake/trail	26°/93.5mm
Wheelbase	1470mm
Wet weight	230kg (clmd)
Seat height	810mm
Tank size	21 litres
Economy	44mpg (est)
Top speed	158mph (168mph) (clmd)
Electronics	none
Colours	strong White, Carbon Black, Desert Bronze
Availability	now

***Bike* verdict** The 1650cc Motus V4 is a phenomenal creation and makes the MST a hugely entertaining sports tourer. The price and lack of electronic options will dent its appeal but it's still a remarkable effort.

***Bike* rating**	**8/10**

'The ride quality is that of a well-sorted, Öhlins-suspended sports tourer... it's a delight, with a light, frisky feel once above walking pace'

'WE'VE DISCOVERED ANOTHER BUSINESS'

Though Motus set out to be a motorcycle manufacturer, the performance of their engine has led to a whole new revenue stream: crate engines. The motor's size, output, reliability and Americaness has led to sales to kit car builders, ATV manufacturers, classic car enthusiasts wanting to pep up their MGBs and even jet boat builders from New Zealand. 'We weren't expecting any of that,' says Brian Case. 'But it looks like it's going to be a big part of our business.'