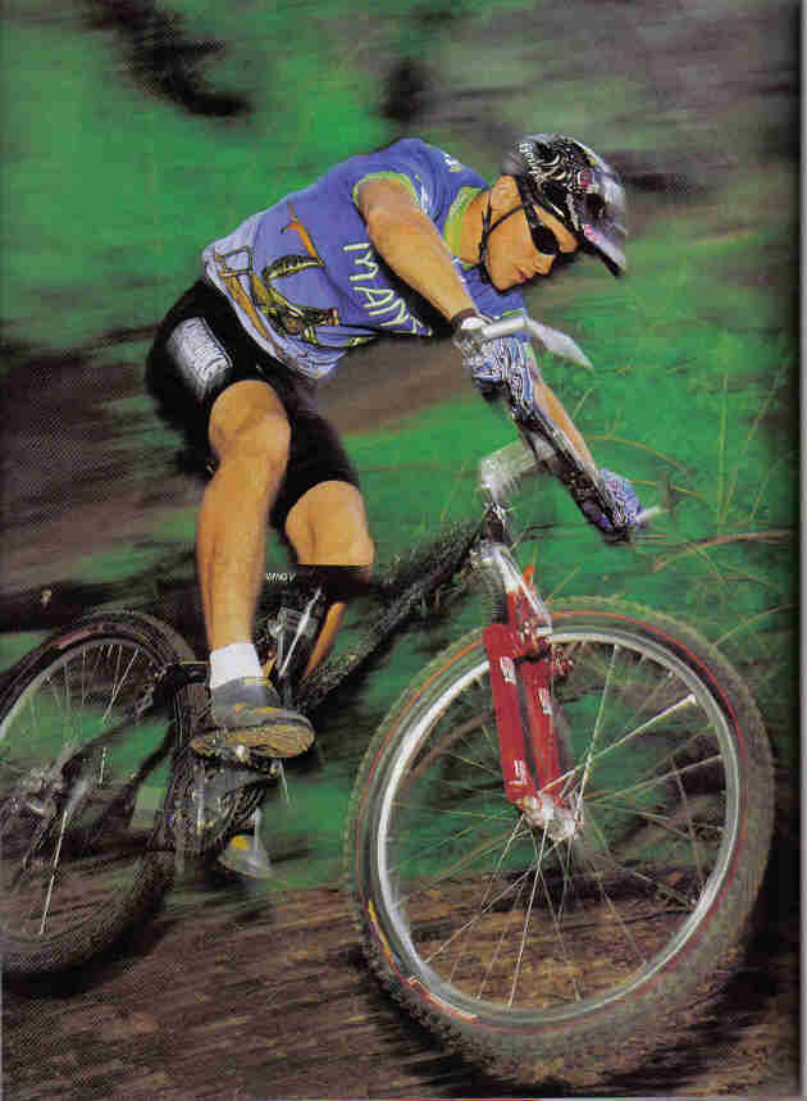


MANTIS SCREAMING V

Fantastic thermoplastic Mac-strut

When Yeti introduced the first thermoplastic composite frame to the fat-tire world in '84, few industry whiz types had a clue about how promising the new material would be. We are just now beginning to discover that thermoplastic carbon fiber frames offer strength, impact resistance, light weight and fatigue resistance that surpass all the mystery-metals and wonder-weavings that mountain bike builders have been raving about. Pat McIntyre, however, was clear on the concept from the start. Pat and a couple of his friends purchased a small, innovative framebuilding company with the primary intention of fielding the first all-thermoplastic, full-suspension bike—the Mantis Screaming V.

The task of developing a frame with this new technology would be no picnic—starting from ground zero with a new material is an expensive and time-consuming process. If successful, the payoff for Mantis would be a big lead on the rest of the mountain bike manufacturing pack. Everyone is searching for the secret recipe for a top-performing, full-suspension bike with thrash-and-bash reliability. Now, after nearly two years of development and testing, the Mantis Screaming V is ready to fly. Of course, the folks at Mantis delivered the first production bike directly into the hands of the *MBA* wrecking crew.

INTRODUCTION TO THERMOPLASTIC

To understand the basics of thermoplastic composite construction, think of bundles of fine fiber (like synthetic yarn) woven into loose cloth. Some of the fibers are nylon-like plastic, the rest are usually graphite (carbon). The cloth is shaped and fitted into a frame mold. Pivot points, brake bosses and other metal parts are threaded through the loose cloth and into receptacles in the mold halves. The mold is closed, then the cloth form is pressurized from within and heated until the nylon fibers melt into a liquid and mix with the carbon fibers. The result is a one-piece monocoque frame that is tough, light and corrosion-resistant. One of the benefits of this method of construction is that extra layers of fiber can easily be added or subtracted in critical areas to adjust the strength or weight of the frame components.

A LOT TO SCREAM ABOUT

Mantis penned the Screaming V as a cross-country bike from the start. It chose the now-classic, interrupted-seat-tube, MacPherson-strut design because it's the simplest, lightest form of active rear suspension. Optimum construction techniques for molding thermoplastic composites favor monocoque construction. The V's futuristic profile utilizes different wall thickness and box-section configurations to match the load requirements at the steering head, seatmast and bottom bracket areas. Full-length cable housing is routed inside the monocoque—and through the hollow swingarm and compression strut to the brakes and derailleurs. Another reason for the design is ergonomics. At 28.5 inches above the ground, the Screaming V's dropped top tube records one of the lowest standover clearance figures of any 18-inch mountain bike—fully suspended or not.

Component-wise, the Screaming V was a customizer's bonanza. Up front, it sported a Rock Shox twin-cartridge Judy DH fork on an alloy SL crown. Critical Racing furnished the seatpost, cantilever brakes, CNC-machined stem and handlebar. Shimano's XTR fleshed out the drivetrain with GripShift's X-Ray twisters on the handlebar. Avid's levers clamped the V's Mavic rims. Specialized Team Edition tires and White Industry hubs filled out the V's rolling stock. Test riders thought its ten-degree Critical stem was a mite too tall and wished for a five-degree-rise unit for a better ascending position over the bike. Otherwise, testers felt right at home in the cockpit. There was plenty of room fore and aft, and its classic 73-degree seat angle was well mated to a 70.5-degree head angle. In short, the Mantis felt comfortable in both its handling and pedaling wards.

SCREAMING SUSPENSION

Cross-country suspension travel seems to be settling in at three inches. The Mantis has a bit more than three inches of rear wheel travel and was well-matched to its three-inch-stroke Judy DH fork. To keep the rear suspension active, the Screaming V uses a MacPherson-strut suspension complete with a Horst Link. The swingarm pivots about two inches above the bottom bracket center, which is about perfect for an active system. Actual suspension duties are aptly handled by an adjustable Noleen NR-3 piggyback shock, which has been modified with a larger-diameter, 10mm shaft and twice as much bearing overlap to accommodate the lateral loads that are inherent to Mac-strut shocks. In the Noleen tradition, our shock was smooth as silk—and spot-on for our test staff's average 150- to 165-pound weight.

Balanced suspension is extremely important for monkey-motion mountain bikes. We were concerned that the Judy's elastomer stack would not match the supple performance of the coil-over Noleen shock. Our fears proved to be unfounded. The Manti-men had installed White Bros. coil-springs in lieu of the Judy's stock MCU stack. Smooth-acting fork! We set the Judy's compression cartridge one click in and the rebound four clicks in. This setting delivered a limousine-like ride from White's "light" spring rate with minimal preload.

In action, we found the V to be very supple. First-time full-suspension converts will probably find the Mantis to be too supple under power, but second-generation monkey-motion owners on our staff liked the V's terrain-following prowess. Although the bike's wheel travel checked out at three inches, it felt like five in the rough stuff. The trick? Speed-sensitive damper valving and proper set-up. We can thank Noleen's expertise in the rear and Rock Shox for adding a second damper cartridge to the DH.

SCREAMING ON THE V

Was the thermoplastic monocoque laterally rigid? Did the Mantis bob on the climbs? Could a Mac-strut compete with the newly emerging crop of rising-rate linkage-suspension bikes? Was the V light enough to be raced in cross-country events?

First, we ground the V up a long ascent. It was stiff under power and had the soft feeling that's common to active rear suspension when the rider is hammering out of the saddle. Under maximum efforts, we could sense some flex in the

MANTIS SCREAMING V

Frame type: Carbon fiber thermoplastic monocoque frame compression strut and swingarm, interrupted seat-tube MacPherson strut design.

Frame geometry: Size tested—18" (med); top tube—23"; wheelbase—42.5"; chainstays—16.625"; bottom bracket height—12.5"; head angle—70.5°; seat angle—73°.

Fork: Rock Shox Judy DH; coil spring/oil cartridge damping.

Fork travel: 3"

Weight: 25 lb.

Sizes available: S, M, L.

Components (as tested): Front derailleur—'95 Shimano XTR (bottom pull); rear derailleur—'95 Shimano XTR; shift controls—GripShift X-Ray; crankset—'95 Shimano XTR (26/36/46); hubs—White Industries (front and rear); cogs—Shimano XTR (12-32, eight-speed); wheels—Mavic 217, 13/18-gauge spokes, alloy nipples; tires—Specialized Team Edition 2.0" (front and rear); stem—Critical Racing (135mm extension/5° rise); handlebar—Critical Racing; brakes—Critical Racing; saddle—SDG Kevlar, Ti-rail; seatpost—Critical Racing (26.8); goodies—Chris King threadless headset, internal full-housing cables, White Brothers Judd springs, independently adjustable brake arms, Ti-bottom bracket.

Price: $2300.

Contact: Mantis Bicycle Co., 719 W. Woodbury Rd., Altadena, CA 91001; (818) 296-1051.

Similar, but not the same: The Screaming V's Horst-link MacPherson strut suspension follows the cross-country-proven abbreviated-seat-tube design to a "T." Noleen developed a Mac-strut-specific NR-3 shock for Mantis to handle the V's lateral stresses and rigid compression strut attachment. ►

rear section. How much flex? The Mantis was less rigid than the Pro-Flex 856 and on par with AMP's B-4—the top Mac-strut contenders this year.

On the second series of tests, the V developed an annoying creak in the bottom bracket area. What sounded like a major disaster turned out to be a loose bottom bracket retainer. We were reminded that hollow monocoque frames are like violins—use Loc-tite or anti-seize thread compounds on all fittings or future Manti-mankind may suffer similar ills.

In technical ascents, this bike climbed like a goat—assisted by its supple rear end and aggressive Specialized Team Edition treads. During long, steep bouts

◄ Sailing into the future: Mantis took the plunge and chose thermoplastic carbon fiber to construct its flagship Mac strut suspension bike. Tough and corrosion-proof, the Screaming V's composite monocoque frame is manufactured in a joint venture with GT Bicycles.

ALL ABOUT THERMOPLASTIC
HOW TO MAKE A SCREAMING V

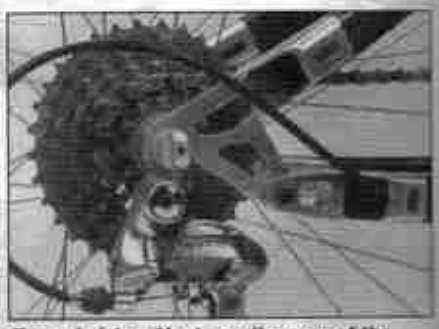
• So, what's the bottom line with this thermoplastic stuff? Isn't carbon fiber old news? Not really. Most composite frames are constructed from thermo*set* material that uses the same types of fibers (carbon-graphite, Kevlar and some high-strength glass) glued together under heat and pressure with a form of epoxy-type resin. "Thermosets" require more intensive construction techniques and, in addition, tend to fail catastrophically (like a wooden structure) when stressed to failure. Nylon-based thermo*plastic* composites bend, rather than break when they give up the ghost, making thermoplastics a far safer framebuilding material than other composites—and most metals as well. In addition, molding bike frames from thermoplastic materials is far more simple and cost-effective.

The Mantis Screaming V's thermoplastic frameset begins life as nylon and carbon threads about the same consistency as the cheap acrylic yarn that your grandmother knits with. The "yarns" are interwoven together in various configurations. The cloth is oriented to align the fibers in the directions the frame will be stressed, cut into patterns and placed into a mold where the layers of fiber are heated until the nylon melts and commingles with the carbon strands (thus the name "thermoplastic"). Tubular rubber bladders are pressurized inside the layered "bag" to force the cloth against the walls of the mold. When the nylon and carbon have become a contiguous structure, the mold is cooled, the bladders are deflated and removed, and *voila*—a monocoque frame is born!

All is not ease in Oz, however. A suspension frame needs pivot points and shock locations. Machined alloy hardpoints are molded into the frame at key locations. Because nylon will not bond to most materials, the alloy fittings are designed to interlock with the thermoplastic composite. This interlock design is the reason for the slot-shaped windows in the frame's dropouts, brake bosses and shock mount.

Don't get too excited about thermoplastics if you are a weight fanatic, though, because, like Mantis, most companies that are using the new material are fudging on the conservative side of the weight spectrum. Expect thermoplastic framesets and components to weigh about the same as their light aluminum counterparts. In the near future, though, thermoplastic mountain bike components will be coming into their own. Watch out all you Ti-guys! •

The secret of my success: Alloy-reinforced "hard points" are molded into critical junctions. Pairs of slots in this shock mount allow the thermoplastic composite material to flow into the spaces and lock the fittings into the nylon/carbon fiber matrix.

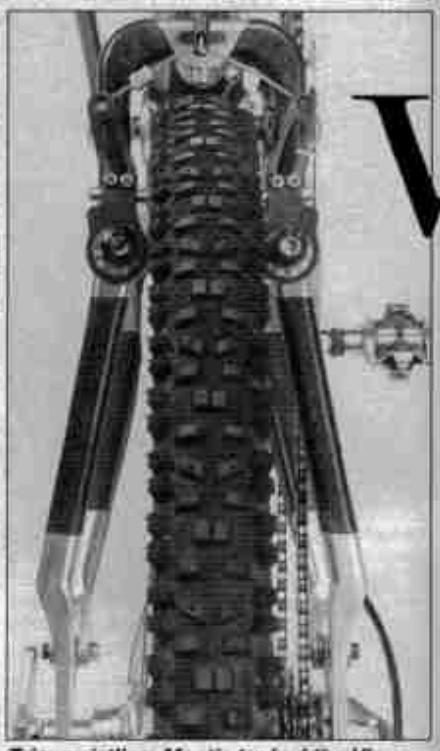


Tunnel vision: Vents on the rear of the swingarm and compression strut function as the ports that the inflatable bladders are inserted into during the molding process. Mantis took advantage of the hollow construction and routed its cables internally whenever possible.

in the saddle, we would have preferred a lower stem. The Mantis handled all types of uphill treachery with aplomb—except short, explosive, out-of-the-saddle efforts. Unless Mac-strut suspension is set up on the too-stiff side, or has a damper lockout device, its suppleness will confound most powerhouse riders with poor sprinting form.

In general, we liked the Screaming V's dirt-worthiness. It held a line well—so well that it wouldn't tolerate sloppiness at the handlebars on the rider's part. This bike would actually go where it was pointed—even if it was pointed in the wrong place. Equipped with its aggressive Specialized treads, the Mantis was a secure corner carver. Its ability to hold a line was a singletrack asset, and in high speed situations the V's neutral steering in a slide made scorching fire roads a no-brainer.

Stopping the V wasn't as inspirational. While its Critical cantilever brakes were good stoppers, the bike's supple suspension provided more traction than the V had stopping power. Test riders found themselves overcooking the corners on



Trim waistline: Mantis tucked the V's seat stays and chainstays well away from the path of the rider's heels. The V's dropped top tube and narrow rear end made the bike very user-friendly in technical situations.

the singletrack section of the *MBA* downhill. We liked the low profile, light weight and adjustability of Critical's latest cantilevers, but we would choose the brand's longer, heavier and more powerful caliper arms (see Giant 890 test, March '96).

Would the Screaming V be a good downhill racer? Not really, nor was it intended to be such. The V's thermoplastic frame, suspension travel and geometry make it fun as a descender, but a true downhill machine would need to be more robust, have a longer wheelbase and a couple more inches of wheel travel on both ends. In its intended role as a raceable, cross-country mount, the screaming V is very worthy.

MBA RATES THE SCREAMING V

MBA's suspension lovers were happy with the Mantis' Noleen-equipped, active rear end. Our last hardtail holdout whined about the bike's "too-supple" suspension. This is a second-generation full-suspension mount that will satisfy anyone who is looking to trade up from a semi-active (or demi-active) old-fashioned suspension bike to the real world of monkey motion. We would equip the V with more suitable brakes, and recommend a fork with performance similar to the V's White Bros.-sprung Judy DH. The V's finer qualities would be lost on gravity-head aggressive descender types, but racers and back-country hammerheads will like this bike. *MBA* gave the Screaming V a "very good" for its bump-leveling suspension and secure handling in the rough stuff. ❑