full SUSPENSE

Last month we brought you the ins and outs of full suspension design. Now BRANT RICHARDS gets various other people to test the bikes for him, while he's still in plaster. Pics by STEVE BEHR

I really thought this was going to be the ultimate cushy test: lots of high-end suspension bikes, the weather getting groovy, lots of free time. Ah well. A broken wrist meant I only got to hammer a couple of these, the rest of the reviews relying on input from other trustworthy testers. Big thanks to Matthew Dawson (Pace's chief fork builder), Pete Tomkins and others too numerous to mention.

We gathered together a number of the suspension bikes available in early spring. We rode most of them hard, some of them really hard, and a few a bit too hard.

It's not really worth evaluating the bikes the way that we normally do in the bike test, as so many are available just as framesets or with different component groups. For these purposes, we just looked at handling (including suspension action), build quality, braking and value. Things like gears, wheels and tyres weren't looked at hard. Here's what we found.

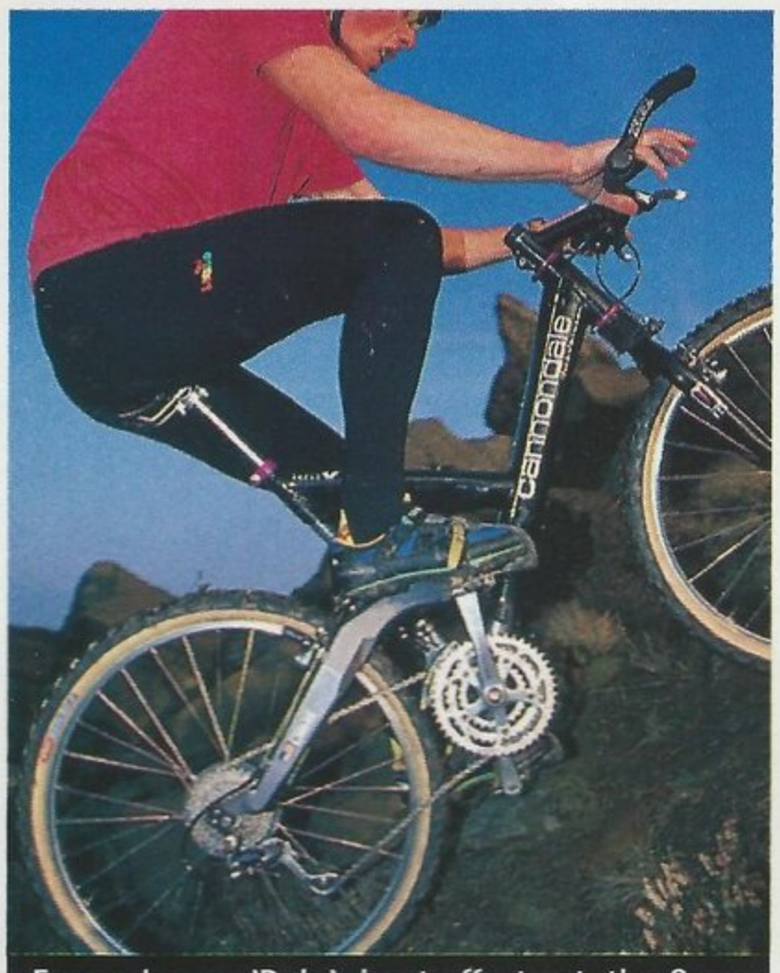
CANNONDALE SUPER V

Cannondale's previous attempts at rear suspension haven't met with acclaim from me, but it didn't take long to see that the Super V was as far removed from their first frames as it could be.

Suspension has brought about innovations in frame-building as a result of the necessity to mount shocks, pivots and linkages on a bicycle frame. Nowhere is this more noticeable than the *Super V*. No double diamond frame here; one massive tube links headtube to bottom bracket, with the swingarm, seatpost and other important bits hanging off it.

Frame

Using a fat tube with a thin wall **Cannondale** get a backbone to work from. The seat tube is supported by a large diameter aluminium tube, with two small diameter braces keeping it from sagging. The shock is mounted to the underside of this tube. Up front is the latest incarnation of the *Delta V* fork, running a single shock design on needle bearings with air springing and oil damping. The compression damping is adjustable while riding; the rebound damping isn't.



Far and away 'Dale's best effort yet, the Super V handles all conditions well.

The heart of the Super V is an excellent, well-controlled Fox shock unit.

Rear shock

The **Fox** shock fitted is such a cool unit that it's definitely worth a mention. It uses a large diameter tubular shock shaft, much bigger than we're used to seeing, which gives the shock excellent rigidity. A benefit of bigger shocks is that they move more oil, take more air, and hence are easier to tune. Unlike previous air shocks for the back end of bikes, the **Fox** unit takes a pressure that is attainable with a floor pump, at around 100psi. Unfortunately, access to the shock valve is difficult – the valve just isn't in the right place!

Brakes

Using the latest incarnation of the *Force 40* brakes, **Cannondale** seek to stop the bike quicker and with less effort than standard cantilevers. Rocker brakes are fine when they're in the workshop, but they are super-sensitive to cable stretch and slip, pad wear and maladjusted spring tension. These were no exception. Though they did stop the bike, we'd give up some stopping power if they worked well all the time.

Front suspension ride

I've never actually spent much time on the front fork before, and initial impressions were good. The adjustable damping is only of benefit to road riders, and worked best for us when it was one-and-a-half turns of fully on. Tracking was excellent, the two blades being one welded unit certainly improved steering control over some wobbly telescopic forks. The biggest problem was the repeated top-out of the fork, with a metal/metal clunk. The addition of a top-out bumper would smooth things considerably. We're fans of running suspension as soft as possible to get its full benefits; if it's not bottoming out occasionally it's too hard! Though the fork compressed on the climbs, it paid back by isolating the trail well, and felt much in harmony with the rear.

Rear suspension ride

Though the rear swingarm is a one-piece welded unit, in true motocross style, the placement of metal in the unit leads to problems. Sure the front of the swingarm is nice and boxy, with plenty of support for the shock, but get to the back and the stays get pretty thin and spindly. This is necessary because the frame needs to clear the chain and sprockets, but it could have been improved by cantilevering the dropouts from above, rather than in front. This lack of metal leads to noticeable twisting of the swingarm under torsional loads, particularly noticeable on rock and root-infested single track. The large box section means you can bash your ankles on the frame during tricky moves, but it's not bad. The pivot point is mounted fairly high, which on the trail means it does lock out under those really hard moves, and is definitely out of the truly active zone, entering the lock-out region. With loads of travel in the back, the shock soaks up the big hits well. On repeated bumps, the rebound damping proves too much for the system, with the shock pumping down and getting wallowy. Less damping, giving a faster rebound, would improve this no end.

The highish pivot means some lock-out under hard pedalling, but it works most of the time.

Overall

It's the best **Cannondale** suspension to date, excelling for downhill racing and general recreation play-riding. It's a very noisy bike, with the swingarm in particular giving lots of noise because of the cables, chain, stones and other bits bouncing off it. But hey, it's a great bike; a first choice for downhilling, and good for hardcore slamdunk play-riding.

CANNONDALE SUPER V

Climbing:	●●●●●●●●○○
Descending:	●●●●●●●●●●
Single track:	●●●●●●●●○○
Overall:	●●●●●●●●○○

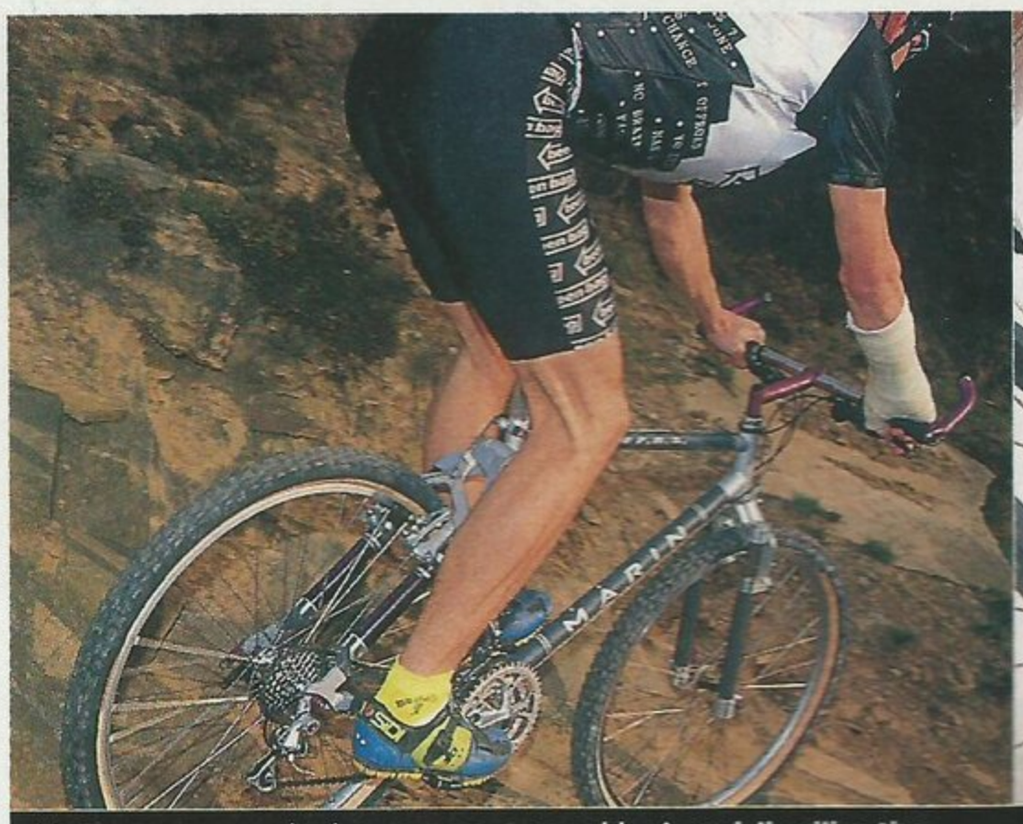
Price: £2,450

From: Cannondale ☎ 010 31 5410 22772

MARIN TEAM FRS

Using the Manitou design, Marin are entering the full suspension market for the first time. Manitous are some of the finest examples of mountain bike art in the world, whereas Marin just make excellent production bikes.

Testing wasn't without its problems. The first bike shipped to us had incredibly hard elastomers fitted, resulting in minimal suspension movement. When the softer elastomers arrived, we found that the rear swingarm had a crack appearing in it! Then, casually front-wheelying down the pavement, I got thrown off the front and broke my wrist! Argh! Another back end arrived, which then wouldn't fit, then another bike turned up. Here's what we found out about the two-and-a-half **Marins** we tested.



Not recommended, even on a good boingy bike like the Marin, is riding with a cast on your arm.

The FRS back end is basically a re-positioned Manitou fork.

Frame

The *FRS* is a very clean looking frameset. No extra tubes in the front triangle, the suspension pivots just behind the bottom bracket. Using a simplified fork on the seat stays, the **Marin** offers lateral strength but using aluminium stanchion tubes means less weight. The elastomers are changed by popping the caps of the rear fork and using a long allen-key.

All the pivots on the *FRS* are tubular running on hardened steel, on plastic bearings in aluminium locators. They're easy enough to knock apart and require minimal maintenance.

Rear shock

Using the same elastomers as in the front fork, **Marin** allow quick and easy changing of the suspension qualities of the bike. The seat stays are essentially the same as the fork, with twin sliders and stanchions as well as a drastically machined 'crown'. Pivots are located above the dropout, at the bottom bracket, and at the seat cluster. With the brakes mounted on the sliders of the fork, the relative position of the brake blocks to the rim actually moves during braking. This should mean braking would tend to stiffen the suspension, but it's not noticeable.

The FRS's rear end features some of the nicest CNC machined parts we've seen.

Brakes

Using stock *XTR* brakes, with their hulking great blocks, the *FRS* slows down well. Some bikes suffer from rear brake flex, but not the **Marin**; the big fork brace keeps everything in line. With no extra bits of leverage, the **Marin** doesn't have better braking than a well set up rigid bike, and with the speed increase that full suspension brings, it's in need of more stopping power when the going gets gnarly.

Front suspension ride

We've spent considerable time on **Manitou** forks over the last couple of years. This was different to any other we'd tested, with an even, suppler action. With the big lumps of alloy holding everything together, the tracking is great, and the action of the fork with these soft rubbers begins to show the limitations of some elastomer systems. The increased loading that it's possible to put on the fork because of the rear suspension means you're starting to push the solid elastomers out of the edge of their performance window. Initial action was supple, but towards the end of the stroke the rising rate meant the performance was muted at high loads. We attained 1.25in of travel. **Manitous** don't bottom out, the action just gets stiffer until they don't move anymore.

Rear suspension ride

The elastomers in the rear have a rising rate, stiffening as travel increases. However, the elastomers in the rear were so hard to start with that it was some feat to get any travel at all. Under extreme situations, the suspension managed to squish about 0.5in on the stays, giving 1in at the rear wheel. We were beginning to get an idea of what this bike was for. It only works on the big stuff, and then only took the edge off the big bumps rather than eating them up. As a result, there weren't any significant ill-effects of chain tension, the swingarm did not really swing far enough to counter the effects of the suspension. With the soft elastomers, under hard acceleration the system dropped the back of the bike, the elastomers absorbing some of the power load – an inherent problem of the low swingarm pivot design that ensures the suspension can work all the time. The elastomers still stiffened up pretty quick.

Overall

It's a great bike for general recreational riding, and has a suspension which gives solid performance without too many of the disadvantages. It hasn't got feet of travel, but works well in softening out the trail.

MARIN TEAM FRS

Climbing:	●●●●●●●○○○
Descending:	●●●●●●●●○○
Single track:	●●●●●●●●○○
Overall:	●●●●●●●○○○
Price:	**£2,250**
From:	**ATB Sales ☎ 0424 753566**

OFFROAD PRO FLEX 953

Offroad have been doing the rear suspension thing for years. They had at least a year on everyone else in the rear suspension stakes and were working on rider-suspension (Flexstem) before that. With new funky linkages, gas/oil struts and advertising hype for other bikes, you might forget Offroad. Don't! Offroad have more riders on more suspension bikes than any other manufacturer on the planet. We had a new 953 specially freighted in, the top-of-the-line for '93. Totally cool component specc-ing was order of the day here, with Gripshift, Shimano Ultegra rear mech, Ringlés, White Industries BB... way cool!

Offroad's vast experience in suspension bikes shows in the sophisticated yet simple design of the 953.

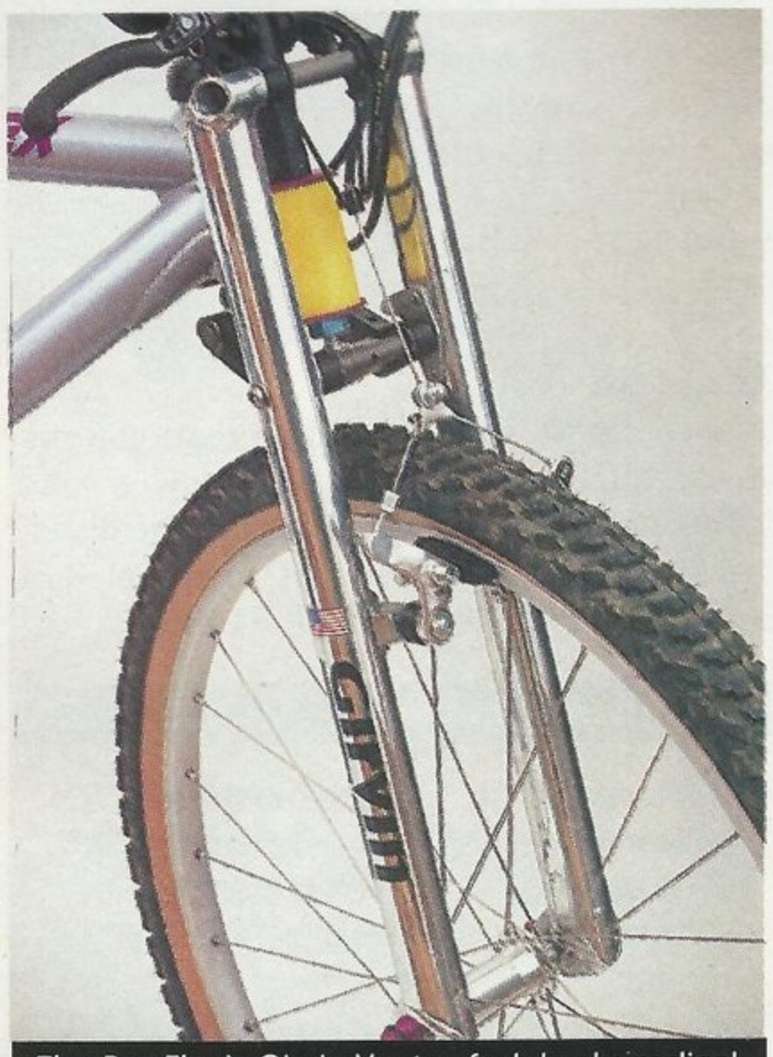
Offroad's pivot has lowered over the years, making for a very active back end.

Frame

Using double-butted 7005 aluminium in a chunky oversize format, the frame features great welding and a normal format, with a brace added for the swingarm pivot and a bracing tube positioned to take the elastomer unit. The swingarm location has dropped over the last couple of years, which reduces the torque reaction on the rear wheel. A good idea. The right swingarm is pressed to a box section through its radius bend above the bottom bracket, to stiffen up the power transfer. We're not convinced that it'll make much difference, but it does help.

Rear shock

A large diameter micro-cellular elastomer does the springing and damping in this system. **Offroad** have spent a lot of time with elastomer systems and have them pretty much sorted. This unit is tagged "Interdamp" and is adjustable for pre-load with unfashionable purple aluminium spacers. The seat stays do very little on the *Pro Flex*, just providing a strut to push the elastomer, as the brakes are mounted on the chainstays. It's simple. It works.



The Pro Flex's Girvin Vector fork looks radical and does the business.

Brakes

The front and rear brakes are **Dia Compe** *987s* and, while they are a nice little unit, they have dreadful brake pads which just don't work at all. At the back the brake is operated by a smart little rocker device. It increases the leverage and modulation slightly and gave a good feel to the rear brake. The front brake didn't work so well, probably because of its flimsy hanger. Better pads are essential.

Front suspension ride

Yikes! The **Girvin** *Vector* fork looks like no other, with huge aluminium tubes, double pivoting links and big elastomer bung. Not surprisingly, it works very much like a normal fork, doing what it should do, and keeping the bumps from blowing our cool. **Offroad** claim that by rotating the top link pivot forward, you can adjust the axle path of the fork at the start of the compression. Something to do with anti-pogo and J-shaped strokes.

We didn't notice much difference, but the fork worked well in all situations, soaking up the big stuff well and the little stuff very well.

Rear suspension ride

With a low pivot just above the big ring, we expected the *Pro Flex* to work superbly. It did! The suspension is barely affected by chain reaction, except in the little ring when some dig-in could be gained under extreme load. Because of the low pivot the action of the suspension under compression was extremely natural and didn't take any getting used to. It felt more like a bike that simply had very fat tyres and was soaking up the terrain. With 2in of travel, the suspension could become overfaced on the really gnarly stuff, and that shorter travel reared its head when you started to get really daft on it. But it's still light years better than no suspension and the extra problems of longer travel systems don't come into the equation.

For an elastomer system the damping was almost perfect; both on compression and rebound the springing felt great. It's perfect for race or recreational use, giving all the benefits of comfort and traction with few complexity and weight disadvantages.

Overall

It's almost perfect! Though you may complain about the lack of air/oil shocks, adjustable damping and nitrogen reservoirs, the thing that makes the *Pro Flex* (rear suspension) so fantastic is its simplicity. That front fork might look complicated, but it's easy enough to lubricate and adjust and that counts for lots. We're still sceptical about the wear in linkage forks... ask us in a year and I'll tell you what happens.

OFFROAD PRO FLEX 953

Climbing:	●●●●●●●●●○
Descending:	●●●●●●●●●○
Single track:	●●●●●●●●●○
Overall:	●●●●●●●●●○
Price:	**£1,895**
From:	**Ultrasport ☎ 0602 731001**

SBIKE 909 DOWNHILL

When National Veteran Downhill Champion Rob Kinsey tells you that a bike works, you really ought to take notice. It's a little hard to completely believe the facts he's telling you when he's also the UK Sales and Racing Team Manager for SBike. He wafted the 909 Downhill under our noses for a few brief seconds, gave us a quick spin on it, and then took it away again. Here's what we learnt in that short time.

Frame

SBike's frames have never impressed us. Engineered, I'm convinced, for form rather than function, the bike looks radically different from any other on the market. Its thin, deep box section main spar with other accoutrements welded off provides one-of-a-kind looks. Craftsmanship is good, with clean welding and well thought out tubing sections. The rear dropouts are particularly nicely executed and the large diameter chain stays support the rear end well. The pivot for the swingarm is a big diameter unit, doing a good job of holding the back end together, and the shock unit is mounted vertically up against the seat tube.

Rear shock

A steel sprung shock with adjustable oil damping is provided to do the suspending, and is produced by **Bitubo**. The cool bit here is the adjustable damping provided by a thumbshifter activating a shaft through the bottom of the shock. It's possible to adjust the damping from free-floating through to locked out, so the performance can be adjusted as you ride. It's the only bike on the market that has this type of true 'active suspension'.

Brakes

Two versions of this bike are available, one with *XTR* cantis and the other with *ProStop* discs, running on **Pulstar** hubs. The *XTRs* worked OK, but the rear cantis were compromised by the complicated routing around the seat tube and shock.

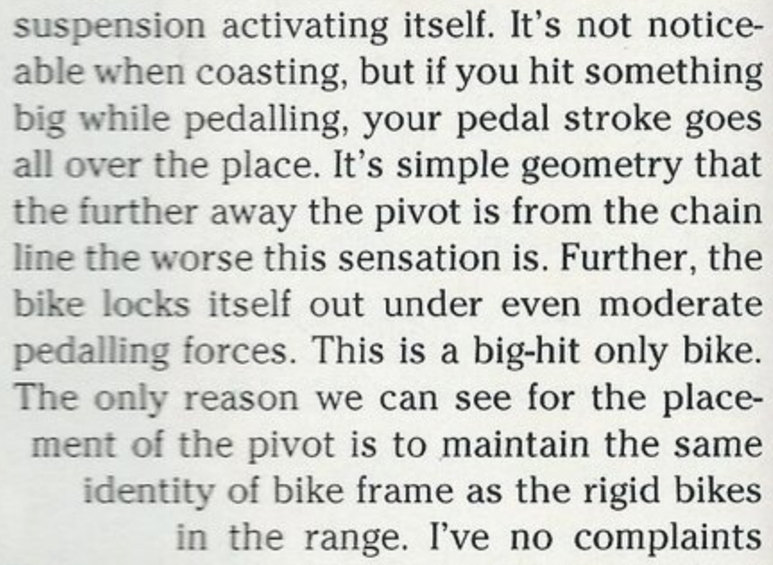
Front suspension ride

The upside-down elastomer fork runs cantilever brakes by means of a slot cut in the front of the stanchions. The cack is kept out of the bearings by a transparent plastic cover which slides on the outside of the stanchion. We are not so sure that water would be as keen to stay out, though. The action of the fork was smooth enough and the travel was good as well. Return was a bit quick, though, which led to a bouncy feel.

Rear suspension ride

With an incredibly high pivot point, the **SBike** rides the bumps like no other. Particularly noticeable is 'pedal feedback', where the chain tension causes the rider to feel the suspension activating itself. It's not noticeable when coasting, but if you hit something big while pedalling, your pedal stroke goes all over the place. It's simple geometry that the further away the pivot is from the chain line the worse this sensation is. Further, the bike locks itself out under even moderate pedalling forces. This is a big-hit only bike. The only reason we can see for the placement of the pivot is to maintain the same identity of bike frame as the rigid bikes in the range. I've no complaints about the rigid bikes standing out from the crowd, but when a suspension bike is designed function should take place over form. A pivot this high locks out under pedalling. Adjustable damping is good for fine tuning the ride though.

The suspension does a very good job of insulating the rider from the trail when it does work. The oil-damped shock with the steel spring and adjustable damping gives a consistent high performance.

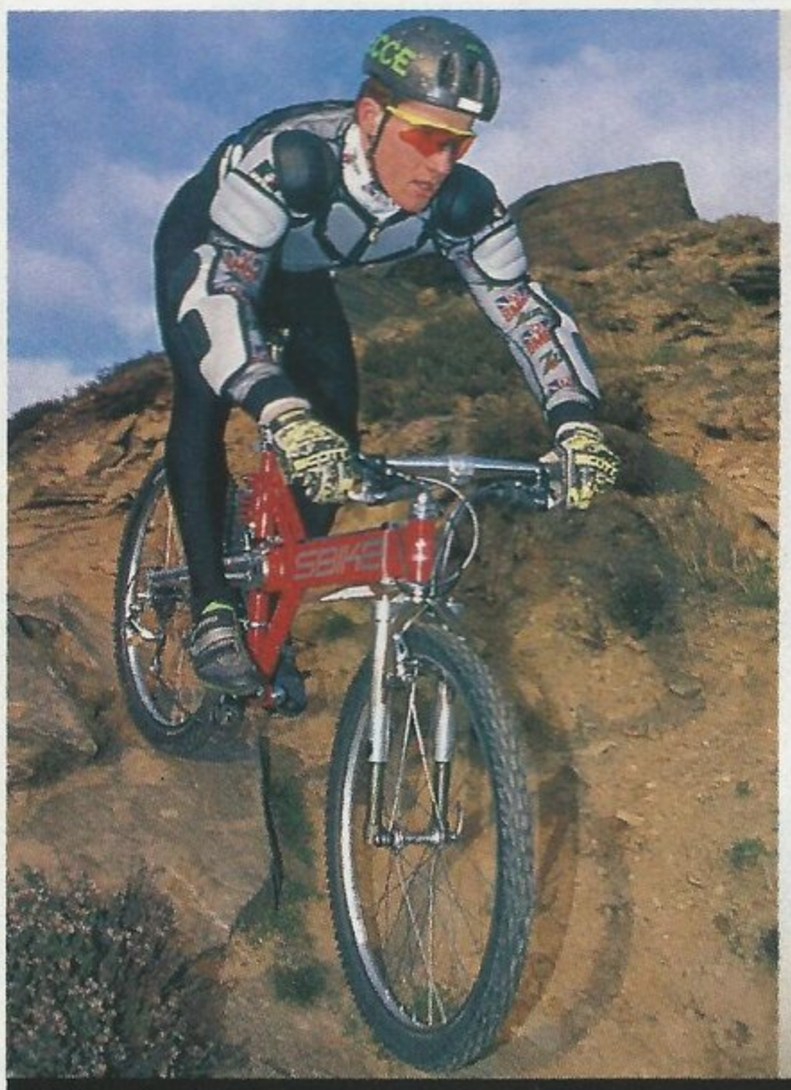


The high-pivot rear suspension soaks up the bumps, but also reacts to pedalling.

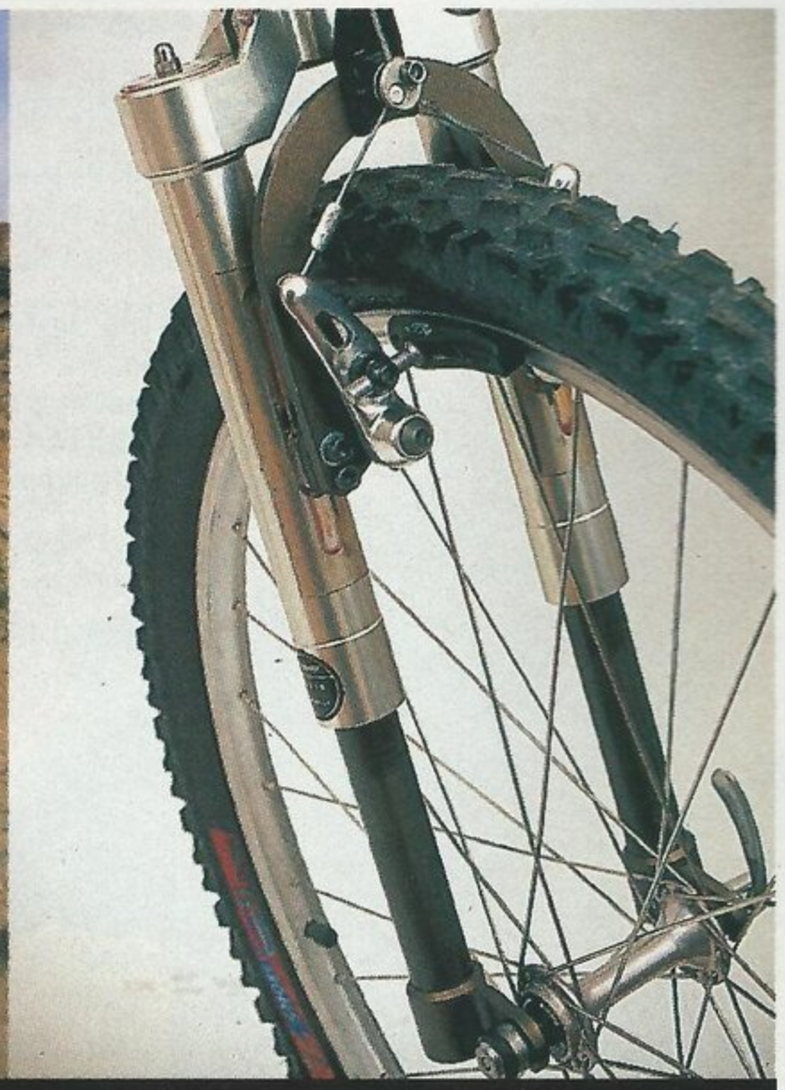
Overall

The all-up weight of the **SBike** was 29lb, which is heavy, but not really a massive problem for a downhill-only machine. The only problem that **SBike** will have is that there isn't really a market for downhill-only bikes in this country.

The only time that we would really expect to see any of these bikes out on the trail are when they are being used by the race team.



SBike's high pivot gets it a downhill-only tag from the makers. We agree.



Upside-down forks are rare on MTBs; SBike's works pretty well.

SBIKE 909 DOWNHILL

Climbing:	●●●●●○○○○○
Descending:	●●●●●●●●○○○
Single track:	●●●●●○○○○○
Overall:	●●●●●●○○○○
Price:	**£2,950**
From:	**Surfsales ☎ 0303 850880**

DIAMOND BACK DUAL RESPONSE

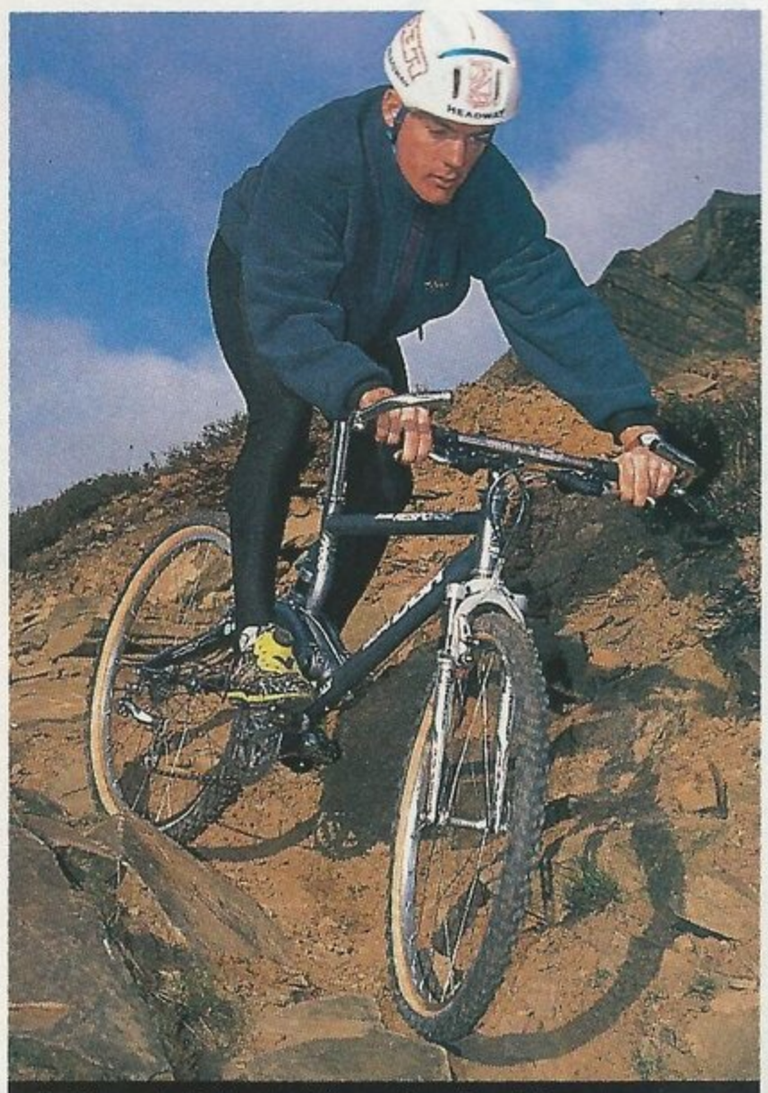
Quite a few manufacturers have gone to Verlicchi, the Italian builders of Dave Cullinan's World Championship-winning frame. So far back ends on Iron Horse, Haro and Diamond Back bikes use the company's engineering. They are linked to Marzocchi, the shock people, and have worked closely with them for several years. This bike is heading up Diamond Back's 'Racing' line, standing above their general bikes.

Frame

Using a similar frame to Dave Cullinan's World Championship-winning downhill bike, the *Dual Response* only differs slightly from Dave's original bike; the pivot point is moved from a ridiculously high position to one closer to the chain line, but still quite some distance above it. Shock mounting too is different from the **Iron Horse**, needing a funky, bent seat tube and cunning gussetry to hold everything together. Doing the lion's share of the work in keeping everything straight through the corners is the big pivot point, with thrust washers and radial bushings, bolts, castings and machining work. It holds the back end like a vice and probably weighs about as much! Quality of the frame welds is superb, with the finish being a stonewash blue hard anodising.

Rear shock

Marzocchi's air/oil rear shock bears a lot of similarity with the **Fox** shock running on the **Cannondale**. It's not quite as big and so, as a result, runs at a silly pressure of around 200psi. Thankfully **DBR** supply a pump for you to achieve this pressure but, get this, you have to take the shock out of the frame to pump it up! Stupid! Unbelievable! Fix this at once.



Cullinan's DH machine, the Dual Response nevertheless works in less vert rough stuff.

Brakes

With an *XTR* groupset the big pads do a good job at stopping the machine downhill, and in the rear more power is available for your use. A neat little brake rocker gives the brakes more power through the stroke with a clever bit of lateral thinking. Nice.

Front suspension ride

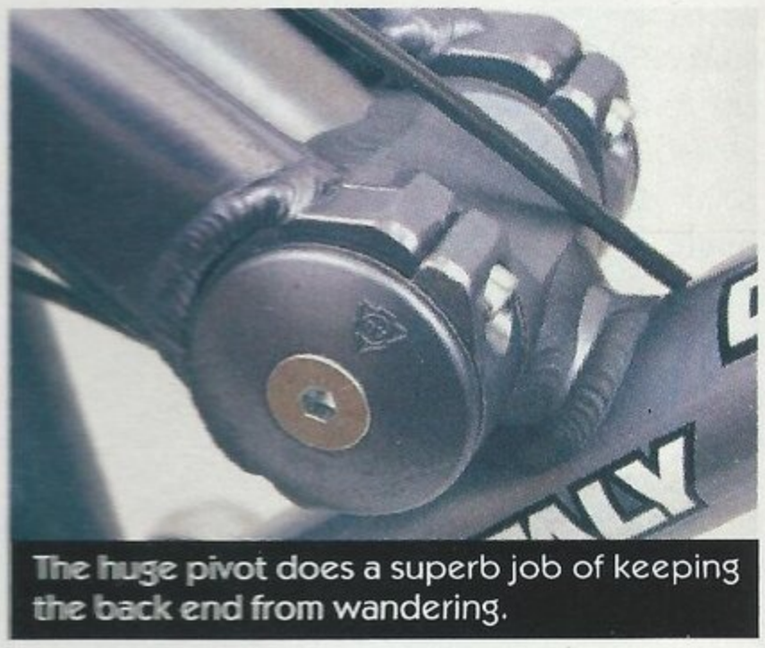
We know that the *XC400* fork is meant to be radically better than the old fork, but it still ain't great. Just the same as when **Rock Shox** lost a lot of the weight from their forks, **Marzocchi** have lost quite a lot of torsional (steering) stiffness. In the bumpy stuff it tends to wander; hit something hard at an angle and it will go skidding off chattering like crazy. It just doesn't have the torsional stiffness to hack it. A brake booster would sort the problem out, but it shouldn't have to be added to fix it.

The travel is very nicely controlled but with quite a lot of lock-out, which is brought about as a result of the air spring used. The rebound is really quick but at the same time is controlled, and gets the wheel to follow the terrain – but not so much that it leaps about like crazy.

To get at the shock valve you dismantle the rear end. A big problem which needs fixing.

Rear suspension ride

With a similar shock type, and an almost identical pivot position, the bike rode almost identically to the **Cannondale**. The pivot gives lockout under hard riding, but still lets the suspension work on the medium size hits. It all depends how you set the shock up. Without any sag in the shock, it works only on the big-sized stuff, but you can set it up soft and put up with the bobbing to get a comfy ride. Its pivot placement means that it's certainly more a big hit machine than a full-floater.



The huge pivot does a superb job of keeping the back end from wandering.

Though the shock certainly offers a great ride the majority of the time, the rebound damping is a bit on the heavy side, just like the **Fox** unit, so you can stack it over repeated big hits. You've only got just over 2in of travel, and so this can come fairly soon. It's funny because the front fork has a really quick rebound... Ah well, maybe next year, or maybe it's a Black and Decker modification!

Overall

Over the really hard stuff, the back end of the *Dual Response* just eats it up, but the fork can let it down when the going gets a bit twisty; a brake booster should fix this problem, though.

Another point against the *DR* is that you couldn't call it a lightweight, with it weighing in around 28lb.

DIAMOND BACK DUAL RESPONSE

Climbing:	●●●●●●●●○○
Descending:	●●●●●●●●●○
Single track:	●●●●●●●●○○
Overall:	●●●●●●●●○○
Price:	**£2,674**
From:	**Moore Large ☎ 0332 270047**

MONGOOSE AMPLIFIER

The brainchild of Horst Leitner, the Amplifier is a mass produced version of his own works AMP bike. A few corners are cut, but generally it's pretty much the same bike. Ours belonged to Pete Tomkins, bought on the proceeds of all his Crud Catchers. Being Pete's bike, he'd specced it with some interesting idiosyncrasies for his own style of riding... a super-wide 23in bar, no bar ends, high/long stem, low saddle, prototype DCD.

Frame

The frame features a few bits you don't normally see, such as double down tubes and more links than usual. The shock is in one piece with the seat stays, which are also connected to the rear dropouts, then pivoted before they join the chain stays. The pivot for the chain stays is just on the back of the seat tube, in line with the little ring. Workmanship is fantastic.

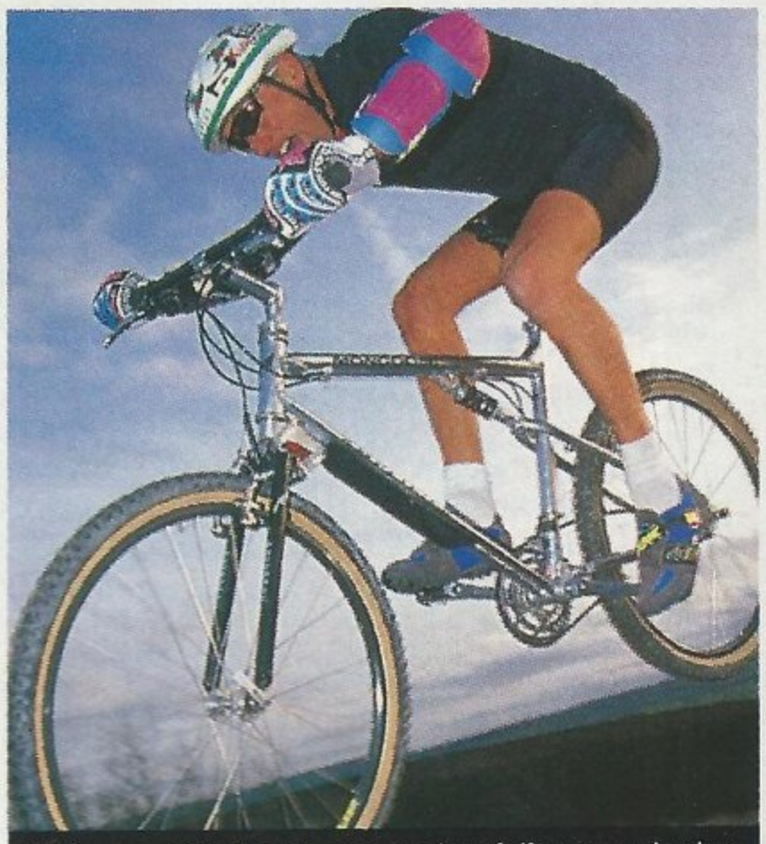
Rear shock

It's a little gem this. It can be stripped down in about 10 minutes, which Pete had to do initially 'cause it was leaking oil like a rusty Capri. The internals are very easy to work with, and with a minimal amount of technical knowledge the whole thing can be tuned. The springing is done with a steel spring on the outside of the shock body, with preload adjustable by turning the preload ring up the shock body.

Front suspension ride

This was the first time we'd played with the **AMP** linkage fork and, though it looked weird, it worked great. It's a combination of spring/oil and elastomer technology, the spring and tiny damper does the action for the first half of the stroke, the elastomer back-up for the last bit.

Because of the angle and length of the various links in the system, the blades don't travel like a telescopic fork; it's more of a rotation than a vertical travel. This means that on the trail the fork goes over obstacles better than a telescopic fork. At speed on the bumpy stuff it works more progressively than many telescopics, soaking up all the bumps, big or little.



This month's best suspension bike ever is the Mongoose, a truly great all-rounder.

Rear suspension ride

The suspension works all the time, keeping you comfy whatever you're doing. Because of the pivoted link at the seat stays the bike doesn't bob as badly as you might think for a long travel, low-pivot bike. Its pedal tension reaction and feedback are about the same as the *Pro Flex*, with the suspension barely activated when pedalling. Because of the low damping and soft springing of the frame it does tend to bounce around a bit if you try to ride it like a rigid bike, but if you sit down, shut up and spin circles it gets there in the end.

This thing's got more smiles per mile than anything I've ever ridden, giving a super-plus ride over the roughness of off-road.

The Amplifier's AMP fork works exceptionally well, better, in fact, than most teles.

Overall

This is great. It's the most active full-suspension bike we've ridden and definitely takes a bit of getting used to. It's got works looks, great performance, easy maintenance and it's light. If you want a full-floating suspension, this is the one for you. ✪

MONGOOSE AMPLIFIER

Climbing:	●●●●●●●●●○
Descending:	●●●●●●●●●●
Single track:	●●●●●●●●●○
Overall:	●●●●●●●●●○
Price:	**£1,100 F&F**
From:	**Hotwheels ☎ 0202 425744**

Maintenance and adjustment of the oil-damped steel spring rear shock is incredibly easy, and the configuration of the springarm means that it works brilliantly.

Which gets the ticket?

Which of these six bikes would most of us like to have? The Cannondale for downhilling, the Offroad if I had to spend my own money and buy one bike to do everything. However, for cost-no-object recreational riding Pete's Mongoose gets the nod. Way cool and with a truly works-all-the-time design, it's light years better than most of the others (except the Pro Flex) for all-round trail comfort.