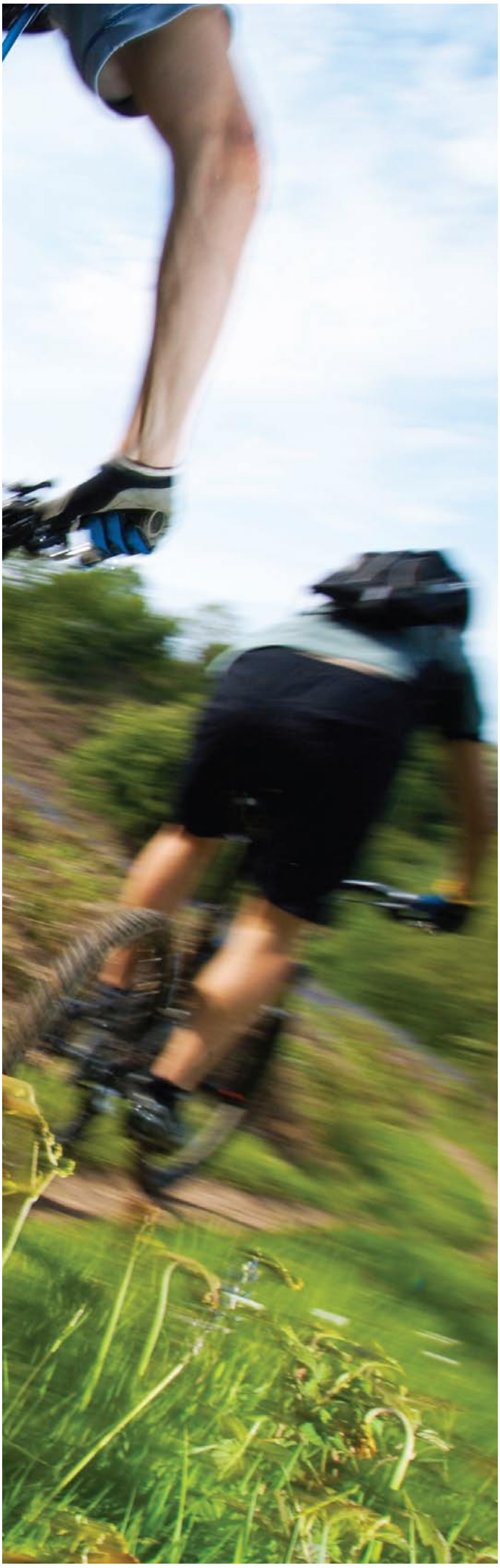
SHOCK TACTICS

Which full suspension bike is best for you? Find out with **Guy Kesteven's** guide to suspension technology and see what you could be riding in 2009



Pic: Seb Rogers

Full suspension is now becoming the norm – not the exception – on mountain bikes over £1,000. That's because it offers clear advantages in terms of off-road speed, control and comfort. But what do you really need to know about suspension and how do you choose the bike that will suit you best?

Why choose suspension?

Although suspension bikes aren't the ideal off-road machine for everyone, they offer masses of advantages for off-road riders As just the wheels – not you and the whole bike – move up and down in response to bumps, rocks, drops and dips, the tyres stay consistently connected to the ground. That means more grip for braking, cornering and traction in exactly the rough situations where it's most vital.

If you and the bike are suspended above the trail rather bouncing all over the place it's much easier to keep a smooth pedalling rhythm too. As well as being isolated from the continual buzz and rattle of the trail you won't be fighting with the bike and reacting to every small obstacle either. This means you'll feel far fresher for longer, and a full Sunday off-road ride won't leave you feeling murdered on Monday morning.

Suspension has come a long way in the last 20 years since the first basic, bouncy, overweight beasts appeared. However, after a decade of frenzied evolution from the early '90s onwards, recent developments have been evolutionary rather than revolutionary. There are occasional new radicals appearing, but overall the bikes you can buy now are detailed refinements of well-proven designs. That means you can buy better performing, more reliable suspension bikes, in a wider range of ride characters, from a wider range of manufacturers than ever before.

What sort?

If you've even skimmed the surface of the suspension subject you'll realise there is a huge amount of different types available. These vary from ultra-light race specials with 75mm (3in) of suspension travel right through to freeride, freefall bikes with up to 250mm (10in). More confusingly there are now lots of so-called 'All Mountain' bikes with 150mm (6in) of travel claiming to be as much fun going up as they are coming down. With a handful of exceptions, most of these long-travel bikes weigh at least 30lb (many are 35lb-plus), which we can assure you isn't much fun to haul up the last climb of the day.

Most riders will find an efficient cross-country (XC) or trail bike the best option, with 100-130mm (4-5in) of travel front and rear. It's enough to increase speed, comfort, control and overall capability significantly. These bikes are still light (between 22-30lb depending how much you spend), tight and agile enough to be fun on climbs and fine on road sections.

The key components

There are several key components on suspension bikes that are crucial to their overall performance.

Fork: Because suspension bikes let you hit rougher trail sections faster, fork performance is even more important than on hardtails. Air sprung forks are light and easily adjustable, while rebound adjustment (which controls the spring's return rate) is essential for tuning. Lockout of some sort can be useful for road sections too, so that you can switch the suspension off. As for brands, Fox and Rock Shox are dominant, with Magura and DT Swiss coming up on the outside rail.

Shock: Unsurprisingly the rear shock is vital to overall performance too. Again an air shock (preferably a Fox one) with

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Swing-arm: Orange Five Pro

£2259.95

The Five is a truly iconic British trail bike, mixing straightforward swing-arm design with sweet handling and handbuilt-in-Halifax practicality.

As a basic design it's been evolving for years too. The latest subtly curved designs are a far cry from its original slab-sided 'Mr XC' ancestry but the honed basics still provide a benchmark ride. The high-pivot rear suspension digs in under pedalling effort for a solid power kick, keeping you in touch with the trail for accurately metered traction in all conditions. Granted there's a bit of rattle and kickback over rougher stuff, but the latest Fox shock maximises control and small bump sensitivity while still cutting pedal bob.

Where the Five really shines though is its super-confident handling. It'll be a shock if you're used to an 'old skool' race hardtail at first, but the short stem and slack angles will turn you into the downhill demon you never knew you were. Add the latest screw-through 15mm oversized axle front fork from Fox and you've got a bike that'll take on the most evil Peak District or Lake District descents without a worry.

The simple design means massive mud clearance for winter use, easy cleaning when you get back and very low maintenance overall. Even better, Orange's Halifax paint plant produces the most durable coats in the business and you get to choose between seven standard colours and 11 custom hues (£100 extra).

Despite small volume UK manufacture and a frame and shock price of £1174.95, complete bike prices are more competitive than ever. Plus there are all sorts of custom build kit options to choose from too.

TECH SPEC

Frame: UK built monocoque/tubular alloy swing-arm frame.
Fork: Fox 31 Float R140 QR15
Shock: Fox RP23
Wheels: WTB rims on Hope Pro 2 hubs
Drivetrain: Shimano XT
Brakes: Hope Mono Mini
Contact: Orange 01422 311113, www.orangebikes.co.uk

SEE ALSO

Santa Cruz Superlight Trail £1799. 'The other' classic swing-arm bike, the latest Superlight is trail tough and almost telepathically communicative.

Cannondale Rize 4 £1999.99. Cannondale's latest trail bike uses a linkage-stiffened low-pivot swing-arm for simple, supple speed.

Commencal Meta 5.5.1 £1699. Another technical trail hooligan, the Commencal Meta family are bred in Andorra but perfect for aggressive riding anywhere.

adjustable rebound damping is ideal. Compression damping (which firms up the suspension) or lockout is useful on more active bikes.

Pivots and linkages: Whatever shock you have, the basic suspension character is defined by the location of the pivots that the rear wheel and shock move around and any linkages that join these 'dots'. We're covering the major systems later, but be aware that even small differences in pivot position and linkage length can make big differences in performance.

Bearings: Finally, nowhere in the world kills suspension bearings faster than our gritty little island. Unfortunately bearing quality varies massively and it's not price dependent either. On the plus side, most bikes are improving all the time, but 'lifetime warrantied' (i.e. free replacement) bearings are a definite bonus if you'll be riding big mileages all year round.

Suspension systems

There are countless proprietary names and acronyms for various suspension systems, but they all basically boil down to four types – each with pros, cons and variables to consider.

Swing-arm: The simplest type of suspension, swing-arms link the back wheel directly to the mainframe. This means fewer bearings to wear and fail. However, the suspension is affected directly by pedalling and braking forces.

Low-pivot swing-arms (main pivot anywhere within the circumference of the middle ring of the chainset) create the least pull on the chain as they move. This means smoother movement over bumps and less disturbance of pedalling rhythm on rough ground. They are more prone to bounce and/or squat during slower speed, higher torque pedalling, however, making compression damping or lockout crucial.

High-pivot swing-arms (main pivot forward and above the outer edge of middle ring) use chain pull to balance power-induced squat/bob for a firmer pedalling feel. Pedalling rhythm is more disturbed over rough ground, though.

There are also lots of suspension systems where a set of linkages is added to a basic swing-arm set-up to alter shock position, leverages or to add stiffness. However, if there is no secondary pivot between the wheel axle and the mainframe pivot then it's still basically a swing-arm.

FSR: FSR suspension systems are primarily used by patent owners Specialized, but they license the design to several other brands. By using a pivot on the chainstay – just ahead of the rear axle – the rear wheel can move outside a simple arc. The exact curve is then governed by a fourth linkage or 'bar' added

"Lifetime warrantied pivot bearings are a bonus if you'll be riding big mileages year round"

Front or rear, air shocks are easy to tune for rider weight and preference. Patience and a shock pump is all it takes

Patent-holders Specialized have been building FSR bikes for years

between the top of the seatstays and the frame. This is why they are often known as 'four bar' systems. They generally feel far more neutral when pedalling than high-pivot swing-arms and cope better with braking forces and blunt faced impacts than low-pivot swing-arms. Most still need some sort of lockout or compression damping to combat pedal squat. ('Squat' is the sinking feeling caused by suspension that is compressed by braking or pedalling forces rather than the terrain.)

Twin-link: By using two links between the mainframe and a fixed rear subframe, the wheel path can be orientated around a fixed or moving 'virtual/effective pivot point' located anywhere. This gives designers a free hand to create whatever pedalling, braking or shock rate response they want. Unsurprisingly most choose a compromise that involves all the advantages of high and low swing-arms and FSR systems. As a result, the various proprietary systems – VPP, DW Link, Maestro, FRS, Full Floater, VPS etc. – generally offer the most balanced and efficient suspension performance, although they all differ subtly.

Floating drivetrain: Floating drivetrain systems are unique in that the bottom bracket and chainset move in relation to both rear wheel and mainframe. This can be used to either create a very firm pedalling feel with enhanced drive (Maverick) or a softer pedal feel with excellent ground connection and traction (GT, Mongoose, Schwinn).

The other aspects

Suspension behaviour is only one aspect of overall bike performance. In fact, with most suspension systems now very similar in character, the bike's handling, ride position and other practical considerations are the most important things to consider. This is particularly true because these aspects vary far more on a full-suspension bike than if you were looking at the fairly cut-and-dried characteristics of XC hardtails.

For a start, a lot of trail bikes – generally those with 120mm or more of travel – now use shorter stems, shorter top tubes and slacker steering angles borrowed from bigger freeride bikes. This is great for added stability and 'power steering' control in more hectic moments. They can make bikes feel very 'sit up and beg', with less room to stretch out and breathe. The constant supervision of twitchy steering and lift-prone front wheels takes some learning too – particularly on climbs.

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cycle D7

FSR: Specialized Epic Comp 2

£1599

Specialized's unique Epic could be the perfect 'automatic' answer to the hardtail/suspension dilemma. While other bikes offer rider-actuated switching from locked to active rear shock, the Epic is the only bike that does it automatically in response to the trail. An inertia valve at the rear wheel lets the shock move when it senses a bump and then closes it when the trail gets smoother again.

Simply set the actuation threshold (or 'Brain Fade') to the sensitivity you want and the bike will do the rest. Locked out for smooth sprinting or fully floated for rocky descents, all without you worrying about a thing.

The contrast between locked and soft takes a bit to get used to (and some riders just plain don't like it), but the switch has never felt smoother than it does on current models and it should be even less noticeable next year.

There's a whole new rocker link layout for 2009 (note: 2008 model pictured above). This brings the bike in line with other Specialized frames and loses several hundred grams in the process. While the World Cup XC race winning S Works carbon bikes hog the limelight, the alloy bikes are still lighter than average.

The lower, longer race-style position also combines with the automatic shock reaction to make them potentially very fast and efficient mixed-terrain trail bikes.

Typically for Specialized detailing – from low overall bike weights to custom colour coded components – is superb, so the bike rides as smooth as it looks.

TECH SPEC

Frame: Specialized M5 custom alloy
Fork: Fox F100 RLC
Shock: Specialized AFR
Wheels: Specialized/Shimano hubs on DT rims
Drivetrain: SRAM X9/X7
Brakes: Avid Juicy 5
Contact: Specialized 020 8391 3500, www.specialized.com

SEE ALSO

Scott Spark £2199. Even the entry-level model of Scott's ultra-light carbon fibre speed machines costs over £2000, but few come close on performance.

Giant Anthem 2 £1390. The benchmark privateer racer. Long, low, light weight, phenomenally smooth and astonishingly good value.

Gary Fisher Hi-Fi Pro £1999.99. Super-light whippy whippet bikes based around unique fast handling geometry and available in 26in and 29in wheel sizes.

Riders who like a longer, lower, more racer-style position should therefore look to shorter travel competition models to find the best fit. Luckily several manufacturers – Marin, Giant, Specialized and others – have realised not everyone loves stunts more than speed and are introducing new strains of exactly this sort of thoroughbred for 2009.

The compromises

As well as bike character there are other aspects of suspension bike design that need considering. Some are far less of a problem than you might think; others can definitely be a downside.

Cost: There's no escaping the fact that suspension bikes cost more. While a good hardtail MTB now costs less than £500 and a great one £1,000, getting similar quality in a full suspension bike adds several hundreds of pounds to the ticket. Whether the enjoyment and expanded ride potential it'll add is worth that is something only you can decide.

Weight: Far less of an issue than you might think. Despite the extra shock, pivots, frame sections etc. most full suspension frames are within a pound of similar category hardtails. Lower-grade componentry for a given cost adds more weight, but you're still only talking 2-3lb in most cases. Not much when you consider the greater control, smoother pedalling and reduced fatigue that suspension brings.

Maintenance: Workshop/spares demands of suspension bikes are much better these days. Pivots and shock bushings do wear out, and shocks need servicing occasionally. Average lifespans are now measured in years not the weeks and months of yore.

Equipment carrying: One thing that all suspension bikes compromise in some way is cargo capacity. Apart from saddlebags and bar bags (both of which should be loaded very lightly off-road) a rucksack is the only real option for gear carrying on a full floater. You'll be lucky to find more than one easily accessible bottle cage mount on a suspension frame these days too, and some have none.

Car carrying: For those who like to park and ride, more elaborate suspension frames can also cause problems with some car racks. Towball or roof racks with wheel troughs and/or QR clips are generally fine, but frame hook types will need checking for compatibility.

Full suspension isn't just for landing jumps. It improves comfort and cuts fatigue on any rough ride

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Twin-link: Marin Mount Vision 5.8

£2300 tbc

Another UK-designed classic. Marin were the first to really crack the long distance trail bike scene with their silver and orange single-pivot Mount Vision FRS.

This latest Mount Vision chassis is now in its third year of subtle evolution and weight-saving on an already award-winning platform. Combining the latest tube forming techniques with replaceable rear dropouts that can run either a conventional QR or screw-through Maxle rear axle makes it the stiffest Marin XC frame yet, as well as adding useful crash- and future-proofing.

In suspension terms Marin's unique QUAD XC system is more dynamic than most neutral-feeling twin-linkage setups. That creates a bike that's perfect for grabbing by the scruff of the neck and really getting the most from the 120mm of Fox shock suspension travel at either end.

Unlike many more aggressive feeling bikes it's still long enough for a decent-speed stretch and ample breathing space on climbs. Actual bike weight is relatively low considering how inspiringly anchored to the trail the bike feels. All in all this really is one of the few bikes that can still hold its own on the climbs but feels like something special on the descents.

Nearly 15 years of Cotswold-based suspension development makes Marins some of the most UK-proof bikes around too. The Quad link totally shields the shock from wheel spray and the back end has acres of space for muddy tyres. The bearings themselves are all lifetime warrantied, so even if they do wear out new ones are free.

TECH SPEC

Frame: Hydroformed 6066 Alloy
Fork: Fox 32 120R QR15
Shock: Fox RP23
Wheels: Mavic rims on Hope Pro 2 hubs
Drivetrain: XT throughout
Brakes: Hayes Stroker Disc
Contact: ATB Sales 01424 753566, www.atb-sales.co.uk

SEE ALSO

Giant Trance X2 £1499.99. Giant's 'Maestro' twin link suspension strikes a superb hard driving smooth riding compromise via these light weight, high-value all rounders.

Trek Fuel EX 8 £1599.99. Trek's new ABP suspension is their smoothest and most efficient yet and pricing, paintjobs and handling are excellent.

Specialized Stumpjumper FSR Elite £1799.99. The original MTB name lives on as this super smooth riding (and looking) bike from Specialized.

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Floating drivetrain: GT Marathon Carbon Pro

£2699.99

GT's latest lightweight cross country bikes mix their 12-year-proven 'I Drive' floating drivetrain system with the latest carbon fibre or alloy frame technologies. The result is impressively light, high-traction action.

If you're properly minted then you've got the option of the stunning looks and low weight/high stiffness performance of the latest multi-faceted carbon fibre frame. Even the alloy framed bikes are impressively low in mass given their outward complexity too, thanks to state of the art tube shaping techniques. A dozen years of continuous development means that reliability issues were wrung out long ago, leaving I-Drives as dependable, durable trail machines.

It's the floating drivetrain that really marks out the ride of GT's bike as something different. With the crankset/bottom bracket section suspended between the two halves of the frame, neither end disturbs smooth pedalling rhythm. The resulting soft, isolated feel under power takes some getting used too, but as long as you can keep pedalling, this bike will keep gripping. You always can flick the Pro Pedal lever across on the shock to stiffen it up for the smooth sections anyway. Add a longer, 'racer' style shape to the low slung front end and you've got an ego-flattering bike that excels on the most technical trails.

You can get yourself aboard an I Drive for much less money than the other systems here too. Obviously the £800 versions are a bit heavier and less lively, but right through the price range GT bikes generally set the upper benchmark for what you can expect for your budget.

TECH SPEC

Frame: Carbon fibre
Fork: Fox 32 100RL
Shock: Fox RP23
Wheels: Mavic Cross Trail
Drivetrain: Shimano XT
Brakes: Shimano XT
Contact: Hot Wheels 01202 732288, www.gtbicycles.com

SEE ALSO

Mongoose Canaan £1499. Similar loating drivetrain to the I-Drive in killer value XC chassis.

Kona Dawg £1374.99. Latest, lightest version of a trusty linkage-assisted low swing-arm trailhound.

Iron Horse Azure £1599.99. Sweet riding twin-link racer as long as you don't love fat tyres.

"Set the rebound too fast and it'll kick the bike into the air or pogo wildly over successive hits"

Setting up your suspension

The rockier the ride, the more you'll feel the benefit of a bike sprung at both ends

If those issues haven't put you off, then you'll need to be ready to set up your new suspension bike to get the most from it. The basics are easy to grasp.

Sag: The first thing to get right is the shock pressure. Switch off any lockout or compression damping and sit carefully on the bike in your riding kit and then carefully get off. The travel marker O-ring should be sat about a quarter of the way down the shock shaft from the shock body. If it's more or less, repeat the measuring, adding or removing pressure until this 'sag' measurement is right.

Damping: While the spring of the shock returns the bike to its ride height after a bump, it's the oil in the damping circuits that actually absorbs the impact.

Rebound: The rebound adjust knob (normally red) controls the speed at which the shock or fork returns from being compressed. Too fast and it'll kick the bike back into the air or pogo wildly over successive hits. Too slow and it won't have recovered from one hit before the next one, leaving the bike wallowing, affecting and handling and robbing it of travel. Start with the rebound in its middle setting and then change it click by click until the shocks are coming back as fast as possible without the wheels jumping off the ground. If in doubt run the fork slightly fast and the rear slightly slow so you're less likely to get fired over the front.

Compression: The opposite of rebound, compression controls how much impact force the oil absorbs. Too much and the shock/fork will stop abruptly, too little and it'll dive through its travel and slam into the bottom out stops. Most shocks and forks only allow low speed compression damping. This controls their reaction to 'slower/flatter' forces such as pedalling disturbance, body weight movement and braking. To set it right, start at minimum and then progressively add a 'click' at a time until any unwanted movement stops. Be aware that more compression damping will reduce suspension sensitivity to smaller bumps/vibrations.

Monitoring and maintaining: While these guidelines should give a decent initial set-up, we'd recommend putting time aside for a dedicated set-up session. Simply ride down the same bit of trail (steps or rocky sections are ideal) several times. Make a single small adjustment (no more than 5-10psi pressure or two clicks of damping either way) before each run and see what difference it makes. Carry on tweaking back and forth until the bike is riding as stably and smoothly as possible. Keep monitoring how the suspension is working too. Check that you're getting full travel from your fork (use a skinny zip tie around the upper leg if the tidemark isn't obvious) and shock at least once or twice on an average ride.