



PHOTOS: DAVE TYRRELL

# Science of Bike Fitting

A pro bike fit could do wonders for your ride comfort and times. **Nik Cook** hooks up with Retul to see how you can make every pedal count...



**Nik Cook** is a freelance sports writer and an experienced competitive cyclist, triathlete and duathlete

It's staggering the amount of money that many triathletes are willing to spend on a bike compared to the low amounts of cash and effort expended getting it to fit properly. Chances are, the majority of your training time will be spent on the bike, and, if fitted incorrectly, every pedal rotation could be incrementally contorting your body, leading to decreased performance and an increased risk of injury.

Andy Pruitt, director of the Boulder Centre for Sport Medicine, has described cycling as "a marriage between the human body, which is somewhat adaptable, and a machine that's somewhat adjustable. In fitting, one needs to adjust the bicycle to the cyclist so that the rider has to adapt as little as possible". He's talking about cyclists but, for triathletes who have to be in a fit state to run off their bikes, a correct fit is of paramount importance.

Many triathletes make the mistake of trying to adopt an ultra-aero position, forgetting all other aspects of bike fit. In a recent study conducted by top coach Marc Laithwaite, comparing running performance after a 20-minute cycling time-trial, Laithwaite found that the cyclists who'd ridden in an aggressive aero position ran with a faster breathing rate and higher heart rate, breathed deeper and consumed more

oxygen in comparison to the group who'd ridden in a more relaxed and upright position. If results are seen after a mere 20-minute ride, imagine the consequences for your run after four to six hours in the saddle during an Iron-distance event.

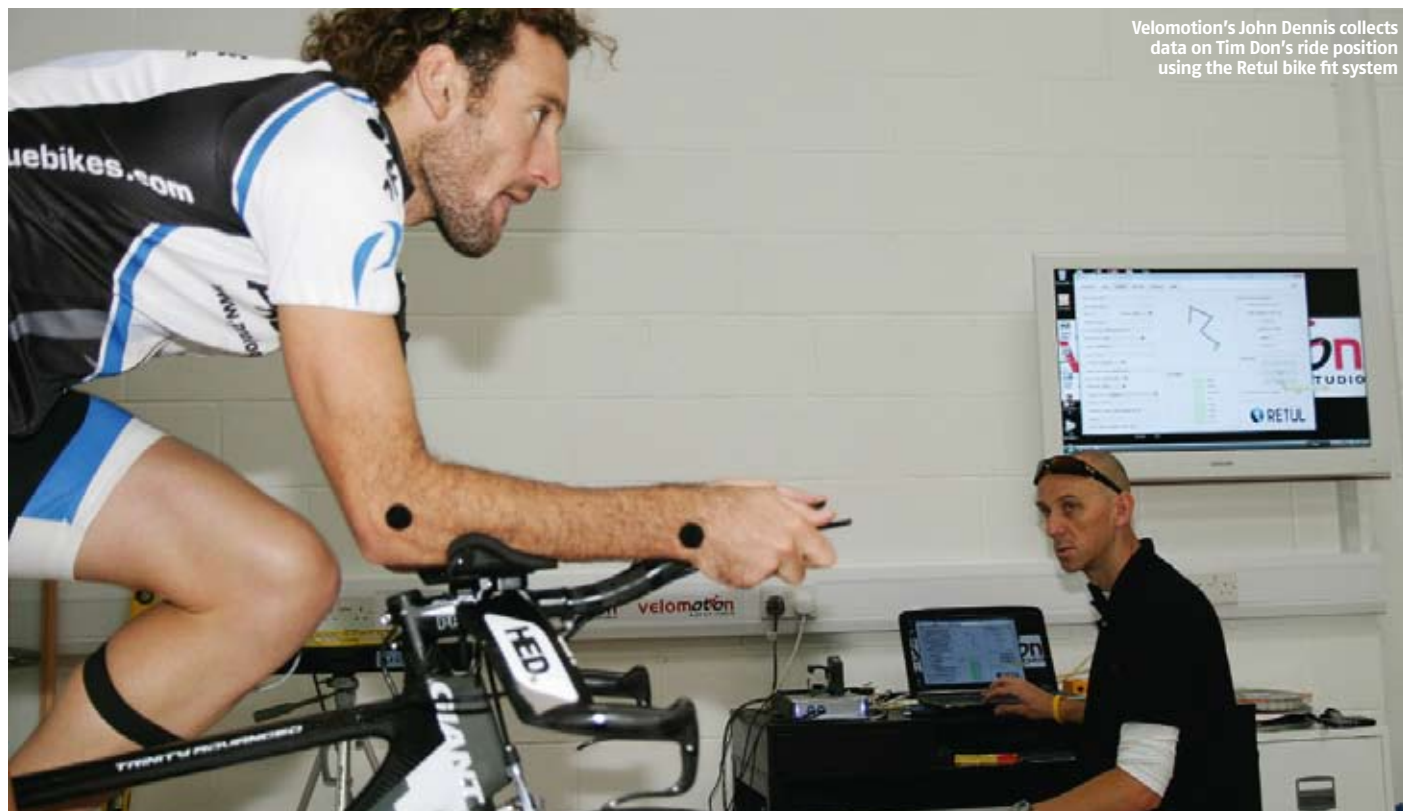
It's no coincidence that many top triathletes, particularly long-course racers, are now looking to high-tech solutions to optimise their bike set-up. And the Retul system 3D motion-capture system is right at the cutting edge. With stellar clients such as Craig Alexander, Normann Stadler and Joanna Lawn having benefitted from the Retul touch at the pioneering Denver studio, the system is now available in the UK.

## Time to go 3D?

Traditional bike fitting involves nothing more high tech than a plumb line, tape measure and a goniometer to assess joint angles. The obvious failing of this system is that all of the measurements are made statically and you don't cycle sitting still. Next up is video capture, which does give a more dynamic fit but is limited because the fitter can only look at one view at a time and those views stand as independent reference points. In order to make the best fit recommendations, Retul says, the fitter must realise that the front and side view are interdependent reference points, which is only possible to determine with their 3D technology.

There's been much talk about the merits of this service, so we made a trip to Bucks to see what the fuss is about...





Velomotion's John Dennis collects data on Tim Don's ride position using the Retul bike fit system

John Dennis is a chartered physiotherapist who has been working in elite sport for the past 11 years, including being part of the GB triathlon team. Having seen the Retul system in Denver, he set up his own Milton Keynes-based studio

([www.velomotion.co.uk](http://www.velomotion.co.uk)) in June 2009 and has since fitted top British triathletes including Jodie Swallow and Hollie Avil, as well as working with the newly founded Team Sky Cycling Team.

With John's background in physiotherapy, it's no surprise that the first stage of the fitting process is an examination of the rider's flexibility and stability. This has major implications as to what sort of position you can adopt, especially regarding running performance off the bike. If necessary, John can make manipulations to free up areas or give recommendations for strengthening or flexibility work.

The next step is for the rider to get on their bike and, during a warm-up period, to have a series of markers affixed on various key anatomical landmarks. A harness system of LEDs is then placed on these marker points that allows the motion tracking to take place. The following stage sees the tester build up to sub-threshold or race-pace power.

Data is recorded at a number of different effort levels because most riders will shift their position as intensity increases. The 3D camera triangulates the position of the LEDs to one another as they ride and captures data during a series of 15-second bursts.

The whole set-up is mounted on a platform that can spin through a full 360°, allowing data to be recorded from every possible angle, building a complete 3D model. The data is then analysed and, combined with feedback from the rider, changes to the rider's position are made. John stresses that this is where a bit of artistry comes into play


and that the process is a combination of the human and the scientific. The rider will then get back on the bike and see how things feel before making any fine adjustments and finally re-running the test and seeing changes to heart rate and perceived exertion at given power outputs. Finally, the bike is scanned, recording all of the dimensions for the rider so that they can be easily applied to any new bikes they might buy.

## Fit for all

It's no surprise that long-course, non-drafting athletes have been the first to adopt the Retul technology. But, with the run leg often decisive in ITU races, having a biomechanically optimised bike position that'll allow athletes to run at the top of their ability is a massive advantage.

As you leave the session with all of your data, this allows you to adjust all of your bikes to as near to the optimum as possible. Obviously, positioning is different on a time-trial, road or mountain bike, but major measurements such as saddle height are transferable.

The whole two-hour consultation costs £185 and John reckons that, unless a bike is really miles out, significant improvements can be made with fairly minor mechanical adjustments to the existing bike or by changing the stem, cranks or other similar adjustable items.

Compare that outlay to an aero helmet or a particularly spanking bike jacket, and the performance vs value equation means this could well be a sound investment. 

## Alternative bike fitting services

### CycleFit

Covent Garden, London

One-to-one 3D motion capture and freeze-frame video analysis to deconstruct your riding position and pedalling technique. By using Computrainer's Spinscan technology, the technician will also be able to see how the changes affect your pedalling dynamics. [www.cyclefit.co.uk](http://www.cyclefit.co.uk)

### WheelBase Professional Cycle Fit Service

Staveley, near Kendal

Offer a cycle-fitting service that combines hi-tech computer programming with years of hands-on experience. It includes a full position simulator, body measuring jig and a cleat-fitting service along with custom-fitted shoes, saddles and inner soles. [www.wheelbase.co.uk](http://www.wheelbase.co.uk)

### Sigma Sport BG Fit Service

Kingston upon Thames, Surrey

Developed by the renowned Dr Andy Pruitt PA, of the Boulder Centre for Sports Medicine. All fitters have to go through a thorough and intensive training course. [www.sigmasport.co.uk](http://www.sigmasport.co.uk)

## Tim's fit

'The Don' booked in for a session at Velomotion to get his time-trial position checked out: "I've not done much time trialling and position is everything. My own physio strongly recommended John Dennis and I knew him from the GB set-up. We're all looking for whatever small percentage gains we can get. I was hoping not to have to make any massive changes and to get some piece of mind that the position I've developed wasn't too far out."

As it turned out a few minor tweaks were all that were needed: "John lifted my saddle about 0.5cm and narrowed and lowered the front a bit. It reassured me that things weren't way out and I've probably saved a few watts here and there. I probably could get more aero, but I'd probably lose power and John knows about the problems I've had with my back."

And the results? "I went home with my measurements from the TT bike and my road bike was pretty damn near. On the TT bike I felt really strong, powerful and comfortable. I gave it a really good test in the five-man Team Time Trial Coupe de France race, which my team won."



1 Tim has his flexibility, stability and range of movement assessed. As well as standing tests, John also assesses riders lying prone and, if necessary, makes adjustments and/or recommendations.



2 Having warmed up and calibrated the turbo, key anatomical landmarks on Tim's feet, ankles, knees, hips, shoulders, elbows and wrists are located and marked with a sticker.



3 Tim has the LED harness fitted and then progressively builds up to a sub-threshold effort. The 3D camera is constantly logging data throughout.



4 John analyses the data and, by combining it with feedback from Tim, the initial assessment and his own experience, comes up with a number of positional changes to try.



5 Saddle height and other changes are made before Tim gets back on to see how things feel. Any other fine adjustments are made.



6 Tim re-rides the test in the new position, giving feedback all the time. John records and analyses the data. Both heart rate and perceived exertion are lower for the same wattage compared to Tim's original position.



7 John scans the bike and records all the dimensions. These dimensions are then sent to Tim, allowing him to check his other bikes and to make sure any new bikes are set up optimally for him.