



Miles better

What bike is best for a long summer day ride or a sportive like CTC's Ron Kitching Ride? Dan Joyce tested road and audax bikes built from steel, aluminium, carbon fibre and titanium; Chris Juden provided photos and analysis

Road bikes are ridden at least as much for pleasure as for the pain and strain of racing. It might be a Sunday ride in the lanes or a summer sportive like a CTC Challenge Ride. With the relaxation of the mudguard rule, close-clearance road bikes are eligible for audax rides. The reverse is also true: audax bikes make fine recreational road bikes. Arguably, the ideal sportive bike sits at the point where road bikes and audax bikes overlap.

Moving a step away from all-out racing requires two things in a road bike – features that any audax bike will already have. Thing one is lower gears. Sportives typically take place in hilly or rolling terrain, because that's where the nice scenery is. While there's a certain machismo (or masochism) involved in stomping up hills in an over-large gear, it's seldom pleasant. Thing two is comfort. Riding all day for fun is different from hammering along for an hour or two, where everything is sacrificed on the altar of efficiency.

CTC staff: Frances Chaloner, Chris Peck, Andy Hawes, and Julie Rand also tried out the bikes and the new CTC clothing

EASIER GEARS

Most road bikes now come at least with the option of a compact double (34/50T) chainset, which has tended to replace the road triple (e.g. 30/40/50T) as a way of providing a lower gear or two on this style of bike. That's pretty much the size of it: compared to the racer's 39/52T, the compact double gives one gear lower and the triple gives two.

At the rear, the racer's 11-23T is usually replaced with 12-27T cassette. All road bike rear derailleurs will

cope with sprockets that size, whilst Campag go up to 29T. The result is a range of gears from about 30 to 110 inches. For a fit rider on an unladen bike that's low enough for any incline and high enough that you won't spin out unless you're time trialling with a fierce tail wind. The wider ratio cassette means bigger steps between some gears, as does the compact double, but when you've got 20 or 30 to play with the steps are always small.

I rode these bikes on hilly circuits in the Wolds and North York Moors, taking in 1-in-6 descents and similar climbs. I'd have got round with a racing double but was glad of the bikes' lower gears. Last time I did the Phil and Friends, I cycled easily up Holme Moss on a triple – past riders with doubles who were walking.

SITTING COMFORTABLY

The comfort issue is more complex, because it depends on personal preferences. Partly it's about getting the contact points in just the right place for you. For example, you might favour a slightly shorter reach on a sportive bike compared to a race bike, with the bars set a bit higher. (Having an old back injury, I do.) This puts less strain on your lower back and means that the drops are readily usable for riding along into a headwind.

Partly it's about what the contact points are – in particular, finding a saddle that suits your bum. The handlebar shape and bar tape thickness also matter, as do your shoes, shorts and mitts. Tyre pressure, width and type make a difference too: 7 bar gives more shock absorbercy than 10 bar, as does 25mm over 23mm, and lighter, more supple tyres might feel better than puncture-proof training tyres of the same width.

On the rougher minor roads favoured by sportive events, slightly wider, softer tyres can even help the bike go faster, due to reduced 'bump losses'. Significant kinetic energy can be lost, i.e. transferred in the form of heat, when a rider's body is jiggled about. Sometimes, comfort and speed go hand in hand!

MATERIAL BENEFITS

I've left until last any comment on what the bike is actually made of. Different materials obviously have

different properties, but the extent to which they make a difference when you build a bike out of them is often exaggerated. You will have heard that steel is heavy but gives a compliant ride; that aluminium is light but gives a harsh ride; that carbon fibre is light, fragile and soaks up road vibration; and that titanium is comfortable but whippy. I'm not saying there isn't a grain of truth in some of these assertions – just don't believe the hype. You can make a decent road bike out of any of these materials.

Steel is the stiffest and strongest metal that bikes are made of. All steels are equally stiff and equally heavy although the more exotic grades are stronger, which means you can use less of them and thereby reduce overall weight. Good quality steel is highly resistant to metal fatigue (of which more later) so steel bike frames can be allowed to flex to and fro without risk of premature failure. This underlies steel's reputation for springiness and comfort. Steel is the material of which springs are made!

Steel frame tubes are fairly narrow because fatter ones would be too heavy or need even thinner walls for the same weight, making them prone to denting and buckling. The ratio of diameter to wall thickness, at which a tube becomes liable to collapse, is the limiting factor with steel. Increased strength allows only slight adjustments in this factor, so even the latest and strongest steels cannot beat the weight of a good aluminium, titanium or carbon fibre frame.

Most of the 'give' in a steel frame is

lateral rather than vertical. Any shock absorbercy or vertical compliance is tiny compared to the give in the tyres and saddle – detecting it is like the *Princess and the Pea*. The lateral spring of steel translates into comfort at the pedals rather than the saddle, and since a lot of your weight is on the pedals when riding hard, that can make a difference. So, if you don't mind the weight hit, steel remains a sound choice for a sportive bike.

Aluminium is about a third the density of steel. It's also about a third as stiff and half as strong as steel. And since the bending and twisting stiffness of a tube is proportional to wall thickness times diameter cubed, it takes only a small increase in both (especially diameter) to produce a tube that's just as stiff and strong as steel but still only half the weight.

But aluminium has one major weakness: it is much less resistant to metal fatigue – in which repeated flexing of the metal causes cracks to form and then spread through the metal, until there's not enough left and it breaks. Fatigue affects all materials differently. Some metals, e.g. spring steel, can tolerate a great deal of flexing before they start to crack. Never heard of aluminium springs? That's because aluminium cannot be allowed to flex like that or it will crack.

It should now be obvious why aluminium bike frames have to be made very stiff, with even bigger and thicker tubes (than would otherwise be necessary) in order to limit flex and prolong fatigue life. That life is usually shorter than a steel frame even so. Just

Thorn's Audax Mk3 offers versatility and better clearances. As it's steel, it's heavier



compare typical warranty terms: 15 years or more for steel against five or ten for 'alloy' frames.

Despite all that extra metal, aluminium frames still come out lighter than steel, and at least they don't rust.

Titanium sits between steel and aluminium in the density and stiffness stakes. Some titanium alloys, however, are almost as strong as steel and every bit as good in fatigue. Yes indeed: you can get titanium springs – at a price.

These properties make titanium arguably the perfect metal for bike frames. A slight increase in diameter and wall thickness is all it takes to obtain the necessary strength and durability, in a frame that's significantly lighter and can be even more springy than steel.

Titanium is also extremely resistant to corrosion (in fact, you could boil nitric acid in a titanium pan), which is why the tubes are usually left unpainted. Its main drawback is the cost: titanium requires a huge amount

of energy to extract from its ores and is hard to manipulate: welding requires expensive inert gases. Even drilling holes presents unique difficulties.

Carbon fibre was discussed in detail last issue by Mike Burrows. For the benefit of those who missed it: carbon fibre can have a better strength to weight ratio than any metal, depending on how you align, bind and bake the fibres. Since it's anisotropic like wood, it's strongest along its 'grain' rather than equally strong in all directions like metal. More so than metal, it's only as good as the way it's made. Its main drawback is not that it is fragile – it can outlast metal frames on test rigs – but that when it breaks, that can happen suddenly and without warning. For a performance-motivated racer, who weighs the risks and takes them, that's no big deal. And whilst it's possible to see a crack in metal before it becomes catastrophic, a lot of people don't; so metals are not a whole lot more predictable in reality.

'Aluminium cannot be allowed to flex like steel does or it would crack'

While strength-to-weight ratio is carbon's ace card, it also has a reputation for damping down 'road buzz', and it's

telling perhaps that all four bikes on test have a carbon fork – a more vital component to comfort and to safety than the frame.

FUNCTION AND FORM

'Conventional wisdom' has some pretty clear opinions on the way road bikes should be made. Most have a head angle of 72 or 73 degrees and a seat angle that's slightly steeper. Stems for medium size road bikes seem to be fixed at 11cm.

For bigger bikes that are longer in the top tube, this might be fine. For average sized bikes and smaller, where you want a shorter reach, you often get toe overlap. That's because the

TECH SPEC

| Bike | Thorn Audax Mk3 | Pearson Aluminium Audax Pro | Cannondale Synapse 105C | Van Nicholas Zephyr |
|--------------------|---|--|--|--|
| Price | £1446 (as spec'd; costs from £899) | £1400 (as spec'd; costs from £1150) | £1250 | £1684 |
| Weight (approx) | 10.1kg/22.3lb (guards, no pedals) | 8.85kg/19.5lb (guards, no pedals) | 8.85kg/19.5lb (no pedals) | 8.4kg/18.5lb (no pedals) |
| Nominal size | 55cm | 54cm | 56cm | 54cm |
| Sizes available | 49.5, 52.5, 55, 57, 60cm | 48-62cm in 2cm increments | 47, 50, 53, 56 58, 60, 63cm | 50-62cm in 2cm increments |
| Frame | Reynolds 853 steel | Pearson A6N Aluminium | Synapse carbon SAVE | 3AL/2.5V titanium |
| Fork | Ambrosio Momentum Carbon | Carbon fibre | Cannondale Synapse SAVE | Reynolds Ouzo Comp carbon |
| Wheels | Continental Ultra Gatorskin 25-622 tyres on 32-hole DT Swiss RR 1.1 rims, Ultegra hubs | Continental Ultra Gatorskin 25-622 tyres on Xero Tarmac XSR-1 wheelset with 20/24 spokes | Vittoria Zaffiro 23-622 tyres on Shimano WH-RS10 wheelset with 16/20 spokes | Continental Ultra Race 23-622 tyres on Campagnolo Khamsin wheelset with 24/27 spokes |
| Transmission | 30/39/52T Ultegra chainset, 12-27T 10-speed cassette, with Ultegra derailleurs and shifters. 30-speed, 29-115in | 34/50T Ultegra compact chainset, 12-27T 10-speed cassette, with Ultegra derailleurs and shifters. 20-speed, 34-112in | 34/50T Shimano FC-R600 compact chainset, 12-27T 10-speed cassette, with 105 derailleurs and shifters. 20-speed, 33-111in | 34/50T Campagnolo Veloce compact chainset, 13-29T 10-speed cassette, with Veloce derailleurs and shifters 20-speed, 31-102in |
| Braking | Shimano R550 mid drop dual pivot sidepull brakes | Shimano R550 mid drop dual pivot sidepull brakes | Shimano 105 dual pivot | Campag Veloce Skeleton brakes |
| Steering & Seating | 11cm Shimano Pro stem, San Marco SKN C40 saddle | 10.5cm threadless stem, Specialized Alias saddle | 11cm Cannondale C4 stem, Fizik Pave Sport saddle | 11cm threadless stem, Fizik Airone saddle |
| Accessories | 'guards, bottle cage | mudguards | none | none |
| Website | thorncycles.co.uk | pearsoncycles.co.uk | cannondale.com | vannicholas.com |

only thing that's really changed is the effective top tube length. The steep head angle is retained because road cyclists apparently don't want too much stabilising trail – even though more trail can help you descend faster. You could keep trail the same with a slacker head angle and more fork offset, both of which would get the front wheel further from your toes. (This is exactly what many current 29er mountain bikes do.)

Another way to reduce reach would be to fit a shorter stem to a bike that's long enough in the top tube to prevent toe overlap. Some cyclists will tell you that a shorter stem will make the steering too twitchy. It won't. Switching from an 11cm stem to an 8cm stem might make the steering slightly lighter, because you've got less of your body weight bearing down on the handlebars and because your hands will be moving through a slightly smaller arc when you turn the bars. But your bike will handle just fine.

Check out the dimensions table to see how the bikes varied. We requested a 54cm model of each bike. The Thorn and Cannondale don't come in a 54 so we were upsized to a 55 and 56cm respectively. Both of these are still classed as mediums.

THORN AUDAX MK3

Thorn's Audax Mk3 is available from £899, but Thorn were happy to build it up for us as a higher-spec'd sportive-style bike. As with Pearson and Van Nicholas, it's an *à la carte* service: you can have pretty much whatever equipment you want on your bike.

The steel frame doesn't translate into bike that feels heavy, either in the hand or on the road. It is around a kilo more than the other three bikes, yet even with mudguards and pedals it's



Carbon forks with (albeit narrow) mudguard clearance are a rare thing

closer 10kg than 11kg. If it climbed slightly slower than the other bikes, that's because it has a lower bottom gear – and I used it. An extra kilo would translate into only a handful of seconds lost on even a long climb.

The Thorn's clearances reflect its audax billing. There's plenty of room for mudguards over the 25mm tyres, and even 28mm tyres would fit. That's thanks to the Ambrosio Momentum fork, which has more room under the crown than most carbon forks. The front centres distance is good at 600mm, which meant that there was no toe overlap with the mudguard (let alone the tyre) with my size eights. But it's dangerous to fit a front mudguard without breakaway safety clips.

A generous 4cm of spacer washers under the stem lets you sit up a bit rather than staring at the tarmac. As the bike was a bit long for me I spent most of my time riding on the tops and shoulders of the bars rather than the hoods. Being stretched out compounded the problems I had with the saddle. Even tilted down slightly, I suffered from numbness. Along with a shorter stem, I'd swap the saddle if the bike were mine. During the

Pearson's Aluminium Audax Pro: nice and light, not harsh to ride, but a bit tight for toes



test, Thorn launched a short top-tube medium with an even longer front centres measurement (608mm) but a reduced effective top tube length (530mm). That or the small/medium 525 size (front centres 594mm, top tube 550mm) would in hindsight have been a much better fit for me.

The Thorn has more to recommend it than getting the front wheel out of the way of your feet. As well as taking mudguards, the frame can be fitted with a rear rack and even a pump. I liked the Thorn's conventional-spoked wheels too. You're less likely to break a spoke when you've got 32 rather than 16, 20 or 24, and the wheel will go out of true less if you do lose one spoke.

This was the only bike with a road triple. I can see the attraction of the larger overall range and lower bottom that it provides – more so than the finer tuning afforded by the 10 sprockets all these bikes have at the back. I'm as happy with nine or eight.

PEARSON ALUMINIUM AUDAX PRO

Like the Thorn and the Van Nicholas, the Pearson Aluminium Audax Pro can be spec'd to suit your preferences. We explained that we wanted a sportive bike and left them to it.

Aluminium has a reputation for a 'harsh' ride, because it has to be built into stiff frames with very little give in them. However, I didn't find the Pearson at all uncomfortable. Part of that might be because it's been fitted with a carbon fork and carbon seatpost, but it was also better fit for me thanks to the shorter reach. It's also got 25mm tyres, like the Thorn, and it's fitted with the best saddle here: a Specialized Alias in the 143mm width.

The flipside of Pearson's shorter reach is that it suffers from toe overlap. People sometimes say: does toe overlap matter on bikes? Yes: I fell off because of it. The front wheel was weaving slightly as I climbed a steep hill. My foot hit the mudguard and I fell off – luckily onto my feet. To be fair, it's the mudguard that's the main problem: with it removed there's a whisker of clearance. Since mudguard clearance is a bit tight over the front tyre anyway, this is a bike I'd ride without them.

The Pearson Audax can come with a triple, but a compact double chainset gives almost the same range and I didn't miss the slightly lower bottom gear – even though I used it when I had it on the Thorn. Could a kilogram less weight make that much difference?

The wheels are Xero Tarmac XSR-1, with 20 spokes up front and 24 in



the rear. I'd prefer the Ambrosio Excellence wheels fitted to the 'standard' Aluminium Audax Pro, but I daresay that even long term these Xeros will be fine with a lighter rider.

CANNONDALE SYNAPSE CARBON 105 COMPACT

All four bikes came with carbon fibre forks. The Cannondale has a carbon fibre frame too, which at this price is good value – don't forget it's the cheapest bike here by £150 or more.

Carbon has a reputation for improving long-distance comfort. I didn't find it *uncomfortable*, but neither did I find it noticeably more comfortable than the steel Thorn or aluminium Pearson – both of which, to be fair, were fitted with tyres with 2mm more bump absorption. It is nice and light, despite its cheaper components, saving a kilo over the Thorn. Before I weighed it, I thought it was lighter than the Van Nicholas.

As with the Thorn, I had to shunt the saddle forward on its rails to get a comfortable fit. I didn't like this saddle either, but at least I didn't go numb while sitting on it. A longer bike meant that there was a longer front centres distance, and so no toe overlap. That's not just a happy accident. Even the next size down of the Synapse has a front centres distance of 588mm, while the tiny 47cm frame measures 575mm – barely less than our 54cm (bigger rider, bigger feet!) Van Nicholas.

Bottom gear was effectively one gear (4") higher than the Thorn, and because of this I found myself going up the steepest hills a bit faster – but standing rather than sitting. The lower weight and narrower tyres made it feel slightly sportier than the Thorn.

Cannondale's carbon fibre Synapse 105 Compact: a light sportive bike that gets its geometry right

It's not as versatile as the Thorn in particular, since you can't fit any mudguards other than clip-ons such as Race Blades, and loads will be restricted to a seatpack and bar bag – not a problem for sportive rides. If you shuffled the stack of spacers on top of the stem, you could even race on the Cannondale, although switching to a closer ratio cassette (e.g. 11-23) on race day would be a good idea.

Shimano's 105 groupset is one tier lower than Ultegra. I couldn't tell any difference in performance, however, and liked the Cannondale's in-cable barrel adjusters. You can tweak gear cable tension as you ride along.

Sixteen spokes in the front wheel and 20 at the back means just over half as many as the Thorn altogether. The wheels look nice and the straight-pull design is stronger than spokes with

Van Nicholas Zephyr: great titanium ride undermined by a lot of toe overlap

elbows. It needs to be: spoke tension must surely be about twice as high. On anything other than a flat-out race bike, and even though I weigh only 68kg, I'd save weight elsewhere first.

VAN NICHOLAS ZEPHYR

We were hoping to test the cheaper Van Nicholas Euros (around £1500). As it wasn't available in my size in time for the test we got the dearer Zephyr, which has a nicer frame (larger diameter, cold-worked tubing). To ring the changes a bit, we asked for it to be specified with Campagnolo Veloce components instead of the ubiquitous Shimano. You could choose either.

As it's a 54cm bike with a shorter reach, the Van Nicholas fitted me better than the bigger mediums from Thorn and Cannondale. That wasn't the only reason it was more comfortable. It also seemed to dampen down the road buzz from rough tarmac. I don't think I was dazzled by titanium's gleaming bling: after just two or three hours, and even though I preferred the saddle on the Pearson, this was unquestionably the most comfortable of the four bikes. For long days, a titanium road bike would be my first choice – if money were no object.

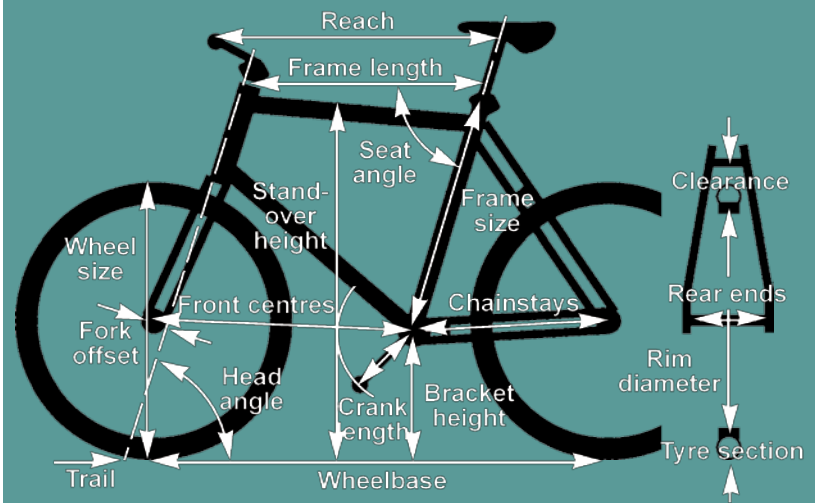
Unfortunately, the front centres distance is tight. Really tight. Even without a mudguard there was toe overlap. I duly hit my toe on the tyre while weaving slightly going up a steep hill. I'd have to go up to a 58cm frame in the Zephyr – much too big for me – to get toe clearance. Van Nicholas do offer an audax bike, the Yukon, but that too is short between bottom bracket and front hub. I'd need the 56cm size (without mudguards) or



BIKE DIMENSIONS

| | Frame size | Frame length | Seat angle | Head angle | Wheel size | Fork offset | Trail | Front centres | Chainstays | Wheelbase | Bracket height | Standover height | Reach | Crank length | Rear ends | Clearance | Rim diameter | Tyre section |
|---------------------------|------------|--------------|------------|------------|------------|-------------|-------|---------------|------------|-----------|----------------|------------------|-------|--------------|-----------|-----------|--------------|--------------|
| Thorn Audax | 520 | 565 | 72.9 | 72.0 | 684 | 44 | 65 | 600 | 431 | 1021 | 266 | 785 | 674 | 170.0 | 133 | 44 | 622 | 25 |
| Pearson Audax | 520 | 541 | 73.5 | 72.0 | 684 | 48 | 61 | 590 | 427 | 1008 | 275 | 790 | 647 | 172.5 | 130 | 40 | 622 | 25 |
| Cannondale Synapse | 560 | 560 | 74.0 | 73.5 | 676 | 46 | 53 | 596 | 412 | 998 | 268 | 795 | 671 | 172.5 | 130 | 37 | 622 | 23 |
| VanNicholas Zephyr | 540 | 540 | 74.0 | 73.0 | 674 | 42 | 59 | 578 | 406 | 975 | 272 | 790 | 650 | 172.5 | 130 | 35 | 622 | 23 |

How to understand the numbers



the 58cm (with mudguards) to avoid overlap. Again, both of those are too big for me. It's not insoluble. For an extra £225, Van Nicholas will custom build a frame to your requirements.

There are no mudguard eyelets on the Zephyr as it's a straightforward road bike, and there's no room for them in any case. You could fit Race Blades, and the fact that these strap-on guards can rub through a bike's frame paint doesn't matter on bare titanium.

I can't criticise the Campagnolo equipment too much because we did ask for it. But I didn't like Veloce as much as Shimano Ultegra or 105, mostly because of the shifters. With the thumb button to shift to a smaller chainring/sprocket, Veloce looks like Shimano's entry-level Sora. And that's what it felt like. Gear shifts happened without the smoothness of the Ultegra or 105 shifters. The thumb button restricts where you can put your hands on the hoods – I wanted to put mine where the button was! The singular

Toe overlap on the Van Nicholas Zephyr. This is Chris's size seven shoe. Dan's size eights were worse

Campagnolo advantage is the 13-29 cassette, on which a compact double gives nearly the same bottom gear as a Shimano road triple setup.

Campagnolo's G3 spoked wheels also merit a mention. This grouping of spokes in threes, two to the right hub flange, one left, neatly accounts for wheel dish by equalising spoke tensions at the rear. Equal spoke tensions are always a good thing: we like it. But G3 at the non-dished front is a nonsensical gimmick.

SUMMARY

Road bikes have more sporting panache than audax bikes, but unless you really are going to race on it as well then an audax bike is at least as good for sportive use. You can always ride without mudguards in summer. You've then got a multipurpose road bike that you can use year round.

If you don't need or want that versatility, a road bike with a compact double is a great summer day bike.

The Cannondale Synapse is a stylish one that sidesteps the toe overlap pit that other road bikes fall into. Well worth considering.

Of the two audax bikes, I preferred the Thorn. I can live with its weight penalty over the Pearson and preferred its greater toe room. Both bikes are available in a cheaper format: £900 for the Thorn and £1150 for the Pearson. That's how I'd get the Thorn, with a cheaper spec and a steel fork in the new 'short medium' size – probably with a compact double.

The bike I enjoyed riding most was the Van Nicholas Zephyr. I didn't like its niggardly front centres distance but there's something in the claims about titanium's smooth ride. I'd want a Ti bike without toe overlap, which would mean looking elsewhere or buying a custom Van Nic frame – at around £1,000, a fairly affordable luxury.

Ultimately, if it were my money, I'd buy the steel Thorn... wistfully thinking about the titanium option.