FOALES *and* HORSES

In order to get to the South of France in reasonably rapid comfort, Steven Dyer ordered a Foale Q2 chassis and a 150 horsepower Suzuki engine. Suddenly Marseilles seems a lot closer.

"When I designed the QL, it was a very practical motorcycle", but then Tony Foale admits with a grin, the Q2 is more for posing.

The proof of the posing was that each time the Q2 rolled to a standstill there would be somebody waiting to ask what it felt like. It was hard to think of a one-liner that would do it justice. Eventually, of course, it went back to meet its maker and he wanted to know the same thing.

What it feels like, in terms of a conventional bike is: big, stable and a bit heavy. If I could have ridden it without being able to see it, I would have said it had a long wheelbase, a lot of weight on the front, 18 inch wheels, raked out steering, more than four inches of trail and a lot of steering damper.

That is what it felt like, plus an engine that was surprisingly flexible when it was rolled off, and very quick when it was opened up. What the Foale Q2 actually consists of is a 58 inch wheelbase, 16 inch wheels, castor which can be adjusted in the 72° to 75° range and a fairly

Single sided swing arms, keyboard controls, tiller steering, digital instruments and lots of horsepower.

ordinary 3.5 inches of trail. There is no steering damper, but a certain amount of friction in the steering linkage has much the same effect, especially at low speed.

Bike riders are probably most suprised by the steering angle, which is a long way removed from the usual 62° to 64° found in conventional steering geometry. It has to be seen as proof that there is no rigid rule about steering angles, despite the highly conservative approach of the bike manufacturers (most cars run an angle in the 80° to 90° range). It also has to be seen as a fixation of the designer's and here we have to exercise some care.

Many exponents of radical front ends verge on the fanatical, they abominate telescopic forks and in their determination to get rid of them they often fit things which are demonstrably worse. But what they are good at is talking about their wretched creations. It was an enormous relief to discover that Tony Foale wasn't a member of this loony fringe and that I wasn't going to be subjected to a long speech on the evils of the telescopic fork.

Tony has been building frames for more than 25 years and he generally favours front suspension which is not of the telescopic persuasion. He also has a controversial attitude towards castor angles. Some time ago he modified a BMW so that it carried its (standard) forks at a very steep angle — at first 75° and then close to 90° degrees, although they were mounted so that the trail remained as standard.

This experimental bike proved to him that low-speed steering and high speed stability were improved by using steeper steering angles. Mounting telescopic forks almost vertically means that they can only resist braking forces by bending — which is why they are normally set at a 60-odd degree slope.

A swing arm, or wishbone arrangement could, however, take all the braking force through its pivot bearings, and feed only bump forces into the suspension. And it would allow him to use any castor angle he

Pics: Phil Masters and Martyn Barnwell

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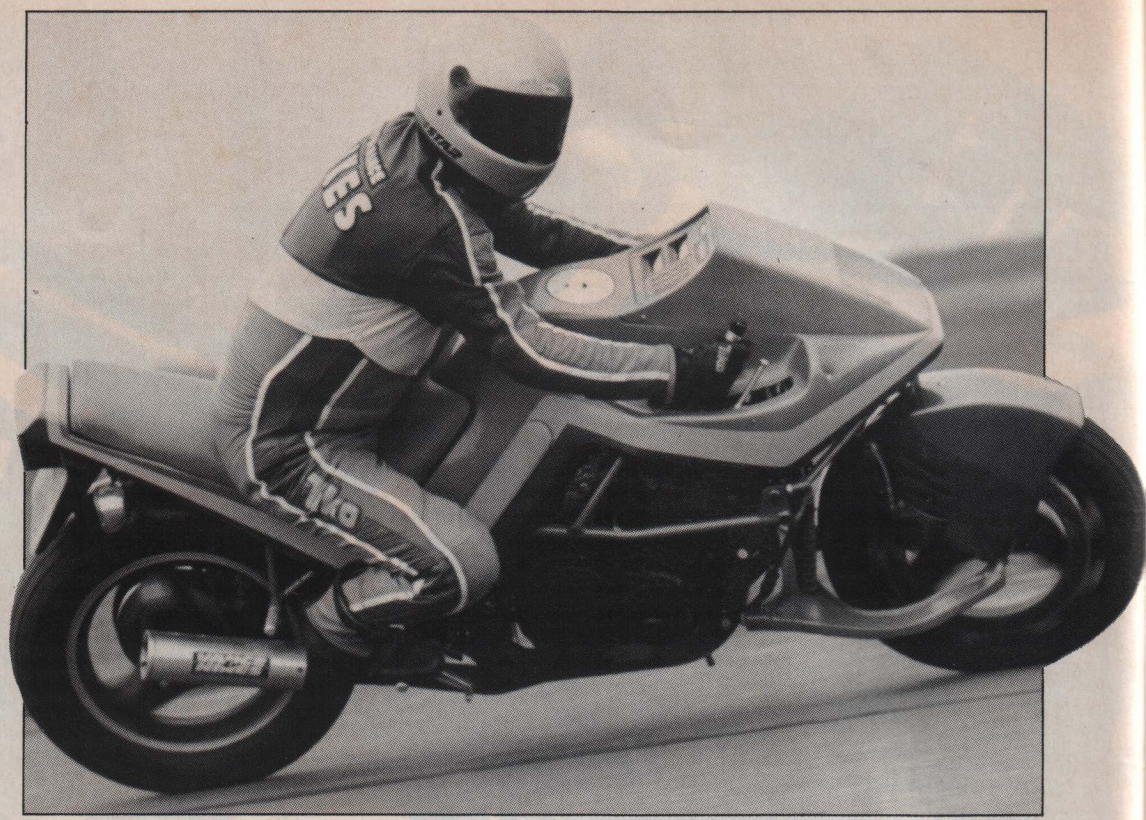
wanted, leaving the trail to look after the stability.

This led to the suspension design on the QL, and the later Q2, bringing the additional practical advantages that small, light, 16 inch wheels could be used without making the steering at all twitchy. Steering, via a drag link could be stepped up as far as 2:1, so the handlebars would only swing through half the arc that the wheel turned through, and would need less room/clearance around the instruments and bodywork. It would also double the force needed to move the steering; in the end Tony settled on a ratio of 1.4 for the QL and about 1.1 for the Q2 as the best compromise.

A series of steering experiments indicated the best set up: 72° rake (Tony, incidentally, measures it from the vertical, so it becomes 18°) and trail in the region of 3.5 inches. Having got this far, the QL and Q2 designs became a logical progression. Single sided swing arms allow easy wheel removal; on the Q2 they pivot on a fabricated cradle in which the engine sits.

A triangulated top frame locates the top wishbone for the front suspension and this carries the spherical bearing which is the top steering pivot.

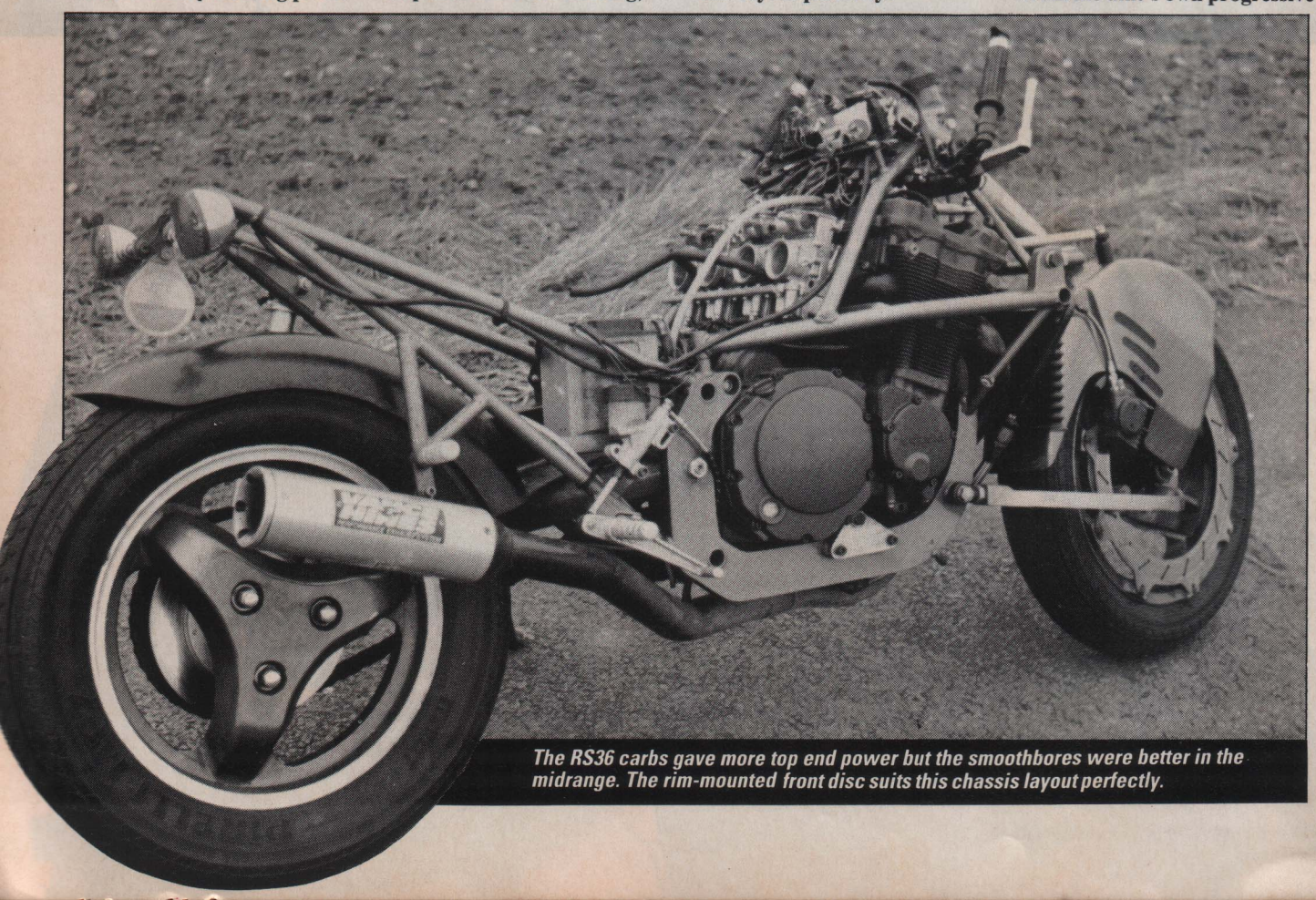


This is the weak point of the design, as Tony admits, because the bearing housing screws into the wishbone, so the threaded portion is subjected to bending stress which is not exactly what it was designed for.

However, if you make it big enough it will be strong enough and this layout was the lesser of several evils. The construction has the advantage that all the pivotting parts, in the suspension and the steering, have a small amount of adjustment via the threaded mounts. Therefore it is possible to align the wheels without complicated jigging and it is possible to build the chassis as a one-off around individual engine units.

The wheels, which are made to Tony's design, are dished (allowing the lower steering pivot to be in the centre of the hub) and Lockheed's rim-mounted disc brake suited this layout perfectly. Originally they had trouble machining the discs and maintaining the thickness accurately, now Tony gets them laser cut from a sheet of the right thickness, a process which causes no distortion and this has solved the problem.

Fournales suspension legs are used, one on the front wishbone, giving a rising rate front end, the other mounted conventionally on the swing arm, the rising rate coming from the unit's own progressive



The RS36 carbs gave more top end power but the smoothbores were better in the midrange. The rim-mounted front disc suits this chassis layout perfectly.

action.

The distinctive glass fibre bodywork contains the fuel tank, electrics and, the final innovation, liquid crystal instruments with a coded control system. There is no key, and no switches — apart from an indicator and horn switch on the end of the handlebar, plus a starter button. In place of the usual ignition and lighting switches, there is a numeric key pad. A four-digit code activates the electrics; individual numbers switch on lights, switch them off again and kill the ignition.

The Q2 contrives to look and feel a lot bigger than it really is. Tony reckons it is lighter than the standard GSX-R, although the aerodynamics are not as good. Its steering is, if anything, a shade too heavy but it is completely stable; we ran it up to 150mph without any problems.

The biggest drawback to this layout, especially with the near-vertical hand grips, is that the riding position is critical. If the position isn't exactly right then it emphasises the heavy steering, makes the machine less comfortable and less easy to control at low speed.

Built for owner, Steve Dyer, the riding position was too upright for me and the bars were set at the wrong angle which made low-speed steering and throttle control a bit awkward. It also caused wrist-ache after a few minutes' worth of low speed circling.

The only other problems which showed up were the sort of detail niggles which you'd expect with a one-off development, and which shouldn't be too difficult to sort out. For instance, the throttle action was too long and too heavy which was aggravated by the angle of the bars. This could be changed pretty easily by using a larger diameter twistgrip and fitting a closing cable, so that lighter return springs could be used. In the same way, the feel from the front brake lever could probably be improved by altering the angle of the lever; the power from the front disc seemed pretty good, with minimal dive at the front.

There were also a few problems with the fuel pump and tank breather which Tony plans to cure by fitting smaller needle valves into the carburettors and re-routing the breather pipe.

A clever part of the design is that it can be adapted to a variety of power units. When I took the GSX-R back, Tony was working on a BMW K-series, a TZ Yamaha and a couple of in-line fours. Steve Dyer had chosen the Foale after he rode the standard bike down to the south of France and found it too uncomfortable. He'd obviously been attracted by the looks of, and various reports on, Foale's machines and presumably reckoned that this extra degree of comfort and manageability could cope with more power than Suzuki had provided.

While the chassis took form in Foale's workshop, the engine was delivered to TTS with instructions to liberate more power.

Using their experience with Andy McGladdery's racer, TTS added the appropriate parts; acccording to their Superflow dyno, it gives a maximum of 149bhp. We have run a GSX-R with just over 130bhp and, once we'd got the gearing right, it topped 170mph. An extra 15 to 20bhp would be good for about 178mph. (See page 34).

We had two attempts at top speed runs. On the first occasion, mindful of blowing up someone's engine, I kept the engine at least 100rpm short of the redline. The speeds were very low; we went away muttering about gearing and tyre sizes. Tony had, in fact altered the gearing to compensate for the 16-inch rear wheel; where the engine peaked at 10,800 rpm, it was geared for 180mph. It began to look as if the tacho was reading seriously high. Ever confident of their engine, Paul Langley suggested we took it back, ignored the tacho and ran it into the rev limiter.

On the day it was raining and just about dark by the time we got the Q2 to the strip. Shifting up at the rev limiter in the gears, it pulled 151mph in top; considering the weather and the fact that I had to sit nearly upright, partly because of the riding position and partly because of the visibility, this wasn't an unreasonable performance. It compares to a sitting-upright speed of 139mph on the stock GSX-R. Given that the aerodynamics aren't as slippery as the original Suzuki, then the Q2 is overgeared; in better conditions it probably has the potential for 160mph or a shade more. Enough, I'd have thought, for both posing and for maintaining a reasonable cruising speed along the autoroute du soleil.

JR

Prices inc VAT

Q2 rolling chassis (depending on detail spec).	£6,000
Carillo rods	£480
Cosworth pistons	£320
Megacycle cams	£265
Mikuni RS36 carbs	£390
VM33 smoothbores	£340
Vance & Hines exhaust	£240
Work on ports	£160
Engine build (with rods)	£200
(top end only)	£85)

The engine

When the 1100 first loomed on the Wellingborough horizon, the sky was dark with conrods still falling from the 1985 GSX-R750s. Suzuki had, in fact learnt the lesson and rod failure is not commonly associated with the big GSX-R. There was no way of knowing this at the time, and with thoughts of cams to push the rev ceiling up, lots more power and the possibility of the occasional missed gear, a set of Carillo rods seemed like a good investment.

That involved a rebuild from the crankshaft up — some investments are expensive — but produced a bottom end which is safe to 13000. Paul even managed to sound totally confident when he later told me to ignore the tacho and let it run into the rev limiter.

Cosworth pistons, giving a compression ratio of 12:6:1 were used, keeping the standard bores. They match the heads to form a combustion chamber which will burn ordinary four-star without knocking, even at this elevated compression.

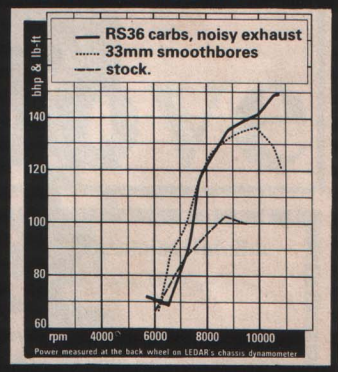
TTS decided to keep the standard valves and springs and simply "cleaned up" the cylinder head, relying on the Megacycle cams to get gas flow at the high engine speeds. These are the stage 1 cams, there are more violent profiles available, but these shift peak torque up from 7500 to something in the region of 8800rpm. More to the point, they don't let the engine get peaky, there's a wide spread of usable torque and it can be trickled about at low speed as easily as the standard 1100.

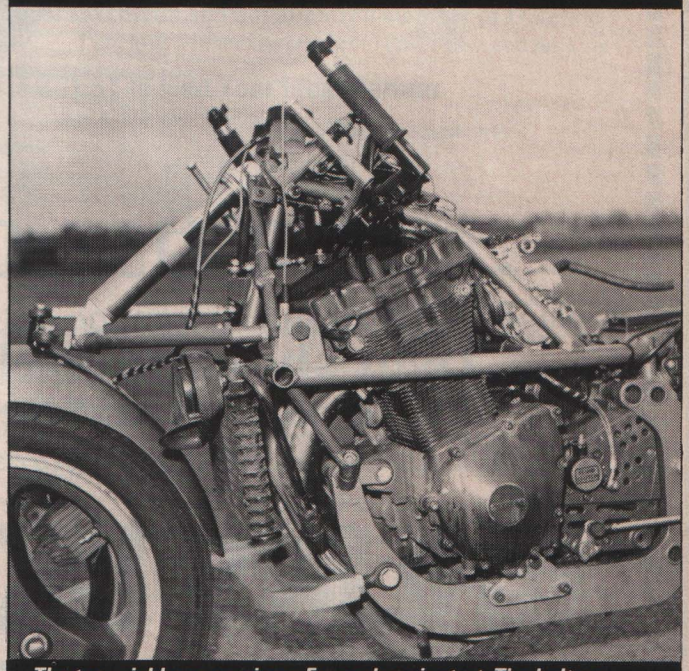
The Suzuki seems to be restricted in both its intake and exhaust, at least it responds quite gratifyingly to changes in these items. When the engine was first built, the new RS36 carburettors hadn't arrived from America and TTS fitted Mikuni 33mm smoothbores instead.

Vance & Hines make a 4-1 exhaust which seems to work well on the Suzuki and it comes with a choice of three baffles, in decreasing levels of noisiness. For road use, Steve had chosen the quietest of the three.

Thus, the lowest state of tune — 33mm carbs, quiet exhaust — makes the engine behave like a very cammy motor. It gains at peak speed, but loses everywhere else. Once the exhaust restriction was removed and the noisy baffle fitted, the motor produced a full power curve, gaining power everywhere above 6,500rpm.

The RS36 carbs make this effect more pronounced, giving less in the midrange than the 33mm smoothbores, but sailing on to a much higher peak — 149bhp with the noisy exhaust, as opposed to 137bhp when the smaller carbs were used.





The top wishbone carries a Fournales air strut. The bolt-up construction allows alignment without exercise jiggery. The buttons on the handlebar ends are indicator switches.