

# YOU CAN TEACH AN OLD DOG NEW TRICKS

Words: **Glen Williams**



**O**ur local road-racing contributor **Glen Williams** had another great season in 2012, securing his fourth NZ title in the Superlite (formerly F3) class. He puts down much of this year's performance to his new front suspension setup which required a 'clean sheet of paper' approach and enlisted the help of Öhlins NZ to help steer him through the murk.

I made a decision late last year to try and solve an inherent handling issue that I had with my Suzuki SV650 based race-bike. The front suspension system has always required a slightly compromised setup in respect of its fork spring needing to be overly soft to help the bike turn into corners, and stay what I call 'nose down' mid corner. The downside of this is it required me to run a firmer than normal internal valving setup with higher oil levels to prevent the front-end from bottoming out under heavy braking loads, which in turn created poor mid-corner bump compliance and loss of front end feel.

**What to do?** First on my wish-list was to start with a clean sheet of paper and take the problem up with suspension gurus Robert Taylor and Dennis Shaw from Kiwi Suspension Solutions in New Plymouth. A phone call and a few emails later the 'Doc' and his crew came up with a cunning plan that was a large shift from where we were at, yet had some merit in its simplicity.

## STEP BACK AND LOOK

The basics of the solution came about by KSS reviewing, step by step, a list of facts that are specific to this particular motorcycle.

1. The bike is quite light overall (the actual weight is a closely guarded secret... not really).
2. Even though the bike has a custom made chrome-moly frame with optimised engine position and weight distribution over the stock frame setup, it still suffers from the inevitable 90 degree V-Twin problem of the engine being too far back in the frame. This is caused by the front cylinder that pokes out toward the front wheel requiring clearance for the front wheel; hence it sits further back than ideal.
3. The bike runs lightweight carbon-fibre wheels and when these are combined with the minimal front weight bias it has the unusual effect of making the front end quite sensitive to sharp bumps.

In a turn of pure irony KSS reckoned that one way to compare this bike's traits was to view it as the exact antipathy of a bike with relatively heavy wheels, such as a cruiser.

Robert Taylor comments, "We re-spec the internals of more Harley-Davidsons than we can poke a stick at. Stock standard they blow through their stroke too readily due to that big lump of metal (the engine) being very heavy and also because of the lazy fork angle that affords a steering radius and response akin to SS Titanic. So a reasonable amount

of low speed compression damping control is required where there is none to write home about. But, in deference to what is first thought, these same forks require extremely fast rebound damping because there is a lot of weight pressing down on the front end, slowing down return speed. Regular rebound force calibration on these behemoths will make the fork action lazy, non responsive and harsh.

Using that analogy the SV650 is a polar opposite, it has no weight on the front-end and therefore with regular rebound force calibration will rebound way too fast. So they need a relatively stiff rebound stack. Also, of course, for road racing the compression valving has to be stiff enough to give excellent brake dive resistance and chassis pitch control. If the compression valving is not stiff enough the instinct of the rider/tuner is to close in further and further the compression clickers to compensate, but this proves to be a very poor trade-off as the bypass bleed becomes so restricted and non responsive that it takes away edge grip and feel. That's doubly bad on such a bike with poor front end weight loading (at least for road racing). These are a difficult bike to get right and the cold hard truth is they are manufactured as a commuter bike and never intended for racing."

## BACK ON TRACK

All good in theory and commuter bike insult aside, we had limited time to test the idea

and a national championship to take on, so it was a quick decision to get on with the proposals. Sometimes the risk of making large setup changes like this are very real in that there is a good chance that you might take a step backward initially in the hope that you find a new direction.

So it was that we arrived at Hampton Downs in December 2011, the day before the Suzuki Tri-Series began and with a few weeks to go until the National Road Race Series kicked off, with a completely new to me front-end suspension system and with the kind and confident words from KSS quoting "what could possibly go wrong!" echoing in my ears.

I would love to say that I returned to the pits after my first session with a lap record under my belt and new-found front-end mid-corner confidence, but that wasn't the case. However we did achieve better brake dive resistance, allowing later braking points to be used. Yet we were still suffering from the harshness mid-corner over bumps, and also during the moment of transition during quick direction changes such as occurs through the esses between turns 2 and 3, the bike felt quite vague.

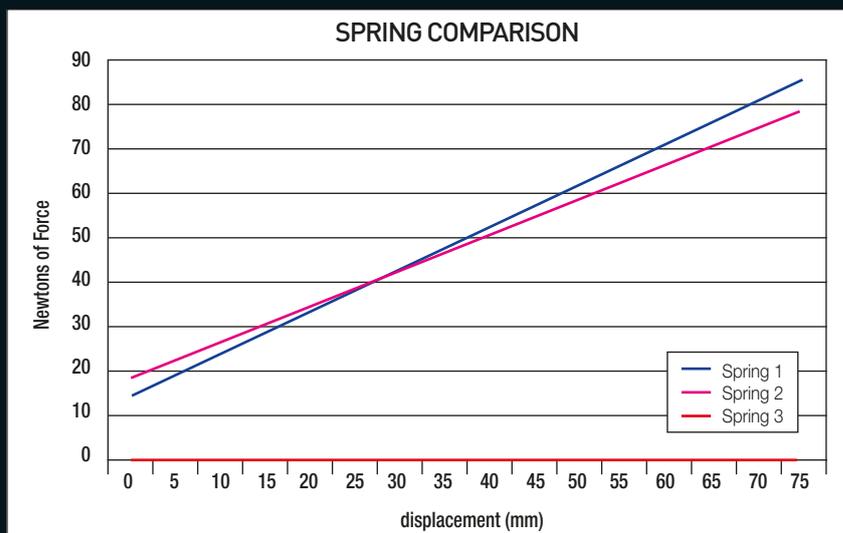
This set of problems highlighted an issue with my own psyche and showed up an example where a rider 'thinks' they know what they need, only to be rebuffed by a technician to tell you that's not the case. Now I like to think I get things right with bike setup more often than not, but my request for a softer compression setting was kindly refused. I was sat down in the little blue Öhlins trailer, plied with coffee and the KSS boys both took ten minutes out of their busy schedule to explain



Dr Bob



A happy Glen



why they wanted to go harder with the valving stacks, not softer. After our informal chat I was 50/50 on the solution offered but figured 'what the heck' if they are wrong it's only going to cost me one test session and then I can have the pleasure of telling them they were wrong and I was right! (Always a pleasurable thing for an old dog.)

### I'LL GET MY COAT

Unfortunately I have a favourite saying which I repeat to myself when working on bike setup issues. That saying is 'the stopwatch doesn't lie', and in this case I had to listen to my own advice, as whilst the bike in the very next session felt much the same on bump compliance - the reality on the stopwatch was that I had shaved almost three quarters of a second off my lap-time. Humble pie had been served, and it was immediately obvious that now we must continue to go even further along those setting lines until the stopwatch went the wrong way.

Robert Taylor commented, "With many suspension tuning scenarios we hear 'it's too stiff, make it softer' and in part to satisfy our often warped humour we may respond, 'Okay, let's make it stiffer to make it feel softer!'

If we take the example of humble fork springs alone - fork springs that are too soft in rate will usually be preloaded a lot by the rider in a futile attempt to gain some vestige of chassis pitch and brake-dive control, but over-preloading of soft springs will give so much initial spring force (not to be confused with spring rate) that the fork will feel harsh and will top-out too readily. Yet, later in the stroke the springs are still soft as the ramp-up in spring force is a relatively slow slope angle. Firmer springs with much less preload will, in fact, deliver a more compliant and responsive initial ride quality but will also have a more aggressive ramp-up in spring force later into the stroke, delivering the pitch control

required. In all fairness, the selected spring rate and preload must also act in combination with oil level and therefore the 'secondary trapped air spring compression ratio'.

Dr Bob - "Similarly, it is important that the valving is also suitable and this is more about what we were talking about with Glen's commuter bike that took a wrong turn to a race track. If the compression valving is too soft then the forks will be too easily predisposed to blowing through their stroke. Damping is all about controlling rate of change of position, so if the compression damping is too soft the forks will arrive at the more compressed part of stroke too readily, compressing the main fork springs and also the secondary trapped air springing, making them feel harsh. Therefore if we have more initial low-speed compression damping, the forks (or shock) will more readily stay up in their stroke - in the more supple area of the main spring and secondary trapped air spring pre-compression.

This is what we were trying to impart to the biological component (Glen). While we got a result that enabled securing of another title there is little doubt that with a lot more testing we could yield a much better result. But, as ever, time constraints are the curse of any suspension tuner."

The upshot of all of this is we ended up with a more stable and safer bike to ride fast on - and it was a worthwhile exercise to go through, if not only for realising that no one knows all there is to know, and once you have gone as fast as you think is possible, it's time to go faster again.

It also showed that whilst motorcycle racing is not only a tough personal test of bravery and commitment, it also requires that you keep a clear and open mind to new ideas and trust in people that can help you along the way. This old dog got taught a lesson - and I am happy to have received it.