

MAN BITES

# DOG

Continuing the KR tuning saga. The Dog finally gets on to the rostrum, sprays the assembled multitude and meets some serious greyhounds. If you want 43 horsepower, fit the KIPS valves the wrong way round. If you want to get 60-odd, read this.



To be in the middle of this lot you need about 60bhp and a pre-frontal lobotomy. Without surgery, 66bhp helps. To be in the middle of this lot going sideways requires something else altogether.

## TUNING THE KR-1

The KR-1S comes with a 136mph top speed fitted as standard which suggests that it won't be the easiest thing in the world to tune any further. It is also carb restricted which is especially serious in Supersport trim where you are not allowed to change the carburetors. And it turned out to be restricted by its ignition and to some extent by its engine

build precision (or the lack of it).

We say this because it has 28mm carbs compared to the 34mm items used on the RGV. It is not, however, the whole truth. A reader wrote in to say he had dynoed his KR-1S with 38mm carbs and Fems ignition and couldn't measure any difference; therefore it wasn't restricted by these parts. No, it's more subtle than that.

Everything in the KR motor is cleverly matched to everything else, so nothing restricts it and everything restricts it. It makes tuning difficult because, if you change one thing then you have to change everything else to make the most of it. The way the engine responds to modifications confirms this. It is sensitive to small changes in port size and each increase in power is accompanied by a severe narrowing of the power band. All the port sizes and shapes have to be carefully worked in unison to keep a useful spread of power.

The small carburetors actually offer some compensation here. Because the air flow through them is so high they work very efficiently and it is possible to get fairly crisp running over a wide range of engine speed.

Using exhaust pressure waves is one way to boost performance. The thinking is that it creates low pressure to scavenge the cylinder when the port opens, creates low crankcase pressure just before the reed valve opens and produces high pressure before the exhaust closes in order to trap more mixture inside the cylinder. The points at which the exhaust and transfer ports open and close in relation to one another determines how well this works. If it works at one speed, there will be other speeds where the pressure waves get out of step and cause a drop in gas flow: the longer the ports are open, the more chance there is of this happening.

Yet the ports need to be bigger/open longer to shift the same amount of gas in the smaller time interval when engine speed goes up; this means a greater possibility of losing fresh mixture into the exhaust, so the angles and directions of the flow from the transfers becomes particularly important. The resonances only work in a narrow speed range and if the scavenge streams lose mixture into the exhaust, this stands out as one narrow peak of torque, with low torque either side of it. This is relatively easy to achieve, filling in the torque around the peak is the hard bit.

Having got the mixture in and trapped as much as possible in the cylinder, it only makes sense to extract the maximum from it. Here we run into the ignition system. This seems to be very borderline and varies from one CDI box to the next. Increase the demand on it by trapping more mixture, compressing it further or giving it less time to accomplish the task and it doesn't quite have the energy to deliver the goods.

We're not sure if the weakness is in the CDI, a lack of copper in the coils, in the way the signal is produced or a combination of the whole lot. The evidence that there is a weakness is that when tuning modifications have no effect, the torque or revs do go up if the ignition energy is increased (even by small amounts like closing the plug gaps, the pulse generator air gap or by larger amounts like increasing



Here's a bike firmly strapped down with some big pipes attached to it to teach it a lesson and provide us with information upon which we can act and exploit the poor little bugger further.

the current dumped through the CDI unit, a modification about which, regrettably, we're sworn to secrecy.) On top of that, three of the bikes featured here have had stator winding failures in their short lives.

If the ignition can cope with it, raising the compression will extract more power from whatever fuel has been persuaded into the cylinder. It will also lead quickly to detonation, especially if, as Supersport racers must, the motor is run on 100 RON unleaded fuel. The problem seems to be in the shape at the edge of the squish band. Apart from the fact that the head chambers don't always line up with the bores, the gaskets have a bigger bore and leave an odd-shaped pocket of gas all around the edge of the piston. If the squish band is the wrong shape then this pocket gets left and detonates. The trick is to get the right shape and clearance so that this doesn't happen; various tuners use equally various methods with varying amounts of octane and success — see below.

Having improved the combustion it would be logical to optimize the ignition timing, presumably by retarding it. This is not made easy by the way the pulser coil is mounted. What would be nice is a different CDI unit which altered the advance curve and switched the KIPS motor at a higher speed, so that it would tally with the effects of a taller main port.

Careful building can be worth much on this motor as the standard machines seem to vary quite a lot. A good oil is essential — not only for load-bearing qualities, but one which doesn't have any bad effects on combustion. The favourites seem to be Motul 800, Silkolene Pro-2, Castrol A747 and Putoline MX-5 or its successor.

A look at the race kit is always a good way to find out what is necessary/what isn't/where the weaknesses are and KHI produce four kits in Japan, ranging from SP up to F3/open class.

As a guide to how little porting is necessary, the kit simply raises the barrels 0.76mm, and takes the same amount from

the top to preserve compression/squish clearance. The KIPS valves have one side cut away not, we think, to improve gas flow but to make sure that the port does fully open if the linkage is set a bit lopsidedly. The CDI box and generator are replaced, along with the exhaust system and, on the full race kit, the carburetor. As an indication of what this does to the power band, a close ratio gear cluster is included.

The engine's weaknesses, not counting detonation, are piston ring pegs coming loose (exacerbated by wide ports, large piston clearances, hard revving from cold, over-revving and detonation), assorted ignition/generator failures and people assembling the KIPS linkage the wrong way round.)

The only remaining items are the exhaust and intake systems. As the stock carbs are on their limits, anything upstream is not likely to make too much difference and, apart from making the airbox intake unrestricted, there is not much to be gained. It also means that the engine isn't too fussy about trumpet lengths. Where exhausts are concerned, it is difficult to get more power than the standard items but it is possible to shift the power around to suit new porting or just to let the motor rev out further. There are gains in weight, as the stock pipes are double skinned and heavy but it is tricky to get the chambers tucked in well enough for cornering clearance.

To see the effects of all this, we tested two exhaust systems on a virtually stock engine, plus six other bikes from four different tuners, giving increases from 9% up to 22% above stock.

There will probably be a lot of riders and tuners who will see this and think *my KR revs a lot further than that...* in fact most of these bikes were showing tacho readings approaching 13,000 and the instrument error varied from a few hundred low to 1,500 high at 10,000rpm. All the figures here are true rpm, taken from the dyno's rev counter.

Pics: Kenneth P and Philip M



# DOG

## GIBSON EXHAUST

Developed by Chris Noble, fabricated by Peter Gibson, comes with either alloy or (expensive) carbon-fibre cans. They are light and did a season on the Wheelpower bike with no ground clearance problems. Stephen Marlow managed to ground them on his KR, which is more of a reflection on Stephen's lunatic tendencies. To be fair, the cans could've been pulled in a bit tighter.

They had been developed on the racer, which peaked at about 11,500rpm, yet they worked well on the nearly-stock bike



Peter Gibson's hydraulically formed chambers work as well on a stock bike as on the Supersport racer (see graph on opposite page).

where they gave more torque but pulled peak speed down to 10,500. As a result they gave a good increase in torque and power between 9,500 and 11,000rpm. Above 11,000 they give a touch less power but don't drop off so quickly as the stock pipes. A road bike could probably pull higher gearing on these pipes with no need to run it round to the red to get at the performance.

The 8,000 to 9,500 range isn't as good as the graph suggests. It's just the computer joining two points on the graph.

In between the two the dyno couldn't hold the engine steady enough to get a reading. The rider would feel this as a surge of thrust as the motor rushed on to the power band. Mallory's hairpin and awkward bus stop proved that there were no problems in driveability or throttle response. Stephen said the motor would pull evenly all the way through, with no steps or flat spots.

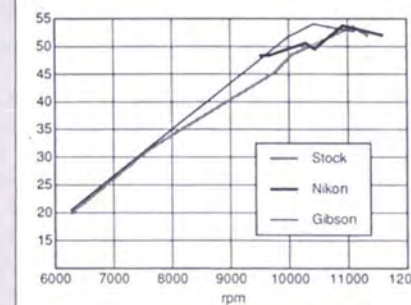
£325 inc alloy cans. Carbon fibre cans £75 each. From Peter Gibson or Development Services (see page 48).

## NIKON EXHAUST

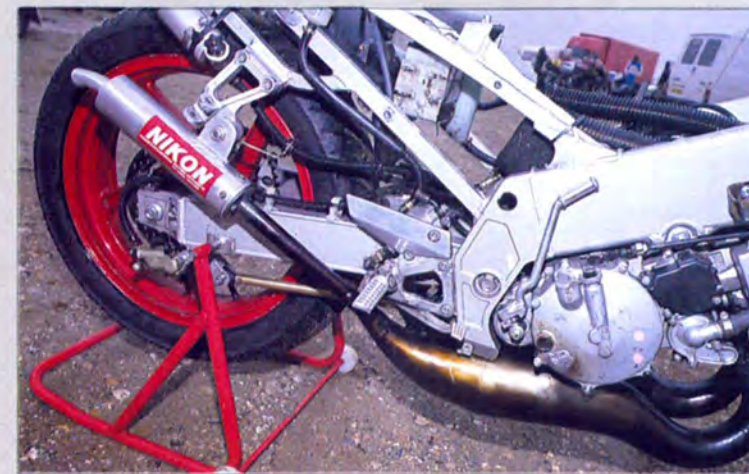
A good example of the difference an exhaust can make; it gives within a gnat's of the Gibson pipes, but produces a completely different torque curve (on the same engine). You can't say one is better than the other, just that they are different. From 9,500 to 10,500 there is strong torque (below 9,000 it was the same as the Gibson system, rushing

in so hard the dyno couldn't hold it). From 10,500 on roughly the same as stock but doesn't let the load drop off so quickly and lets the engine rev out a long way further. So while peak power isn't quite as high as peak on the Gibsons, the Nikons give more above 11,000.

From an engineering point of view, there is less area under the graph the Nikon doesn't do so well. From a rider's point of view it extends the usable rev range and would probably be less critical of gearing and gearshift points. Stephen confirmed this in a race at Snetterton (finished



Gibson and Nikon exhaust on the near-stock Dog. Changes in the shape of the power curve rather than sheer power.



Imported Nikon's let the motor rev out and made it less sensitive to gearing.

second) and the Mallory practice day. Here the bike had been geared for the Gibson pipes, yet on the Nikons it was lapping slightly quicker. Driveability wasn't so good, with a noticeable step coming on to the power band, but the motor revved out more cleanly along the straights.

The Nikons are light and cheap but grounded more easily than the Gibsons and also touched the bellypan, though they could probably be pulled in closer.

£180 — from F Yourell, 2, Arundel Road, Luton, Beds, LU4 8DY, (0582 584188)

## STAN STEPHENS

Stan sent three bikes: for the test, first a KR-1S with a Supersport tune the same as any customer would get and which he lends out to promising riders (but he didn't say *what* they had to promise). Second the KR-1S he prepared for Max Vincent, who finished 5th in the Shell Supercup series and was always the first KR home. This is the same spec as the first, but *fettled*. It's had hours of extra work, matching this, blending that, making sure that nothing could possibly obstruct the efficient production of power. It's the difference between a production racer anyone can buy and a works motor. It actually gave a touch *less* power than the first one, but the shape of the power curve more than makes up for it. And Max, despite his banzai riding style, is intelligent enough to appreciate this and make use of it.

Third we have an elderly KR-1 which "was always a quick one" but was also on a brand new set of Nikasil-ed bores and new pistons.

**KR-1:** in its previous life it used to run cheerfully to an indicated 13,000. Now it stopped dead at an indicated 11,500. This turned out to be 10,200 in real life but it was still 1,500 revs short of its target, though up to 10,000 looked promising. Stan put this down to the new barrels; the Nikasil layer is so hard that he usually fits new rings after the break-in



Man on a black Norton and man called Vincent on KR1-S go over the bumpy bit at Cadwell.

period (this motor hadn't had any). **Barrels:** exhaust boost ports enlarged, transfers are raised and re-angled, backs of barrels shortened to improve intake flow, path to transfer entries is streamlined. Standard pistons. **Heads:** machined and squish area reprofiled with 0.035 inch clearance but the shape is more important to avoid detonation around the edge of the piston.

**Ignition:** standard B10EV plugs. Stan aims for the highest compression and weakest mixture the stock ignition settings permit. **Bottom end:** much work to flow gas towards transfers instead of at the flywheels; standard crank, lightened generator flywheel, no balancer shaft. Standard reeds, opened-up stops. **Intake:** lid off airbox, 145 main jets, larger pilot jets to improve initial pick-up.

Unleaded fuel 46:1 with Silkolene Pro-2. **Exhaust:** standard with carbon fibre cans for no reason in particular.

**KR-1Ss:** both bikes are the same basic spec, with a few detail differences and much more attention to Max's. **Barrels:** enlarged boost and main ports (max width 38mm, 1mm short of usual limit) uses last square mm of transfer area for the best spread of power, being particularly careful with the angles of flow. Port timing slightly less extreme on Max's bike (less peaky — standard gearbox) and Stan has taken ages over getting the transfer streams equal and symmetrical. **Heads:** similar to KR-1 but lower compression. Max's is lower still. **Bottom end:** much removed from

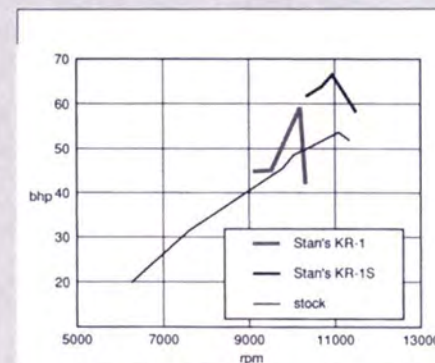
crankcases to improve air flow; Stan says this softens delivery and gives a better spread. Standard crank and balance shaft. Reed stops opened to 12mm; plastic fillers and carb rubbers all matched carefully (*exactly* on Max's). **Ignition:** lightened flywheel, removed charging/lighting windings (battery-driven KIPS), stock CDI, coils and timing, B10EV plugs. **Intake:** Stan insisted we measure the carbs (both 28.4mm). Lid off air box, 145 mains, pilot jets two sizes up. BP 99RON unleaded with 46:1 Silkolene Pro-2. **Exhaust:** standard minus the double skin (saves weight), TZ silencers. **Other:** Max has a stock gearbox, the other one has a close ratio 5th and 6th. Max has been running KR-1Ss for two

years and hasn't had a mechanical failure yet.

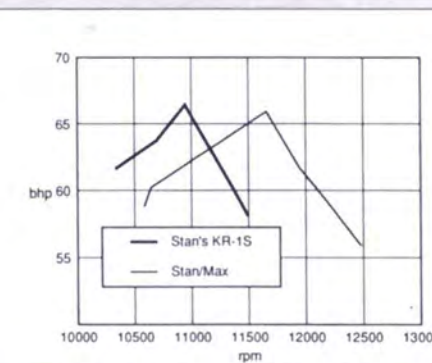
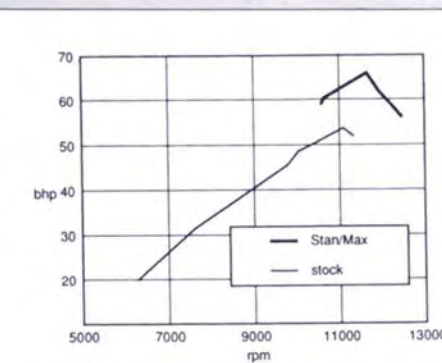
### Tariff inc VAT

Modify heads and barrels	£176.25
Nikasil bores	£81 per barrel
Modify crankcases	£82.25
Lighten flywheel	£23.50
Modify electric	£76.38
Modify reed block/rubbers	£47
Close ratio 5th and 6th	£146.88
TZ cans	£35.25 each
Strip/rebuild inc fitting gears	£146.88

Contact: Stan Stephens, 6, Portobello Parade, Fawkham Road, West Kingsdown, Kent (047485 4331)



Stan's KR-1S gives 66.4bhp with a reasonable power band, Max's version gives 65.9bhp with a much more usable spread and revs out further. The KR-1 starts off along the same sort of course but something stopped it just above 10,000, where it normally revs on to 11,500.





# MAN BITES DOG

Twistgrip's machine uses Terry Shepherd barrels and is tuned for rideability and reliability rather than vicious top end.



## CHRIS NOBLE

Chris developed the motor used in the Wheelpower bike raced by Sean Emmett and Rhys Boyd and supplied a lot of the background for this article. The Gibson pipes were developed on this bike too, giving a flexible spread of power and a useful increase everywhere. The technique is fairly conservative: conventional tuning plus a lot of detail work to blueprint the motor and minimize losses.

**Barrels:** not as radical as you might think. Chris reckons porting can be critical to within 0.010 inches. On transfer ports, the angles of the gas streams are the important bit. Getting it right widens the power band and lessens risk of detonation. All three exhaust ports are enlarged, plus the passageway in the KIPS valves (needs some care or the narrow wall between the ports distorts). Barrel bottoms smoothed to improve intake flow, balanced pistons, skirts matched to bottoms of cylinders. Piston clearance (stock is 0.046 to 0.056mm):

cylinder code	A	B	C
bore 56 +	0.020 to 0.025	0.025 to 0.030	0.030 to 0.035
piston code	A	B	C
diameter 56 -	0.010 to 0.015	0.005 to 0.010	0.00 to 0.005

**Heads:** 0.026inch squish, and profiled concentric with the bores, being careful to remove the recess which forms at the edge of the bore and to angle the squish face at 13.75° — slightly more than dome of piston. The radius at the end of this band can be critical. Most of Chris's

engines have been built with detonation rings in the cylinders and bronze head inserts to prevent the chamfer and overlap at the edge of the head leaving a gap.

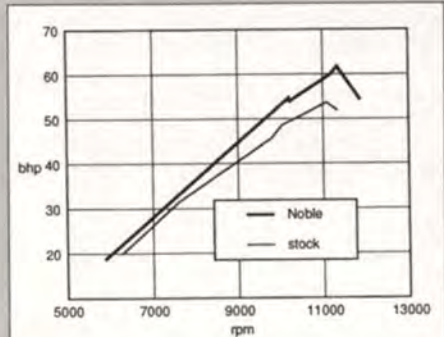
**Bottom end:** checked and trued crank, balancer in place. Chris warns of vibration breaking engine mountings if the balancer is ditched. Crankcase deburred and generally smoothed out. All generator poles removed bar the ignition circuit. Total loss battery for the KIPS.

**Ignition:** the CDI is modified and uses B10EV plugs with standard timing.

**Intake:** front left on airbox, with a shield between it and the tank to seal the intake from the engine area. Standard bellmouths, turned 90° to face away from one another, Dynojet kit (165 mains, needles one notch weaker than stock. Jets have to be filed as they foul the float bowls). Unleaded Reference Fuels 99RON with 40:1 Castrol A747.

**Exhaust:** developed for this engine, made by Peter Gibson with alloy or carbon-fibre cans. Works well on standard engine.

**Other:** much attention to detail, e.g. balancing pistons, matching/blending transfer ports, removing moulding flash from water pump impeller, cutting down water pump gears to 6mm (removing the bit that drives the oil pump), removing thermostat to take load off pump, etc.



Another 8 or 9bhp with the best part of a thousand revs more, plus a wide power band.

**Tariff inc VAT**  
 Exhaust system inc alloy cans £325  
 carbon fibre cans £75 each  
 Engine build to this spec (Supersport) £300

Contact: Development Services, Unit 15, Halesfield, Telford, Shropshire (0952 595368).

## TWISTGRIP

Ridden by Francis Williamson, prepared by Twistgrip, uses Terry Shepherd barrels. It too fell foul of the Kawasaki ignition problem. As the graph shows, it gave a steaming midrange and was shaping up for a good top end when it stopped dead just above 11,000. The motor usually went a lot further than that. Twistgrip changed the CDI box but it still wouldn't rev.

**Barrels:** a fairly mild porting job for flexibility rather than top end. TZ single ring pistons modified to Kawasaki profile and dimensions; they may give less ring friction at high speed, and their pegs definitely don't come out.

**Heads:** machined and reprofiled slightly to raise compression as far as fuel and stock ignition timing allow.

**Intake:** half the lid off the airbox (gave the best range of power), main jets and needle positions altered. Super Unleaded pump petrol mixed 40:1 with, originally Putoline MX-5, later with prototype Putoline which will supersede MX-5.

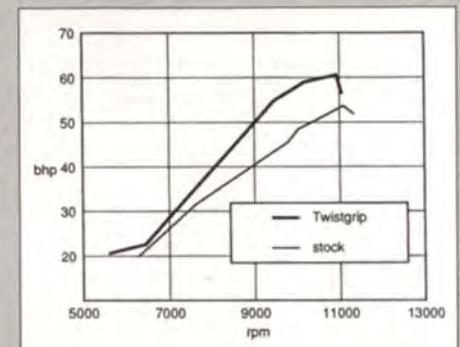
**Ignition:** standard generator throughout.

**Exhaust:** standard pipes, TZ cans (though they made no difference).

**Other:** motor blueprinted by Twistgrip

**Tariff:** Twistgrip keep a full range of KR parts and offer a postal service. They also do complete machine preparation.

Contact: Alan Cooper at Twistgrip Motorcycles, 18, Radford Road, Nottingham, NG7 5FS (0602 702439).



Very strong from 9,000 through 10,500, something (probably electrical) held the motor back at 11,000 — the load dropped rapidly and it wouldn't rev out.

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## THE LAZY MAN'S WAY TO A MILLION

Millionaires are among the most successful people in the world but their success ideas have always up until now been the most closely guarded of all secrets. One thing is for sure however, THEIR HIDDEN SECRETS MAKE THEM MILLIONS!

Two and a half years ago I became friends with a retired self made multi millionaire. He was thirty eight years old and drove a Rolls Royce Bentley Turbo. As a contrast, I was 25, down on my luck, and going nowhere. I was in a hole and financially embarrassed.

Today things have changed. I now own a portfolio of investment properties, drive a BMW Sport and control a group of successful companies. As well as enjoying at least three holidays a year at my own private villa, if I work three days a week then I consider myself busy. In under 3 years I have gone from being nearly broke, to becoming a wealthy man.

**WHAT HAPPENED TO CHANGE MY FORTUNE?** Let me tell you. When I first met my friend, his success puzzled me because he seemed to spend more time on holiday than he spent at his office. Yet he was making a fortune! Due to his wealth and the fact that I was no threat to him, he agreed to teach me his methods for making money. He showed me a system that he had used for six years. He told me that if I followed his system then I would be GUARANTEED to make a fortune, more money than I had ever dreamt of. It sounded so simple that at first I dismissed it. I thought that if it was that easy then why wasn't everybody doing it? I did nothing, until about a month later when I realised that I still wasn't making any money but I was a month older. I then started to think again about my friend's Rolls Royce, his mansion and his lifestyle. The mere fact that all he was asking me to do was to try his system was enough to spark my curiosity.

**THE RESULTS WERE AMAZING!** Within seventeen days I had made £5,600. The next month I doubled that amount, and the month following that I gave up my full time job because I knew that the money that I had made was obviously no fluke. Now I work one week out of four and live in luxury. I earn more money in a fortnight than I used to earn in a year. When I was asked by an old colleague where I'd come across such wealth, I explained that the system was perfectly legal. I then outlined what he would need to do to try it for himself, bearing in mind he had no business experience whatsoever.

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"A £45,000 thank you for your system - that's how much I've netted using it!"  
 P.S. - Belfast

"I thought that at £19.95 it was nothing more than a shot in the dark and I was fully expecting to send it back for a refund - £19,000 in my first six months says that I was wrong. It's as easy as falling off a log."  
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What you do now is entirely up to you, but remember, this is not some phoney GET RICH QUICK gimmick. You will receive a practical system that will earn you a fortune! What you do now could undoubtedly be the most important thing you have ever done in your entire life. Ask yourself: "What do I have to lose?" Even if I'm wrong you've got my money back guarantee, so all you will have lost is a stamp. BUT WHAT IF I'M RIGHT? A month from now you could be nothing more than thirty days older, or you could be earning a fortune!!! It's your choice.

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