Race preparation for a Suzuki 500 - Part 2 (Note: published in 1990)

TITANING UP

By now keen readers of this esteemed page would be well aware of the potential of the trusty old Titan Suzuki 500 to make a cheap and viable Post-Classic racer. The heart of a Titan is solid gold, it is built to last and will take a heap of abuse. The combination of heaps of torque and big heavy flywheels makes it one of the fastest bikes off the line in its class. Do nothing to the motor except add chambers and the Titan will rocket away into the first corner like no other. So my advice is unless you really need heaps of power leave it stock until you crave more. So you do want heaps of power? Oh well, lets start with the porting charts.

Porting.....

This is a tricky bit and slow as you go here will pay off. Don't jump in hacking heaps of metal off with porting tools. The real techo can probably almost double the standard 47 bhp but I bet the motor will lose rideability, reliability and enjoyment. Be warned go one step at a time, cutting away little by little, each time being sure what you are aiming at with every modification.

The August 1969 Daytona Suzuki factory specs say take 5mm from the top of the exhaust port and take 5mm from the bottom of the inlet port, taking care not to break through between the 3rd and 4th fin above the exhaust port. Similar amounts are taken off each side of the ports. The result, reportedly, is a peaky motor which is not very useable on tight tracks.

Cycle World in April 1970 suggested that the way to go was widen the exhaust port from 44mm to 57mm, raise the port from 40mm to 34mm, raise the transfer port 2.5mm and lower the inlet from 105mm to 110mm while increasing the width by 4.4mm. A good deal more radical than the quoted factory specs and probably peakier as a result.

I've had a lot of success by widening the exhaust port by 10mm, from 44mm to 54mm, raising the exhaust port 3mm, from 40mm to 37mm, leaving the transfer port alone, lowering the inlet from 105mm to 108.5mm while increasing the width by 15mm. The motor is tractable, fast and eminently reliable as a result.

One of the problem areas is access to the transfer ports. If you are really clever you can cut through the cylinder casting, open up the transfer ports and reweld the cylinder again. If you are like me, you can't get to them and have to leave well enough alone. The factory recommends raising the transfers by up to 2.5mm. Clearly if you can't increase the volumetric efficiency of the transfer ports then there is little point fiddling with the inlet ports greatly. The safest part of the transfer port to modify is the bottom of the port where it joins the crankcase. Cut the base gasket to match the cut-outs and then match the transfers to the base gasket. Then carefully smooth the transfers and dress up the piston cut-out to make sure everything is a good match. Clean up and match the rear edge of the transfer inlet windows in the cylinder lining. Some tuners choose to cut out the lower edge of the inlet window to assist transfer flow, I'm not so sure that is such a good idea. Any tuners out there got an opinion?

When opening up the exhaust port aim to keep it as oval as possible. This port shape is fairly gentle on the rings provided it doesn't get excessively wide. Increasing the width of the exhaust port will normally result in a power increase from the upper mid-range to peak rpm with no noticeable loss of power elsewhere. Raising the port will always knock off some bottom end power. Below is a chart of different recommendations for port sizes. Suffice to say that the mild exhaust port height I use, combined with a wide exhaust port has proven to be a tractable beast. The latter Suzuki TR500 specs have a higher exhaust port and the motors are renowned for their peakiness.

When lowering the floor of the inlet port it is important to rework the inlet all the way back to the carburettor. Otherwise the port will not flow any better than the original port. To encourage air flow the port must be smooth and free of any obstructions. Polish the port as much as possible by hand or use a flap stick mounted on an electric drill piece.

You too could be a Barry Sheene on the race track with this porting!

Comparison chart :

the following list of recommended porting arrangements will give an idea of the different approaches tried by various sources. You will note that the porting I use is not all that radical which indicates that when I want to I can still extract some more power from my machine.

H = height, measured from top lip of exhaust port to top of the cylinder lining, in mm. W = width of port, in mm. D= depth of inlet port, measured from bottom lip of exhaust port to top of the cylinder lining, in mm.

Ports	Standard barrels	1969 factory specs	Cycle World 1970	Clymer 1973	Factory specs
Exhaust :H	40	36	34	35	35
W	44	51.5	57	46	51.5
Inlet: D	105	110	110	109	108.5
W	44	48	48.4	44	48

Ports	Ron Grant	Pal & Panther	My race motor	old reliable
exhaust: H	35	34	37	37
W	55	48	55	54
inlet : D	105	107	108.5	108.5
W	47.5	57	60	59

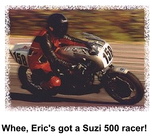
Kevin Schwantz was a nobody until he followed the advice on this page!

An Exhausting Topic

The exhausts are probably the most critical element when it comes to power tuning a two-stroke. Many shortfalls of porting can be compensated by tuning the pipes to suit. There are a number of sources of expansion chamber for the T500. Swarbrick Racing in London does a nice set (for you) at a very nice price (for them). Kiwi John Woodley is happy to supply you with a set of impressive looking chambers for a TR500 for $800. They look good and go well so if you are interested you can order them through Powerflow in Geelong. If you are desperate you can use ex-road chambers, such as J&R, but expect only minor improvements in performance with a race-ported motor. The basic TR500 design looks archaic and is archaic; but it works well, sounds good and accommodates a vast range of tuning stuff-ups. As I am not after absolute power; but seek reliability, tractability and improved performance all in the one package, I am happy with a set of pipes which not only look appropriate to the time but do the job well. The only drawback is the length of the pipes which makes the fitting of an after market silencer difficult .

69 factory specs		My spare pipes		70 factory specs		Ron Grant 69		My race pipes	
length	diameter	length	diameter	length	diameter	length	diameter	length	diameter
150	45	170	45	100	47.5	286	43.5	190	45
275	49	200	50	250	47.5	220	43.5	230	50
320	65	260	62	70	58	280	58	400	60
32	100	90	95	320	65.5	40	100	30	100
150	100	120	110	30	100	110	100	150	100
237	86	270	110	147	100	220	86	260	90
220	23	310	30	253	87	320	34	240	25
				230	23				

Note: all measurements in mm. Diameters shown are as at the beginning of each taper. The final length of each pipe is for a straight pipe, or stinger.



Whee, Eric's got a Suzi 500 racer!

My race bikes are ported for a theoretical 8500 rpm; however one of the main factors which restrict my machines to a much lower rev limit are the expansion chambers. My current race bike has chambers fitted with dimensions which imply a tuned rev limit of 6750 rpm. This chamber design has a very long header and a long shallow taper diffuser. A long header has the effect of increasing mid- range power at the expense of a drop in maximum rpm. My spare bike fares little better, the pipe is designed for an implied limit of 7270 rpm. The header is a little bit shorter and the diffuser is also slightly steeper. This allows some more revs without taking away too much from the mid-range. Clearly the potential of the motor is not being reached with these chambers. Despite this the motor delivers an impressive turn of speed, rapid acceleration and excellent tractability. When ready I will be able to extract additional power should I feel the need. Taking the spare bike's chamber dimensions and merely shortening the parallel mid-section dimensions from 120 mm to 60 mm will give the motor an implied rev limit of 7700 rpm. Taking it down to 30 mm will lift it to 8000 rpm (based on an exhaust duration of 182 degrees). Compare this to the standard motor which was generally good for 7500 rpm and that was with standard mufflers!

Fiddle with two strokes at your own risk. Of course there are a multitude of factors involved in speed tuning a two stroke motor and I cannot cover any of them in any depth in a short article. Nor am I qualified to do so. Those wanting to calculate the optimum for their machine should consult a reference of the calibre of "Performance Tuning in Theory and Practice - Two Strokes" by A. Graham Bell, a Foulis book published by Haynes (ISBN 0 85429 329 9). This is a wonderful book by an Australian engineer and is a must for any two-stroke tuner.

Head-aches

The Suzuki 500 heads are fairly ordinary in design and the factory brought out some Daytona heads which incorporated a squish chamber and central spark plug to try and improve on combustion. There are some of these heads around; but, they seem to be jealously guarded. Some adventurous souls weld up the standard heads and cut a squish chamber out of them, at great expense I imagine. Certainly a decent squish chamber and fine tolerances will result in a power increase; however, the trade-off is in maintenance and careful assembly of engine components. The most accessible head modification to most Titan racers is to follow the factory advice and take up to 1.5mm off the head in order to increase compression. The heads I use have 1mm skimmed off them. I have another set with 1.5mm taken off; but I haven't used them yet. A higher compression ratio can increase mid-range power and widen the power-band marginally; but, there is little advantage in out-right power terms. I run octane boost to promote a cleaner burn. Pal and Panther supply me with two types which work well, Silkolene's Pro-boost (A$28/litre) or PJ-1 (A$12 a can). The Silkolene pro-boost can be used in proportions as small as 1.5% and helps prevent pre-ignition as well as give the motor a crisper feel. Do remember to tension the heads properly. Rub them down on a sheet of glass with some wet & dry to make sure they are flat. Titan heads have a propensity to crack if not progressively tightened so make sure you don't over tension them, they warp easily.

Sparks

I try to avoid running the old Titan motor. The GT500 model has a modified crankshaft which runs Suzuki's own electronic ignition which is maintenance free and can run without a battery. This "pointless electronic ignition" (PEI) system is quite adequate, uses a single coil and requires no adjustment for racing conditions. The absence of a battery is a godsend. The vibration of the motor at racing speeds combined with the weight of the rotor is claimed to sometimes result in fractured crankshaft noses. I know of only one machine that this happened on. It was not raced and is now in Darwin. In several years racing it has not happened to me (so far). For the average historic racer PEI is the way to go. Some keen individuals have mounted modified GSX ignitions on Titans; but I am not familiar with this modification. Similarly, Krober ignitions can be fitted if you have the money. I have a Femsa electronic ignition for the T500 which is rather temperamental but provides a healthy spark. Too healthy, the only time I ran the Femsa it put a big hole in a piston. The result of wrong ignition timing I suspect. If you can't find a suitable electronic ignition then points ignition can be accurately used by ditching the alternator and running total loss with a battery. You just need to keep the battery charged between meetings. Spark plugs are critical. Never run on anything hotter than a NGK 9HS or its equivalent. Pal and Panther Cycles are good enough to supply NGK B10HV plugs which retail for A$12 each. These plugs are ideal for racing with their recessed electrode and long lasting reliability. Whilst on ignitions, do yourself a favour and buy an electronic tacho which clips to the spark plug lead. I use a digital tacho favoured by go-cart drivers . It is small, light reliable and accurate unlike the cable operated tacho which lags behind the motor to the point where it is useless. The digital tachos are not cheap though! Plan on spending $150 on a good one.

Cranks

The Titan crank is heavy. Bloody heavy! The trade-off is that for normal use (read: Post-classic racing) they are trouble-free. They had better be, the huge main bearings are expensive and only available from Suzuki warehouses. Suzuki practise is to use injection oil-feed to the main bearings. So don't take the oil-pump off and rely on pre-mix in the petrol tank. If you must take the pump off to a. look like a real racer and b. because you think you need that little tiny fraction of horse-power that will be saved, then don't forget to drill some passages to feed the bearings. One mod that is popular is to machine the flywheels down to lighten the crank. If you do this it is advisable to put stuffers in the crankcase to maintain primary compression . It is a big, expensive job to lighten the crank and stuffers don't just sit around on the shelves. One alternative , if you desire a free spinning motor, is to lighten the flywheels by cross-drilling and then stuffing them with cork and epoxy resin to maintain the primary compression. Opinions vary on whether to lighten the crank or not. Some say the light crank helps with acceleration while others maintain that it makes stuff-all difference!

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