

Engine Modifications

By Rick Oliver

Greetings NC freaks!

This time I'm going to talk about tuning your grey import NC30 for more power and speed, so first we need to understand the baseline from which we are working.

Japanese legislation during the NC's production period required that 400cc bikes should produce a maximum of 59bhp and be speed restricted to 180Kph (112Mph). As you will all know by now, the speed limiter is electronically imposed and can be overridden by fitting an M-Max or similar derestriction unit in series with the ignition "black box", under the seat hump. This does not make the engine produce any more power, it simply allows the bike to reach its true potential top speed of 125Mph or so. The NC30 engine unit was designed with the brake horsepower limit in mind, and so in standard road legal trim 59 Bhp is the most that a healthy one will produce. This can be improved upon to some extent by modifications to inlet, exhaust and ignition systems to allow the engine to breathe and rev more freely, but you will always be bumping into the inherent limitations of a "designed for 59BHP + engine, and so extracting serious power increases will require the attentions of a professional tuner to carry out such internal work as porting, increasing compression ratio, changing cam profiles and fitting big bore kits. I will therefore approach the subject in two stages - the "bolt on/do it yourself" level, and the "call in the professionals and spend big money" stage.

DOING IT YOURSELF

1) Exhaust system - this is where we all start, 'cos let's face it, a standard NC does sound like a sewing machine, doesn't it? The cheapest and simplest option is to fit a "slip-on" replacement can. These are available in road legal or race types. Road versions are unlikely to show any significant performance increase, although they may sound a bit fruitier than standard. Race cans will improve performance, but are, of course, illegal for road use, so don't tell anyone I encouraged you! There is a relatively wide choice of face cans on the market - a £300 carbon fibre job won't perform any better than a £130 allow one, it just depends on how much you value the pose factor. Because the collector pipes and silencer of the standard system are all one piece, you will have to saw off the silencer to fit a "slip-on" can. Some manufacturers supply an adapter to re-fit the standard can for M.O.T. purposes, but I would suggest that, if you have an undamaged standard exhaust on your bike, you don't saw it us, 'cos they are scarce and valuable - get your local breaker to sell you one with a crunched silencer (plentiful and cheap) and use that to mount your race can on.

The second option is to fit a "half system", which uses the standard front pipes, but replaces the original collector and silencer assembly with something lighter and more efficient. As far as I know, no-one in the U.K. make such a system, but many Japanese after-market suppliers do, so lots of them come in on grey imports. I've seen at least four different versions; mostly they are all-stainless constructions, and are designed and fabricated to a standard which puts certain major British exhaust makers to shame. Shop around at grey importers and breakers and see what they have in stock - you might just buy yourself a bargain.

The final option is to fit a full race system. The only one available in the UK is made by Micron. This replaces the entire standard exhaust and is a multi-sectional job with quick release, spring-retained

joints. It is a 4 into 1 system with equal length headers (all others mentioned so far are asymmetrical 4 into 2 into 1 systems) and is therefore tuned to give optimum top end power, possibly at the expense of some mid-range. This system will give you the most peak RPM horsepower, and the more tuned your engine, the better it will work.

Drawbacks are:-

- a) You have to remove the fan assembly from behind the radiator and,
- b) The cost - nearly £800 new.

However, as I keep saying, shop around - I bought my Micron with a scratched can from the Motorcycle News classified ads. for £150.

2) Air Filter - the first thing to say is don't be tempted to remove or seriously to modify the air filter box. The shape and volume of the box are tuned to work in harmony with the carbs for the best spread or power, and removing it will radically interfere with the carburetion. Just fit a K&N filter element, which will give slightly freer airflow and also will never need to be replaced.. One small D.I.Y. which will help breathing is to re-direct the airflow into the airbox snout by cutting a window into the plate which extends forward from the bottom airbox moulding into the space behind the steering head.

If you look at your bike from the front, you will see a small plastic airscoop just above the top radiator. This directs air into the "vee" of the motor to keep the carbs cool. The plate on the front of the airbox forms the top wall of this airduct, and you will see that, if you cut it away between the moulded ribs, then the airbox intake will breathe clean cool air from under the fairing nose instead of hot stagnant stuff from beneath the tank. Pop rivet some gauze over the aperture that you've made in order to keep the flies out. It's nothing like a proper "ram air" system, but its an improvement.

3) Carburettors - Now that everything is flowing more freely, the carbs will need rejetting to suit. Without getting too technical, there are basically three overlapping phases in carburettor operation. The pilot jets and airscrews control tickover and initial pickup, the needles and needle jets cover the mid-range and the main jets take over when the throttle is fully open.

The very least that you will need to do is get the main jets right. An alternative set of needles will improve mid-range, and there is a carb slide modification which will improve the speed of pick-up.

As I mentioned in the last magazine, early (RK) Model NC30s have 110 main jets, which need to be changed for 115 front/118 rear as fitted to later models, or 118F/120R if you are using a race pipe. This is a rule of thumb guide to sizes, which you can double check by giving your bike a good flat out thrash and then having a look inside the tail pipe of the exhaust, which should be coated with a dry, coffee-coloured deposit - if it's white, it's too weak, dark brown or black, too rich. (In an ideal world, you should check the colour of the spark plugs, but this way is a lot less trouble, and accurate enough for a road bike).

Mid-range carburetion can be improved by changing the carb needles, this will fill in the noticeable flat spot which is present around 5 - 7,000RPM on most NCs. I have personally tried two different carb needle kits (both of which come complete with main jets). The first was the American-made "Factory" kit, and must as I hate to slag off anyone's products, I have to say that, fitted as per

instructions, it made practically no difference to the power curve, but did put fuel consumption up from high 30s to low 20s of miles per gallon. Putting that one down to experience, I subsequently tried a kit produced by Jonathan Collins at Cayman Products. This uses dynojet main jets and their own custom-made needles, and it works just fine, filling in the mid-range and improving peak power by 5BHP with a race exhaust. It would be noted that Dynojet main jets as used here are, because of their better flow characteristics, effectively one size larger than standard Keihin jets, i.e. Dynojet 118s are equivalent to standard 120s. Pilot jets will not need changing, just make sure that the pilot air screw settings are as per the Workshop Manual or carb. kit instructions (usually around 2-2½ turns out from fully seated).

The last carburettor mod. is to reduce the degree of damping on the slides to enable them to rise more quickly when the throttle is opened. This has no effect on power, just improving throttle response, and is achieved by increasing the size of the air bleed holes which you will find in the bottom of the carb. slides, off to one side the needle. Remove the slide from the carb. as per the instructions in your Manual, and extract the needle from the slide. Carefully drill out the air hole from its standard 2mms. to 2.5mms, blow out any swarf and reassemble the carbs.

4) Ignition - we have already discussed the "M-Max" type of derestrictor box, but there is also another ignition uprate available. This is a unit produced by H.R.C., Honda's Racing Division, which plugs in series with the ignition unit and derestrictor box and (as I understand it) modifies the ignition advance curve so that it holds full advance right to the red line and moves the rev. limiter cut-off point up by about 1,000 rpm.

Contrary to some claims, the H.R.C. box makes precious little difference to a standard bike, but used with a tuned engine and race exhaust will enhance top end power. The box is available in this country on special order from an H.R.C. Dealer as a cost of over £300, but again I'd say shop around - plenty of ex-race or race school NCs come into this country, so ask your breaker or check the MCN "Race Bits & Pieces" ads.

That's about it as far as D.I.Y. tuning goes, but if your engine is in good condition, it should now be giving a good spread of power with no flat spots, peaking at 63 - 64 BHP and revving out to 14,000 RPM.

GETTING SERIOUS

Professional tuning is a highly precise, labour intensive job, and as such is going to cost a not inconsiderable amount of money, so, before you go down this road, stop and think about the fact that the cost of a cylinder head porting job, when added to the resale value of your NC would easily buy you a late model CBR600 or similar, producing 100 BHP in standard trim. Having pondered on that, if you love your '30 enough to proceed, here's a rough idea of what you'll get and what it will cost you. I've based this on information kindly provided by Stan Stephens and by T.T.S., both of whom have reputations for good quality work and offer "staged" tuning packages.

Stage 1

Carb. modifications and race can - same as you can do at home, but done by the tuner and set up on his dyno - cost around £90 for the carb kit, £150 - 300 for the can plus maybe £50 for the setting up

and dyno time. Result - 64BHP and improved mid-range - see the following dyno chart courtesy of Stan Stephens Performance Centre.

Stage 2

Cylinder heads ported and gas flowed, valve seats recut, combustion chambers modified to increase compression ration - cost £500 - 600 if you strip your own engine and just send the tuner your heads - add anything up to another £500 if you want to take the bike in and have it done for you. Result - similar power curve, but more of it, peaking at possibly 68 - 70BHP.

Stage 3

Camshafts reground to a more "racing" profile - cost £350 - 400 exchange, plus a small charge for fitting (or maybe fitted free if done at the same time as a Stage 2 package). Result - more top end power. Maximum BHP now perhaps 72 - 73, but produced at 13,500 RPM instead of 12,000, enabling the bike to be geared down for better acceleration with no top speed loss.

Stage 4

444cc big bore kit - cost £470 for pistons plus maybe £200 for reboring work and the usual £400 - 500 to rebuild the engine. Result - more power and torque throughout the rev range, peaking at 76 - 78 BHP if you're lucky.

Before leaving the subject, I have to mention that the ultimate engine job is a full tune and blueprint done by Honda V guru, Tony Scott, engine builder to many top race teams including Honda G.B. The following list shows what is involved, and the price of £1,600 plus parts hardly reflects the time and care taken. "Plus parts" in this context would ideally mean the HRC race kit of cams, carbs, etc., which would probably have to be specially imported from Japan, and cost nearly the price of another NC30! Having said that, what you will end up with is the sweetest, smoothest running and most powerful NC engine that money can buy, and bullet proof reliability as well. Master craftsmanship has never been cheap.

So, to summarise - £2 - 300 wisely spent can buy you a noticeable performance increase, major power gains will cost you big money, and next time someone tells you that his bog stock NC30 with a loud exhaust is making 70BHP, you will absolutely, categorically know he's bullshitting! !

Rick Oliver

CONTACT NUMBERS

The Club A lot of the "bolt on" stuff is available through the NC30 Club - check with Pete on 01424 - 215566 or look in the price list Stage Tuning Stan Stephens 01474 - 879331 T.T.S. 07000 - 367887 The Ultimate Tony Scott 01772 - 423614 Any questions Rick Oliver 01603 - 720387

(Ed's Note)

Rick has once again given us the benefit of his knowledge and advice. He is producing many goodies for NC's such as 17 -inch rear wheel conversions and yoke's to accept ZXR400 forks. I'm sure like me you have enjoyed this informative article and I would like to on behalf of all of us thank and

congratulate him for this splendid article.

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1. *Journal of the American Medical Association*, 1954; 157: 1000-1001.
2. *Journal of the American Medical Association*, 1954; 157: 1001-1002.
3. *Journal of the American Medical Association*, 1954; 157: 1002-1003.