

TUNING YOUR BULTACO by Ginger Molloy

As promised previously, I will now attempt to put pen to paper and try to explain the intricacies of obtaining some more horsepower from your Bultaco. What I am about to write is pertinent to my race winning 250 Bultaco at Daytona, 1998.

The engine specs are as follows: 1965 TSS 250 ex-works, however fitted with Metralla period engine 5 speed to comply with USA race rules (i.e. 6 speeds forbidden).

Max horsepower 36 hp rear wheel, 8200 rpm

Max revs 9000 rpm, 34 hp

Dellorto SS1 35mm carb; 210 main jet; P2 needle

Slide #4; 3.10 needle jet

P.V.L. electronic static ignition

2.00mm BTDC ignition time

VP rod assembly fitted, balanced to 60%

Wiseco piston, single ring, lightweight

Special fabrication clutch using Bultaco parts,

Barnett plates and single row roller primary chain made by Regina Extra

Crankshaft flywheel sprocket from 1962 TSS 200

20 x 46 or 47 gearing depending on wind

Max rev obtained at Daytona 9400 but mostly in region of 8000-8800 in top gear

Rev range 7000-9000 rpm

Compression ratio 13-1, use English method

Next we move onto how to modify your cylinder head to obtain a better shape and compression ratio.

First, have your cylinder head thoroughly cleaned, then bead blasted. Take it to a reputable alloy welder and have the hemisphere completely welded closed. You need access to a lathe and must have a tool made (drawing 1) about a 6" long and 25mm round bar with a thread turned on one end to the same dimensions as a 14mm 3/4 reach spark plug. Your cylinder head should now be screwed onto this device and fitted into the lathe.

Now let's presume at TDC (top dead center) your piston is 20 thousands below the top of your cylinder liner. Proceed to machine to the following specs. (drawing 2)

The above specs will give you a 30 thousands squish clearance. You will want to end up with an actual compression ratio of 13-1, using the English method.

By carefully machining out the hemisphere and checking a little at a time, you will arrive at the right ratio. Approximately 21cc of light oil should fill the capacity at TDC, with the cylinder head fitted and oil up to the bottom spark plug thread.

You might ask what is my pedigree in regards to two-stroke tuning, well now that could be construed in several ways. Really speaking, I do not have any engineering degree or technical teaching. However, hands-on tuning is what I seem best at, and my knowledge has been honed somewhat by firstly

racing Europe through the 60s and also the USA early 70s. Going back to the period of 1964-1970, I was always allowed access to the Bultaco race department and was quite friendly with Paco Lopez, who was the Bultaco Development Engineer and was responsible for all TSS race and dyno work. Being associated with his work is probably where I gained my best two-stroke understanding.

Indeed, over the winter of 1968-1969 I worked in the race shop where we started to build the new 125 two cylinder, but unfortunately abandoned, racer. However, that is another story. The most horsepower ever recorded at the factory with a 250 was in 1968 when the TSS produced 42hp at 10,500rpm at the crank. The rear wheel was 10hp down on this figure.

This last year at Daytona, my Bultaco made 36hp at the rear wheel, with a modern dyno, at 8,000rpm. Now I'm not trying to say that I'm a better tuner than Paco, it's just that there is a lot more knowledge around now and exhaust pipes and fuels are way much better than in the 60s.

Cylinder timing specifications: exhaust opens ATDC 81°, 198° duration; transfers open BBDC (bottom dead center) 68°; inlet opens ABDC 87°; blowdown time 31°.

I use an ignition timing of 2mm before TDC and you may be able to improve on this, but I have never had the facility to enjoy dyno testing for a day or so, so one could really find the best timing. However, my machine doesn't seize or burn holes in the piston, so we must be fairly close.

The cylinder liner needs to be removed and a new one fabricated without the two window ports. This enables you to increase the size of inlet port quite a lot, and it will run better with the two extra ports drilled as shown in drawing 3.

I use 20° downdraft for the carb induction, and the carb should be fitted as close as possible to the cylinder. At the bellmouth 'induction' side, the carb should be made as large as possible.

For oils we use a synthetic Red Line or Castrol 747 at 25/1 mix. I buy the best petrol available, ELF.

Piston to cylinder clearance is 2½ thousands.

A point to remember with the carburetion, if you raise the compression (check to see what you have first), you must increase your needle jet size and your main jet. Remember, the higher the compression, the larger these two jets must be. If it's now too rich, you can always reduce the sizes, and you probably won't seize the piston.

Cylinder work, 250 Metralla: I find it best to remove the original cylinder liner and have a new one made to original specs *minus* the two boost ports that are fed from holes in the piston. Now if you look at my drawing showing the base of the cylinder, you should be able to see how to get a 10mm hole drilled up through the cylinder to enable two more ports to be fitted. You must have windows cut into your cylinder. (drawing 4)

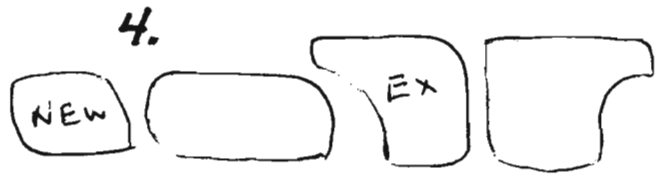
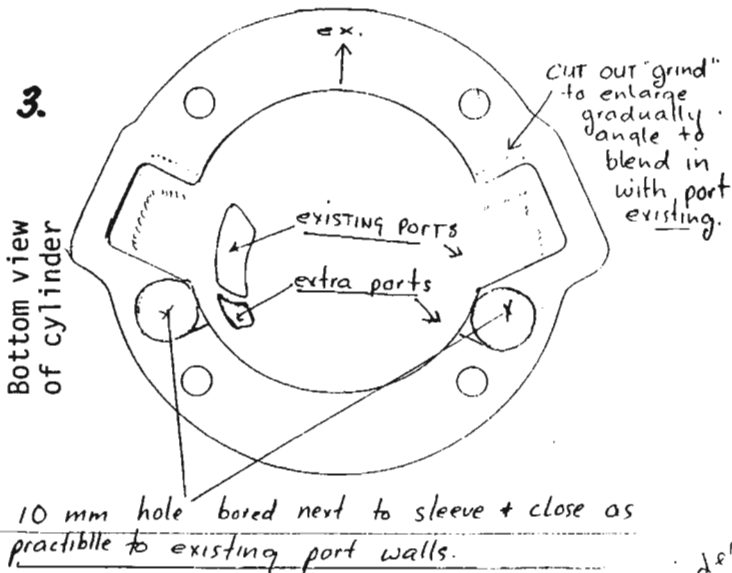
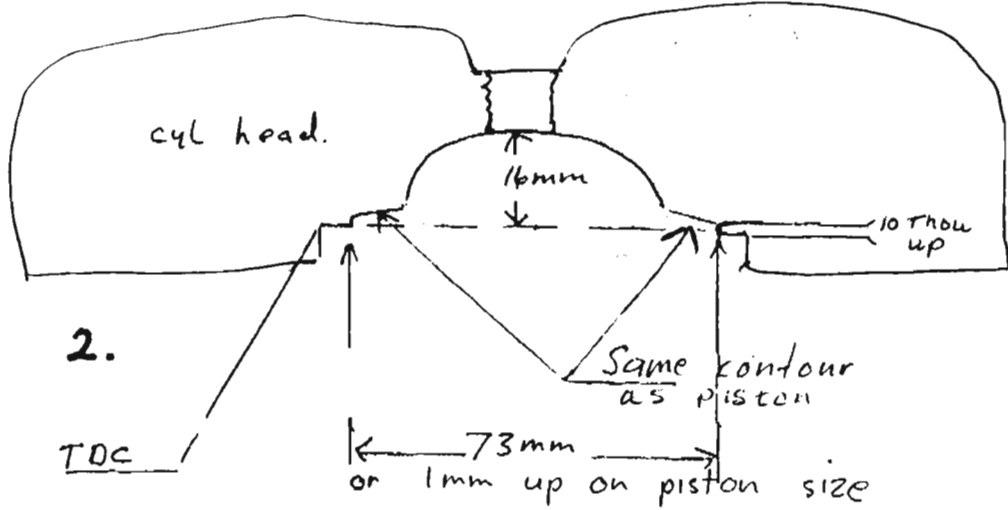
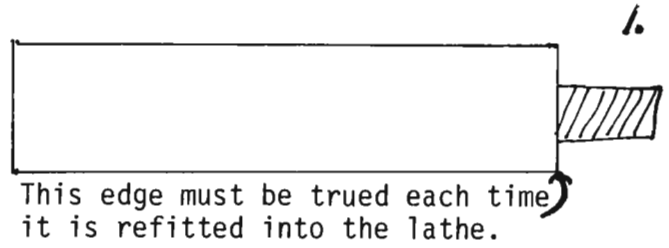
A little working out but with some careful drilling going in, quite a large port can be cut up. Leave no alloy against the liner, and make the roof of the port nearly right angle.

Now that you have got rid of those boost ports, you can set about getting a decent inlet front shape. Currently it's too small.

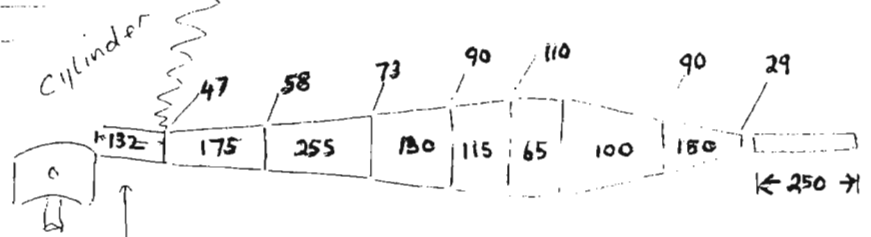
Also while you are busy with porting tools, the transfer can be cut larger both in the cylinder and crankcase.

Don't file any alloy in your ports next to sleeve.

Exhaust pipe specs: Your cylinder may not measure this length through the exhaust outlet, but increase or decrease as required to arrive at a total length of 307mm for the first two measurements. (drawing 5)



Exhaust pipe specs
all measurements outside 5.



Ginger's fax number from the USA is
011 647 828 9687

Your cylinder may not measure this length thru the exhaust outlet, but increase or decrease as required to arrive at a total length of 307mm for the first 2 measurements.

TUNING YOUR BULTACO by Ginger Molloy

As promised previously, I will now attempt to put pen to paper and try to explain the intricacies of obtaining some more horsepower from your Bultaco. What I am about to write is pertinent to my race winning 250 Bultaco at Daytona, 1998.

The engine specs are as follows: 1965 TSS 250 ex-works, however fitted with Metralla period engine 5 speed to comply with USA race rules (i.e. 6 speeds forbidden).

Max horsepower 36 hp rear wheel, 8200 rpm

Max revs 9000 rpm, 34 hp

Dellorto SS1 35mm carb; 210 main jet; P2 needle

Slide #4; 3.10 needle jet

P.V.L. electronic static ignition

2.00mm BTDC ignition time

VP rod assembly fitted, balanced to 60%

Wiseco piston, single ring, lightweight

Special fabrication clutch using Bultaco parts,

Barnett plates and single row roller primary chain made by Regina Extra

Crankshaft flywheel sprocket from 1962 TSS 200

20 x 46 or 47 gearing depending on wind

Max rev obtained at Daytona 9400 but mostly in region of 8000-8800 in top gear

Rev range 7000-9000 rpm

Compression ratio 13-1, use English method

Next we move onto how to modify your cylinder head to obtain a better shape and compression ratio.

First, have your cylinder head thoroughly cleaned, then bead blasted. Take it to a reputable alloy welder and have the hemisphere completely welded closed. You need access to a lathe and must have a tool made (drawing 1) about a 6" long and 25mm round bar with a thread turned on one end to the same dimensions as a 14mm 3/4 reach spark plug. Your cylinder head should now be screwed onto this device and fitted into the lathe.

Now let's presume at TDC (top dead center) your piston is 20 thousands below the top of your cylinder liner. Proceed to machine to the following specs. (drawing 2)

The above specs will give you a 30 thousands squish clearance. You will want to end up with an actual compression ratio of 13-1, using the English method.

By carefully machining out the hemisphere and checking a little at a time, you will arrive at the right ratio. Approximately 21cc of light oil should fill the capacity at TDC, with the cylinder head fitted and oil up to the bottom spark plug thread.

You might ask what is my pedigree in regards to two-stroke tuning, well now that could be construed in several ways. Really speaking, I do not have any engineering degree or technical teaching. However, hands-on tuning is what I seem best at, and my knowledge has been honed somewhat by firstly

racing Europe through the 60s and also the USA early 70s. Going back to the period of 1964-1970, I was always allowed access to the Bultaco race department and was quite friendly with Paco Lopez, who was the Bultaco Development Engineer and was responsible for all TSS race and dyno work. Being associated with his work is probably where I gained my best two-stroke understanding.

Indeed, over the winter of 1968-1969 I worked in the race shop where we started to build the new 125 two cylinder, but unfortunately abandoned, racer. However, that is another story. The most horsepower ever recorded at the factory with a 250 was in 1968 when the TSS produced 42hp at 10,500rpm at the crank. The rear wheel was 10hp down on this figure.

This last year at Daytona, my Bultaco made 36hp at the rear wheel, with a modern dyno, at 8,000rpm. Now I'm not trying to say that I'm a better tuner than Paco, it's just that there is a lot more knowledge around now and exhaust pipes and fuels are way much better than in the 60s.

Cylinder timing specifications: exhaust opens ATDC 81°, 198° duration; transfers open BBDC (bottom dead center) 68°; inlet opens ABDC 87°; blowdown time 31°.

I use an ignition timing of 2mm before TDC and you may be able to improve on this, but I have never had the facility to enjoy dyno testing for a day or so, so one could really find the best timing. However, my machine doesn't seize or burn holes in the piston, so we must be fairly close.

The cylinder liner needs to be removed and a new one fabricated without the two window ports. This enables you to increase the size of inlet port quite a lot, and it will run better with the two extra ports drilled as shown in drawing 3.

I use 20° downdraft for the carb induction, and the carb should be fitted as close as possible to the cylinder. At the bellmouth 'induction' side, the carb should be made as large as possible.

For oils we use a synthetic Red Line or Castrol 747 at 25/1 mix. I buy the best petrol available, ELF.

Piston to cylinder clearance is 2½ thousands.

A point to remember with the carburetion, if you raise the compression (check to see what you have first), you must increase your needle jet size and your main jet. Remember, the higher the compression, the larger these two jets must be. If it's now too rich, you can always reduce the sizes, and you probably won't seize the piston.

Cylinder work, 250 Metralla: I find it best to remove the original cylinder liner and have a new one made to original specs *minus* the two boost ports that are fed from holes in the piston. Now if you look at my drawing showing the base of the cylinder, you should be able to see how to get a 10mm hole drilled up through the cylinder to enable two more ports to be fitted. You must have windows cut into your cylinder. (drawing 4)

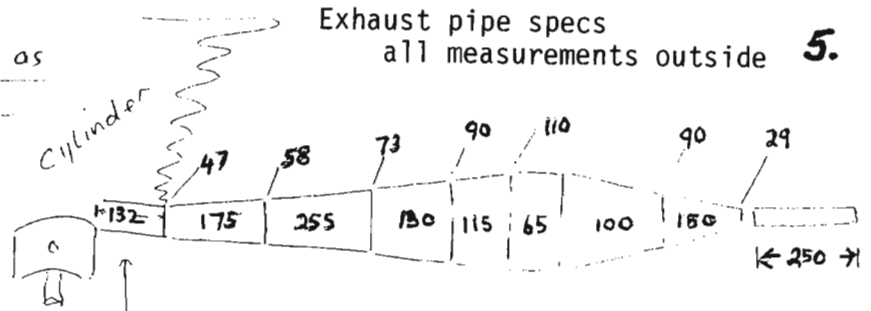
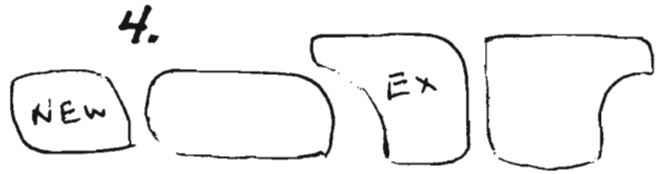
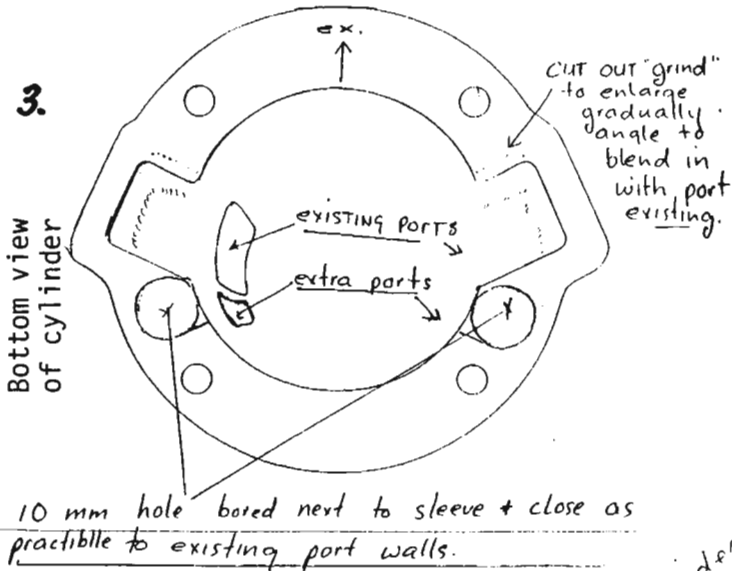
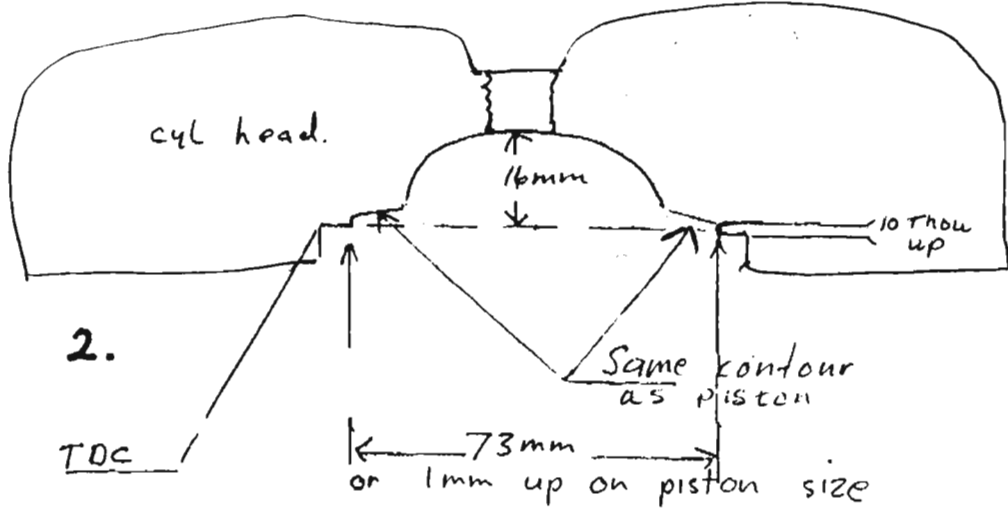
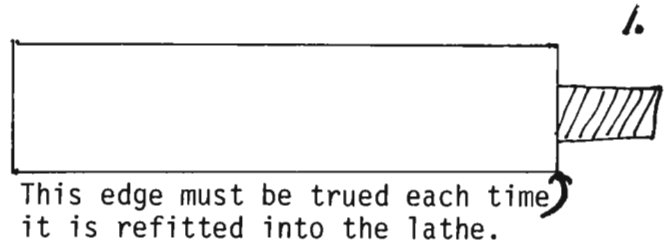
A little working out but with some careful drilling going in, quite a large port can be cut up. Leave no alloy against the liner, and make the roof of the port nearly right angle.

Now that you have got rid of those boost ports, you can set about getting a decent inlet front shape. Currently it's too small.

Also while you are busy with porting tools, the transfer can be cut larger both in the cylinder and crankcase.

Don't file any alloy in your ports next to sleeve.

Exhaust pipe specs: Your cylinder may not measure this length through the exhaust outlet, but increase or decrease as required to arrive at a total length of 307mm for the first two measurements. (drawing 5)



Ginger's fax number from the USA is
011 647 828 9687

Your cylinder may not measure this length thru the exhaust outlet, but increase or decrease as required to arrive at a total length of 307mm for the first 2 measurements.