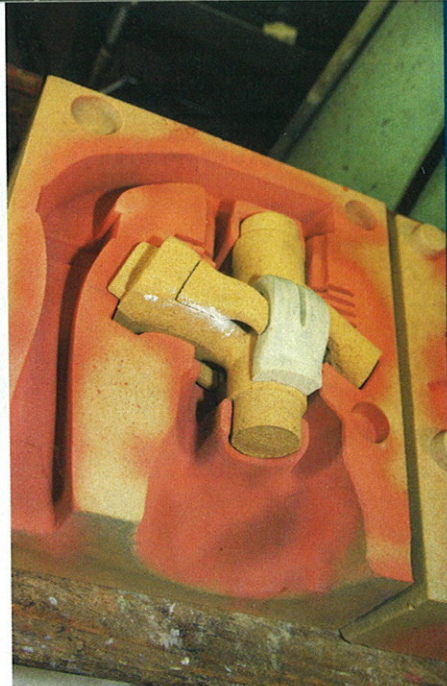
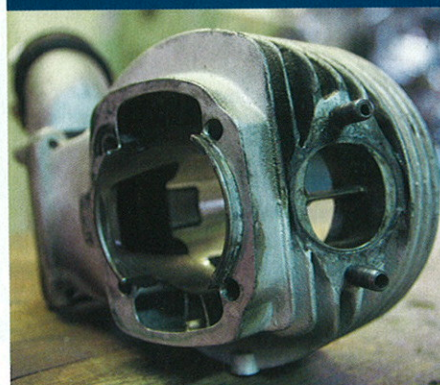




Falc Racing



The sand cores for the inside of the cylinder assembled into the mould. Like an RB barrel the inlet port has feeds that lead straight into the transfers.

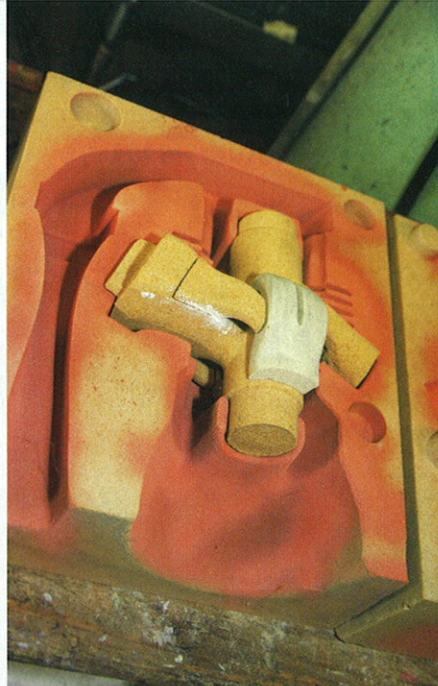


The prototype 175cc 64mm bore smallframe kit is "absolute maximum!" Look how close the studs run to both the bore and the transfer ports.

The track is narrow with ditches each side and the tarmac is damp from an earlier shower. In the distance I can hear an engine being held at 10,000rpm and the clutch being rapidly released. Seconds later a helmet-less Lauro Caforio howls into view; accelerating to over 80mph on a pink Vespa smallframe in a flash of wild hair and sparkling eyes. Welcome to Falc Racing, and Lauro's personal test-track: the road outside his house. Now it's my turn...



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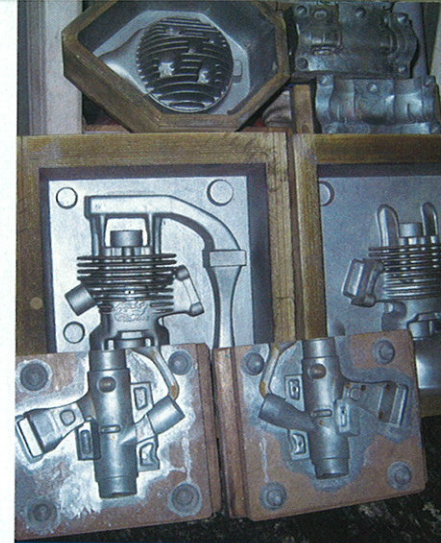


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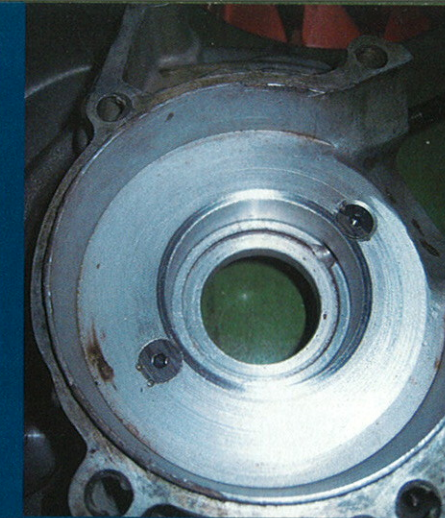


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Lauro's home-made patterns for producing the sand cores required to cast the barrels.



Lauro fits an adapter ring to the inside of the casings to allow the use of a better main bearing. The ring is retained by countersunk screws.

You only have to step into the packed workshop of Lauro's 100-year-old farmhouse to know that you are in the presence of genius. Here is a man who has produced a cylinder kit for the smallframe Vespa that – when fitted as instructed – obliterates every tuning kit previously produced by the famous names. I'm not just talking about smallframe Vespa kits either. There is no bolt-on kit for any Vespa or Lambretta that matches the Falc 150. And it's still fan cooled and fits under standard bodywork (though it's not quite a bolt-on).

Lauro has been playing with two-stroke engines since he was 10 years old. Tuning Vespas and racing motocross and powerboats have been his passion, leading to him becoming a mechanic in a world Moto Cross Grand Prix for several years during the mid-90s. At the time CarpiMotor were the Italian Suzuki off-road importers and employed Lauro to travel as part of their GP circus, working on the bikes of top riders Tallon Vohland and Dave Strijbos. As such Lauro has seen a fair bit of the world, but quickly came to the conclusion that the food is best in Italy. I'd tend to agree.

Lauro's wife Anna was until recently one of Italy's top female MX racers, and her maiden initials form part of the company name (FALC = Fizzardi Anna Lauro Caforio).

Back in Italy during the late 90s – and obviously now brimming with GP-level tuning experience – Lauro reacquired himself with the scooter sprinting scene using both a Vespa and a tube-framed Piaggio NRG.

The Italian scooter sprint scene is a strange one; with races being run over 150-metres. From the late 80s it built up quite a following with names like Scauri and Zirri battling it out in the Vespa classes using bike-barrelled smallframes. If the rumours are true then there were some uncomfortably big bets riding on the winners at one stage.

In 1997 at Mantova Lauro turned up with his Vespa fitted with a Polini kit for an Aprilia motorbike and took the record. He covered the 150m course in 6.71 seconds with an exit speed of 139kph (86.3mph). To get that in perspective – he'd be doing 86mph before the halfway point of a quarter-mile track like Santa Pod.

Wet feet

Following his tenure with CarpiMotor, Lauro has continued to make a living in tuning: not only for two-wheelers for national and GP-level, but also for racing boats and hydroplanes. He worked together with VRP designing and tuning motors which went on to take both the 350cc and 500cc European and World powerboat championships.

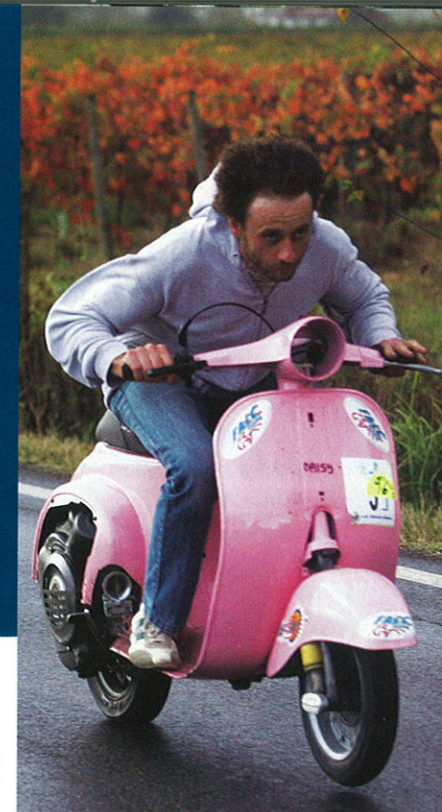
Lauro actually races his own 50hp 125cc hydroplane in a sport that's only marginally safer than tiger wrestling. Apparently they aren't very easy to race. The boats are piloted lying face down with one leg controlling the length of the exhaust which has a 13cm-long slip-joint in the downpipe. By sliding the main body of the expansion chamber backwards and forwards to suit the engine rpm Lauro says it's possible to get the peaky two-stroke to hold maximum power over a range of 3000 rpm. That's a far bigger power spread than any exhaust power valve can achieve.

Cylinder manufacture

Along the way Lauro has picked up lots of engineering skills allowing him to design and pattern-make his own cylinders, heads and manifolds from scratch including building up the sand cores. The only part of the casting operation he doesn't do himself is pouring the actual aluminium; which is done in a local foundry.

All of Lauro's production is sand-cast, not only because this is the only cost effective way to do small batch production, but also because he says it results in a better product. Lauro explains that all GP-level engine casings and cylinders are sand cast because pouring into sand allows the aluminium to cool in a more controlled way, thus reducing internal stresses in the material compared to using steel moulds.

Currently Lauro produces a cylinder kit for the Honda RS125 GP race bike as well as a selection of kits for the smallframe Vespa in varying degrees of mentalness from Charles Manson to Nero. The first photo of one of his Vespa cylinders was posted on the internet in late 2007 and after that everything went crazy.



The 150cc Falc in third gear at maybe 60mph, leaning forward and still the front wheel won't stay on the deck. Lauro's 175cc sprint engine makes 7hp more than this one!



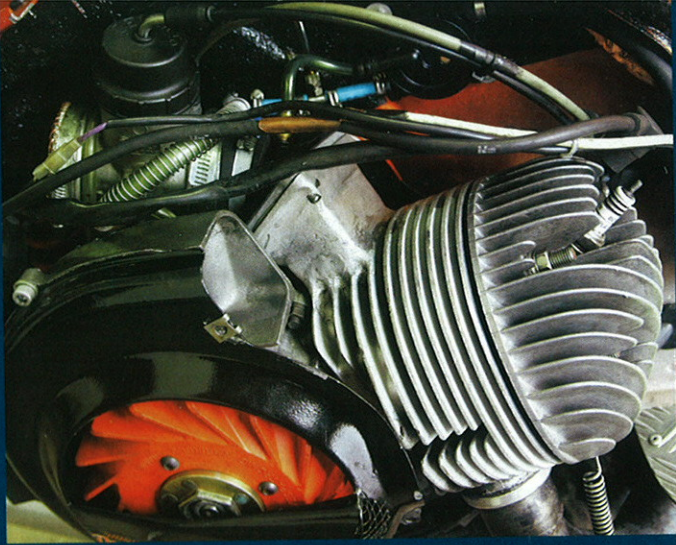
Comparing a Honda RS125 race cylinder to the 150 Falc kit. With the Vespa stud pattern it's not possible to add any more transfer port area.



Lauro identified a problem with the fans for the popular Vespatronic and Parmakit ignitions. The orange Vespatronic fan blows well at low rpm but causes the air to cavitate (swirl around the fins rather than blowing) at high rpm resulting in insufficient cooling. The grey Parmakit one by contrast is too efficient and knocks over 3hp off the output of one of his race motors. His solution was to get a new fan CNC machined from aluminium billet that is designed to cool well without causing too much drag.



The prototype Falc P200 pipe is a revvy mother, and a little loud, but just look at the craftsmanship.



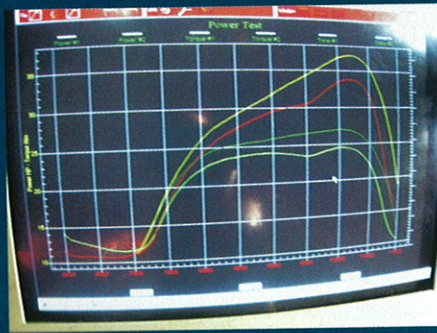
Piccio's experimental cylinder based on a Malossi barrel with a Cagiva reedblock welded to it.



The reed valve Falc smallframe cylinders feature a reversible manifold so the carb can be used in standard position or breathing through a sidepanel cut-out. Note the eight-point head fixing on the 175cc version.



A blank cylinder ready for machining.



Lauro's dyno computer is so old it didn't have a USB port for me to take the graphs, but it does its job. The red curve (34hp) is his current 150cc sprint engine. The yellow (37hp) is the best he's seen out of a 150 on the dyno.

Kit and caboodle

Like any of the good tuners, Lauro produces complete kits rather than just single pieces of a complicated puzzle. For the smallframes he produces not only a range of different capacity barrels kits but also crankshafts, exhausts and a clutch to suit.

There are several combinations of the smallframe kit using either a 51mm (standard stroke) crank or a 54mm long stroke which requires the casings to be machined to accommodate the larger diameter crank-webs. Then there are three different piston sizes: the 57mm kit (133cc with 51mm stroke) fits onto stock casings, but the kit with the 60mm piston (153cc with the 54mm stroke) also requires the crankcase mouth to be machined to accept a wider cylinder spigot. On Lauro's dyno (a home-made affair tucked away in another part of the house) his pink 150cc sprinter makes 34hp at the wheel. The best he's ever seen from that set-up with a different pipe and optimised carburation is 37hp, but come here, there's more...

The next Falc smallframe kit release will be a 175cc kit (64mm bore x 54mm stroke) which Lauro refers to as "the absolute maximum". He is just finishing the prototype of the retail kit at the moment but it's going to be expensive because it will only be supplied with an engine casing already modified to suit. Lauro has found that once the casing has been welded to open out the transfer tracts and machined up to suit the larger diameter crank and cylinder spigot that it is very liable to distort. The problem is so severe that the crankshaft bearing housings can become out of line, which will cause rapid bearing failure in an engine revving to 10,000rpm. Lauro's solution has been to machine up a tubular insert that fits tightly in place of the crankshaft with the casing halves bolted together. This has water flowed through it to keep the casings cool while they are being welded.

Lauro's intention with the retail version of the 175 is to produce around the same power as his 150, but with an even wider power spread to make it easier to ride.

In its most evil incarnation he has seen 41hp from of his own 175. That was fitted it to a smallframe with wheelie bars which looks good on

Youtube (search for 'Falc 175'), but turned out not to be in the heat of battle.

"Wheelie bars on Vespa: not possible," laughs Lauro making the gesture of a scooter shooting off at an angle on one wheel. They tried the 175 again with the wheelie bar removed but it proved just as unrideable. Now, finally, the engine has found a home in a lengthened chassis and with Lauro's lightweight friend riding it achieved a time of 6.42 seconds at this year's sprint meeting in Parma to take the unlimited class victory. "My pilot weighs 48kg so he is very fast off the start," explains Lauro. Every 10kg extra adds around 0.2 of a second to your times over 150m.

Falc engines also won the 135 class (6.79 sec) and 150cc class (6.55 sec). Currently the only faster traditional scooter in Italy is a 42hp Lambretta fitted with a Husqvarna motocross barrel which recorded 6.18 seconds at a meeting in Rovigo.

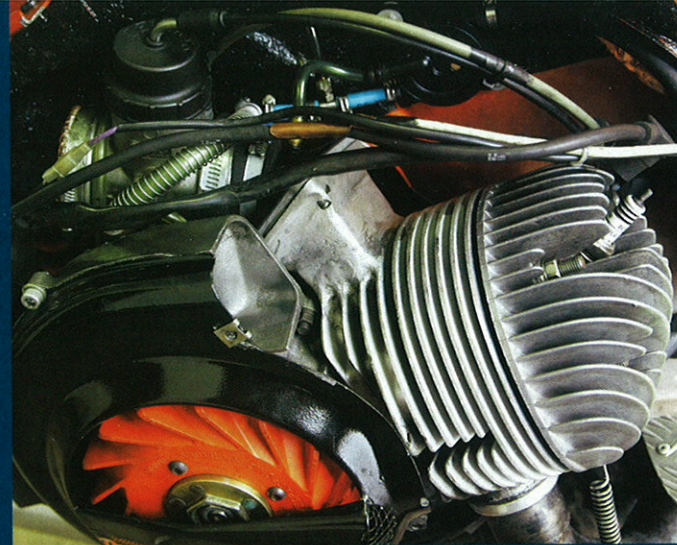
Feeling cranky

The essential components that have allowed Lauro to use all the power that his kits produce are the special crankshafts and long con rods he's made to suit. If you look at the prices of other long stroke cranks on the market, the Falc ones stand out as being almost twice as expensive. It seems that all the others are made in batches by one or two large manufacturers to the retailer's specification. Lauro's on the other hand arrive as bare forgings for the con rod and webs from a specialist in Turin, and his friend CNC machines each part from blanks. The materials and machining, he informs me, are "World GP technology." Somehow he has achieved the impossible in producing cranks that resist twisting without welding. He did this by experimenting with materials and the interference fit between the crankpin and webs. "I make, then testing, testing, testing," he repeats, like a personal mantra.

There are now four different lengths of Falc smallframe con rod. The main point of the longer ones is to reduce crankcase compression. As Charlie Edmonds pointed out: high primary compression is the 'old man's route' and the opposite of what is required with an effective expansion chamber.



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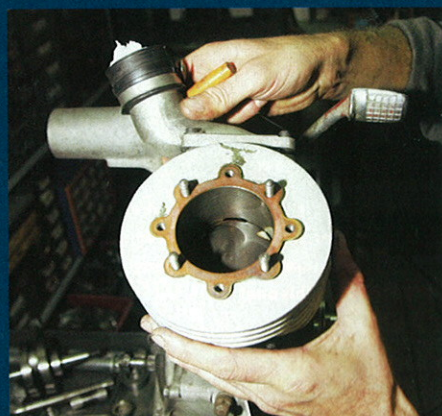
Forged crankshaft webs back from the machinist and ready for assembly and the fitment of balance weights.



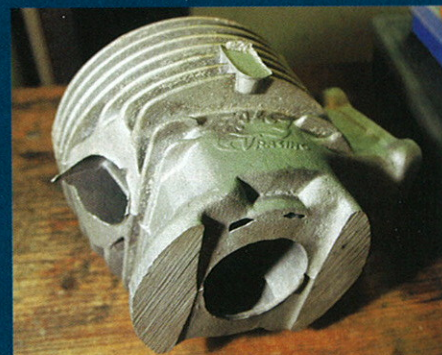
A blank forging and a finished con-rod which is tempered after machining. The Vespa rods are the same quality as the ones he uses for Grand Prix engines.



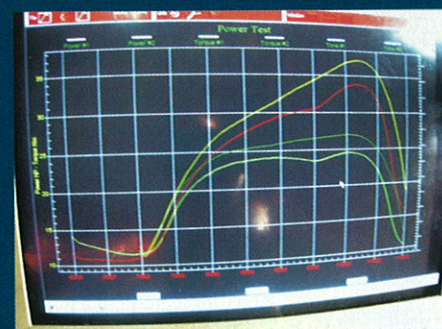
For all the technical advancement of their products, Falc is still a cottage industry. Anna makes the gasket sets on this fly press.



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Falc for PX200

While new-age tuning rivals Quattrini have chosen to make their move into large frame Vespa kits with the M1X for 125/150cc motors, Lauro decided instead to use the 200 engine as a base. The first part of the project is a new prototype right hand side exhaust which is being tested with good results on his friend Piccio's PX200. At the moment it uses an upgear kit which has proved slightly too tall considering that the Falc pipe makes peak power at 8000rpm. The exhaust itself is hand-made from 30 different cones – though Lauro is considering simplifying it a little before putting it into production.

For the moment Piccio's cylinder is based on a Malossi barrel modified to accept a large Cagiva reedblock with a rear-facing carburettor. Lauro already has his own new cylinder design mapped out though. One model will have the choice of standard inlet or reed into the cylinder to be used with 57mm or 60mm stroke cranks. Lauro also plans to make an 'extra' model will have a different inlet that feeds into both the barrel and the crankcase and use a special 62mm stroke crank.

Whether a standard PX200 engine casing will be able to cope with all this extra performance is another question. As Lauro points out, "40hp, that's

the limit because motor design is very shit and the clutch is very shit."

As a result after the PX cylinder kit the next scooter project will be a PX clutch. And then? "Maybe a kit for Lambretta."

Think pink

So to rejoin the story where we started: I've just been handed a 34hp smallframe Vespa which will do 150m in under seven seconds. The back end is jacked up slightly while the front suspension is lowered to the point of being non-existent. There's not a crash helmet in sight so I listen carefully to Lauro's instructions. "Don't use first gear at all – pull away in second and slip the clutch." Ah, that explains how the top boys make up so much distance before changing gear.

I lean forward, blip the revs and don't slip the clutch enough. Thankfully these reedvalve motors will pull from low revs so it doesn't stall, the motor just builds power as the speed picks up. Gradually the front wheel becomes airborne, despite me hanging over the front like a gibbon, and maintains a gentle arc above the road. I make the mistake of sitting back a little before changing into third and the front wheel goes skywards again. Into fourth gear for a second or two and you'd be crossing the

150m line, but the pink Falc is content to keep on accelerating to speeds where the lack of front suspension and crash helmet make backing off seem a good idea. It's a totally a mental device.

Lauro then demonstrates how it is supposed to be done: starting with the headset under your belly. Full throttle is dialled for a split second before the clutch is quickly fed in. The eager little Vespa catapults Lauro off into the distance once more and I'm simply left to ponder: how fine is the line between genius and insanity? **SC**

Sticky

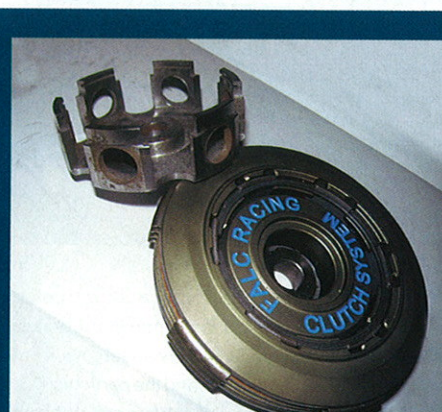
■ Thanks to Lauro, Anna and also Piccio for showing us around. For more details see www.falcracing.it



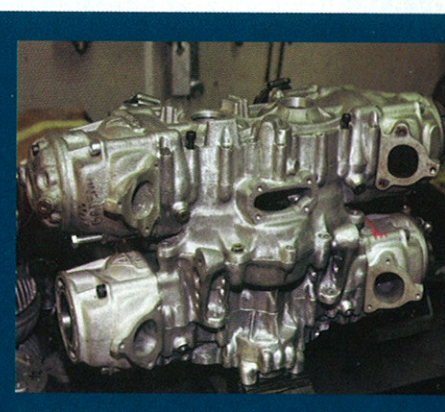
Various retail and test exhausts.



Lauro races 125cc hydroplanes. For those the exhausts are adjustable in length by foot control to widen the power band so he makes them from aluminium to save weight.



Falc parts are continually being upgraded. The next version of the smallframe clutch will have a billet steel centre and improved clutch plates.



This is Lauro's new baby: a four cylinder 500cc two-stroke boat engine for world class hydroplane racing. He has designed and built it from scratch including the casings and the gears that connect the counter-rotating crankshafts.