



ESCORT COSWORTH/MIKE RAINBIRD

# EVOLUTION



The YBP engine's been rebuilt and dyno'd just in time for a trip to the Nürburgring, and the results have been more than worth the wait...



On the dyno and starting to get a little warm...

**AS** I stated in my first article, I was never interested in chasing numbers for my new engine. This surprised many, as all I was after was improved response from the existing set-up, so my choice of sticking with the trusty T4 was always met by the same question: "What power do you want it to make?", whereby my stock reply was, "Whatever it ends up with after it's been mapped!"

Obviously my original engine was built to a similar remit, but I felt that the top end tailed off too soon. The new target was similar response, but extending the rpm range by an additional 1000 rpm (the existing rev limit was set to 7600), and whereas power dropped like a stone after 7000, due to the short-duration cams used to try and pick the boost up down the bottom end, I wanted the new one to hold this



## ENGINE TECH SPECS

**Type:** Ford Cosworth YBP  
**Capacity:** 2228cc  
**Bore/stroke:** 93 mm/82 mm  
**Compression ratio:** 7.3:1  
**Max power:** 498 bhp @ 7010 rpm @ 29 psi  
**Max torque:** 418 lbf.ft @ 5010 rpm @ 29 psi  
**Power/weight ratio:** 362 bhp /tonne  
**Cylinders:** four-in-line, CP 93 mm pistons  
**Cylinder head:** Works-spec big ported head (carried out by Nick Waples), with race-spec long duration cams  
**Block:** cast iron (200 Series), WRC tri-metallic head gasket and long-studded (10)  
**Bottom end:** Farndon 82 mm knife-edged crank, WRC high-pressure oil pump, Auto Verdi 137 mm rods. Mountune oil jets, big-wing (5-litre) baffled sump and WRC crankcase breather kit with braided hosing  
**Valve gear:** four valves per cylinder (35 mm inlet/31 mm exhaust), three-angle valves/seats operated by belt-driven twin overhead camshafts and mechanical lifter tappets operated by Isky valve springs  
**Fuel and ignition:** electronic fuel injection with Pectel T6 ECU, Pectel monitor, water injection, Ford Motorsport leads, distributorless ignition system and ALS, AGP 071 plugs, four Bosch 740cc injectors and 3 bar MAP sensor, live-mapped on engine dyno by Harvey Gibbs  
**Cooling:** Pro Alloy Motorsport 50 mm radiator, Pro Alloy auxiliary radiator (this cools water for cylinder head on my engine), Spec-R header tank, swirl pot and water-cooled power steering reservoir  
**Induction:** K&N 2wd panel filter inside modified standard Saph airbox base with carbon-fibre Group A Escort airbox lid, T04E turbo (60 trim) with Maram 247 shaft 360-degree bearing etc, -31 actuator, Pro Alloy 65 mm super-wide RS500 air-to-air intercooler and water injection (2x0.6mm jet), boost controlled by Ford Motorsport air injectors.  
**Exhaust:** Hayward & Scott 4 inch downpipe splitting into twin 2.5 inch system with oval tailpipe (four silencers)



Just before the rebuild commenced. Check the Farndon knife-edged crank



There's a fair few quid sat on there...

US-sourced CP pistons are 93 mm items



for as long as possible. The original set-up worked a treat with the old engine making 1 bar (15 psi) by 3150 rpm and the full 2.2 bar (32 psi) peak by 3500, where it then held this to 5500, where it tailed off to 1.8 bar (28 psi) from 5500 to 7600, but as already mentioned, the short duration cams had a detrimental effect on the top end.

The new engine would have the wildest possible cams (requiring a mechanical lifter top end, due to the 8000-plus rev range that would now be used). This would mean that the power-band would be shifted up by 1000 rpm. As you know from earlier articles, the idea was to then use the Mountune intake to gain some of the lost response from this shift.

Not only that, but

it was decided to up the capacity slightly with a Farndon 82 mm knife-edged crank and CP 93 mm pistons, with the aim to pick up some extra gas speed at low rpm.

This would have given an horrendous rod angle if the stock rods had been used, so a set of 137 mm long Auto Verdi rods were purchased (the same type that are

do the engine build-up — this was left to Harvey Gibbs at SCS.

The head was sent off to be reported to 'big-port' spec by Nick Waples, with Tim at SCS doing the final fettling to match everything up. The intake and exhaust ports are machined *all* the way through (with the intake ones matching the Mountune roller barrel set-up).

**The engine was able to achieve a smidge under 500 bhp at a very low 29 psi**

in Per Eklund's Pike's Peak Saab) — good for 800-plus bhp and 9500 rpm, so I knew I was never going to push these too hard! With the rods this long, the gudgeon pin on the piston had to be moved up quite a way inside the piston to prevent them from sticking too high out of the bores. CP designed some to the spec we wanted.

There was no choice in who I was going to trust to

The block was machined for 10 long studs, the water pump modified and then everything was carefully cc'd up to check the compression ratio was where I wanted to be — a nice conservative 7.3:1. I am not a fan of high compression, as this requires horrendous ignition retard on the top line meaning lots of heat is put into the exhaust — not ideal on a track car! Although the turbo was left as the trusty T4, Harvey

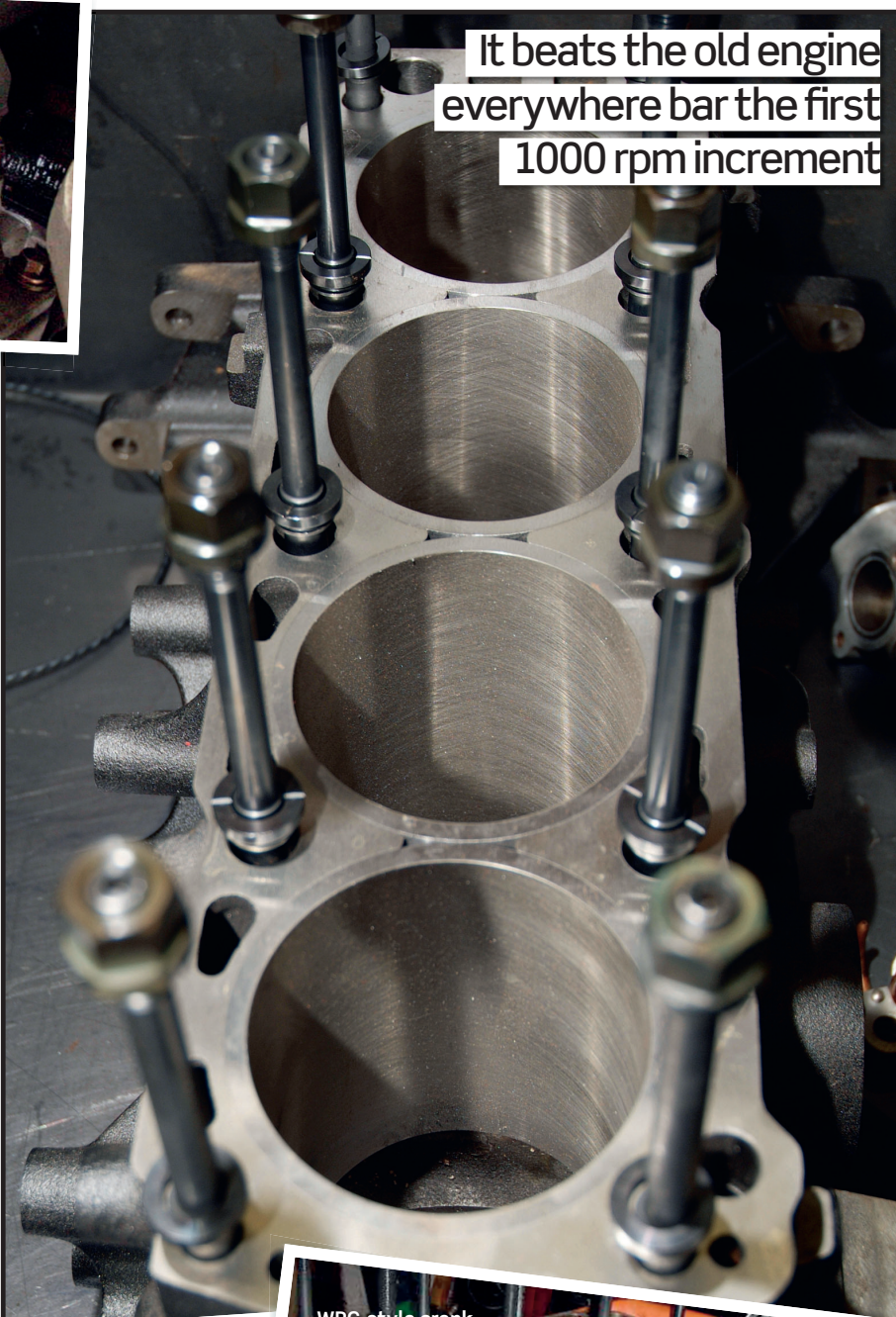
**Auto Verdi rods can take 800+ bhp and 9500 rpm if needed...**







Note the neat engine mount and steering coupling heat shield



It beats the old engine everywhere bar the first 1000 rpm increment

couldn't resist having a play with it and it was decided that he would experiment with a slightly bigger compressor trim. This has performed much better than expected and flows an additional 3 lb of air a minute over the normal T4. With this in place, the engine was able to achieve a smidge under 500 bhp at a very low 29 psi, with just over 20 bhp being made for every 1 psi extra! Not being interested in chasing big figures, I have kept the boost low to give the intercooler an easier time, as well as for longevity.

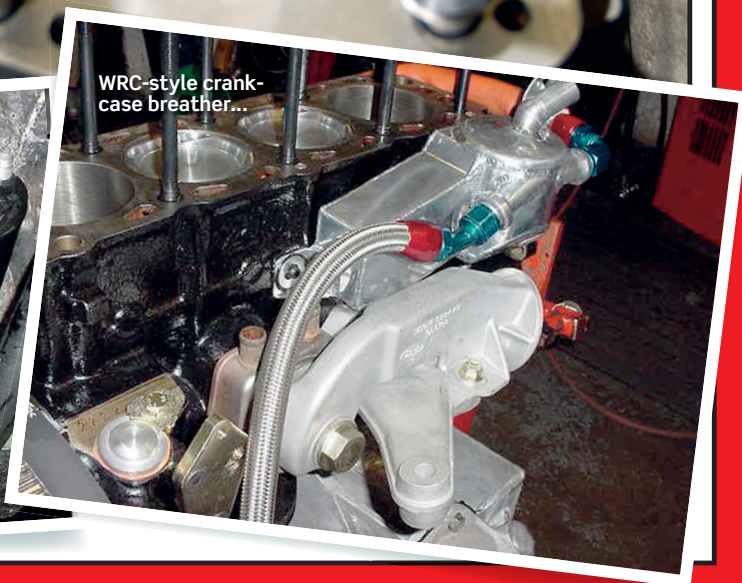
The most impressive bit, is the fact that it hangs on to this power all the way to the limiter and has over 400 lb.ft of torque from 4000-7000 rpm! In fact it beats the old engine everywhere bar the first 1000 rpm increment, but I am hoping the roller barrels will make it 'feel' more responsive. At the time of writing, the engine is still being installed back in the car.

## THANKS

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