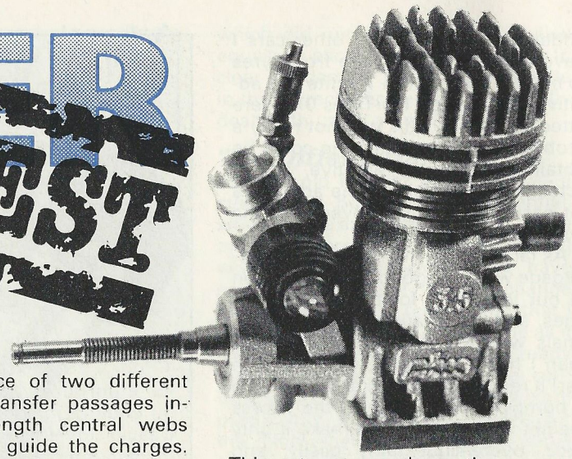
POWER TEST

The Picco P21



A remarkable precedent was set by the Italian engine manufacturers Picco when they released their latest 3.5cc car engine. At first glance it looks quite conventional with its large heat sink equipped head, but the most cursory examination reveals that the mounting lugs have been moved from the customary position on the crankshaft centre line to the base of the crankcase. This feature allows the engine to be bolted directly to the chassis without the usual spacer blocks. Externally, the engine has an exceptionally clean appearance thanks to the gravity die-casting method used to create the components.

Design features.

Removing the cylinder head reveals that it is formed in two parts; the outer is gravity die-cast and simply carries the cooling fins while the inner is fully machined to form the cylinder head and carry the glow plug.

The hard chromed brass liner has a wall thickness of .062in. (1.57mm) with two transfer ports, two boost ports and one unbridged exhaust port.

High silicon aluminium is used to machined on the outside and up to the gudgeon pin bosses on the inside. A forged chromium steel conrod with phosphor bronze big end bearing is employed. No bearing is fitted in the small end but there are adequate oil holes in both ends.

The gudgeon pin is hollowed out for light weight but one end is left solid to prevent any gas crossing between the boost port and the exhaust port as the piston reaches the top of its stroke. Such an event would cause a significant loss of crankcase pressure. Two wire E-clips hold the pin in the piston.

Chrome steel, hardened and ground, forms the crankshaft. It was noted that the induction port was not gas flowed, also that this very tough unit is fully balanced and has an oil feed hole to the big end pin. The main bearings in which the crankshaft run are of the specialised high speed type.

The body of the engine is a gravity die-casting of substantial proportions. The base mounting already commented upon allows a three screw fixing with a choice of two different centre fixings. Transfer passages incorporate full length central webs which effectively guide the charges. The internal convolutions are formed by a homogeneous sand core, which itself is die-cast before casting and dissolved afterwards.

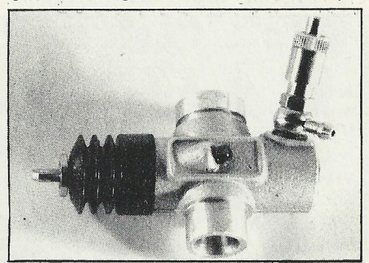
Notable features of the carburettor are its sharply cast main body which carries a long induction trumpet with a 28° inclusive angle. This subtle angling has the effect of broadening the torque curve.

Power tests

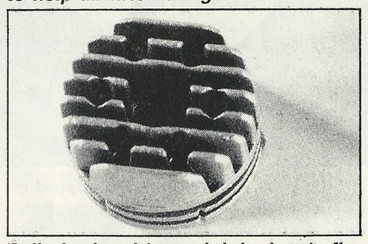
First off, the engine was started up and run at 14000rpm for approximately 15 minutes, which was not to run the engine in but to check its overall operation. Throttling presented no problems with the slide carburettor working smoothly and the engine ran consistently with no signs of overheating.

For the first test the engine was run with an open exhaust and using a 5% nitro/20% castor oil and 75% methanol. With this combination the engine revved freely and reached 29,000rpm easily. At this high speed the torque was still 36 oz.ins., droppign from a peak of 44 oz.ins. at 21,000rpm.

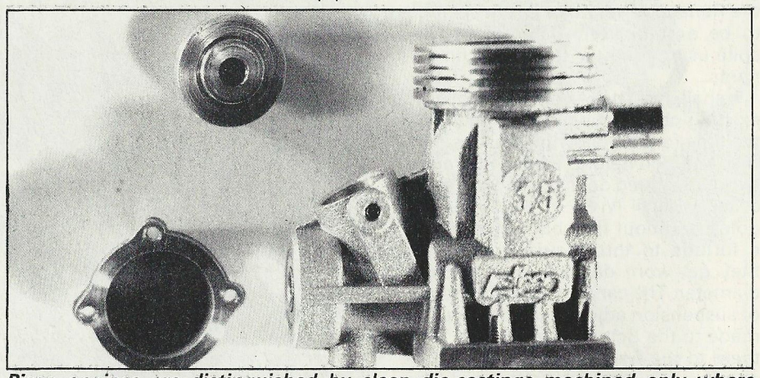
The latest Picco tuned pipe was added for the second test, this being attached via the 180° bend manifold and with a length of 185mm from port to the extreme end of the tuned pipe. This set up reproduces the arrangement most often found in cars. Under these conditions the engine's performance was comparable up to 20,000rpm. Above this sped there was a dramatic increase in torque, the engine peaking at 51oz.ins. at 24,000rpm



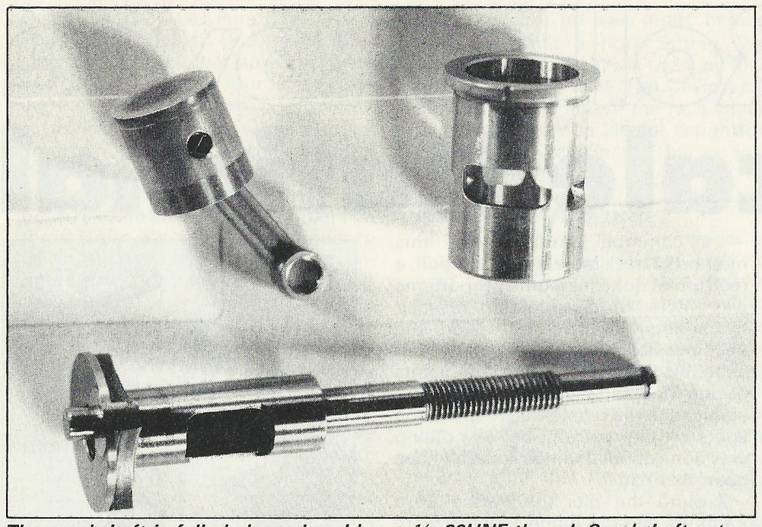
The Picco slide carb is extremely compact and features an effective groove to help air filter fixing.



Cylinder head heat sink is deeply finned and well secured with six screws.



Picco engines are distinguished by clean die-castings machined only where necessary. Also shown in the photo are the crankcase backplate and the fully machined combustion chamber head, or 'button'.



The crankshaft is fully balanced and has a ¼–28UNF thread. Crankshaft extension forms the clutch bell spindle. A notch in the top of the liner indicates the precise centre of the exhaust part for accurate alignment. A wire 'e' clip secures the gudgeon pin.

Specifications

	m.m.	inches
Carb bore	9.2 dia.	.362
carb area	66.47sq mm	103sq in.
carb type:- Picco Slide carb		
Crank induction bore	8.6	.338
crank dia.	12	.472
stroke	16	.629
bore	16.55	.651
stroke/bore ratio	.966/1	
big end dia.	5 dia.	.196 dia.
small end dia.	4 dia.	.157 dia.
crank nose thread	¼–28 UNF	
squish clearance	.28	.011
cubic capacity	3.44cc	.21cu in.
squish angle	Zero angle	

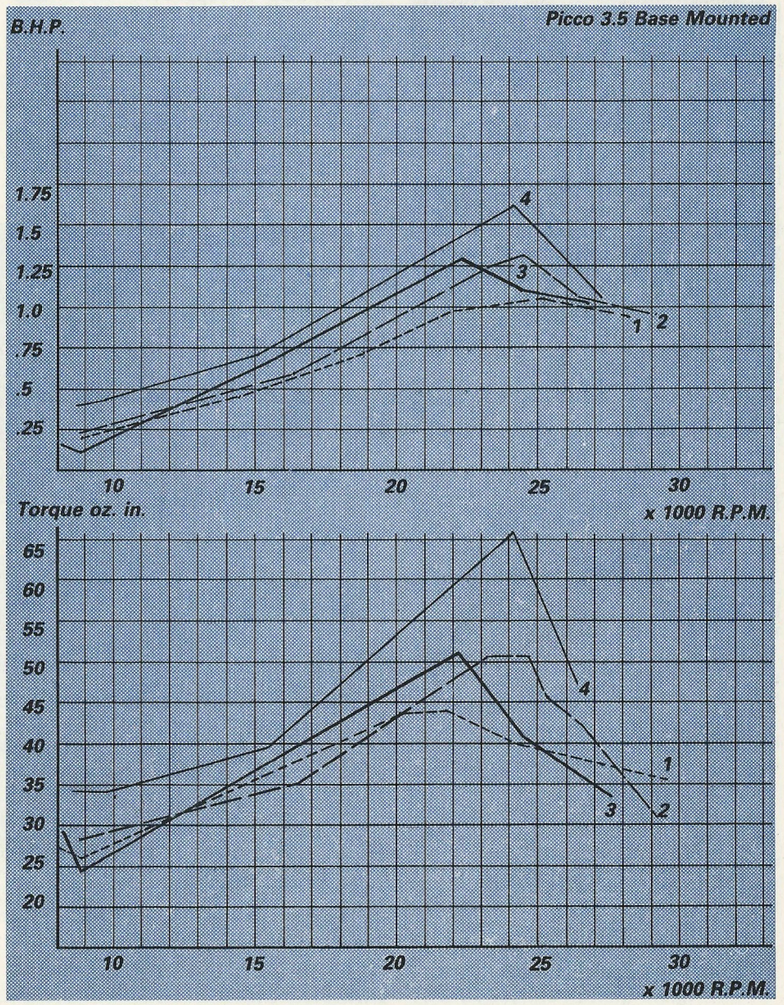
Port Timings

Exhaust port	Transfer port
opens 89° ATC	opens 110° ATC
closes 259° ATC	closes 237° ATC
Total 170°	Total 127°
Boost port	**Induction port**
opens 111° ATC	opens 203° ATC
closes 237° ATC	closes 49° ATC
Total 126°	Total 206°

Fuel 5% nitro methane, maximum bhp 1.03 at 25420rpm
maximum torque 44 oz in at 21940rpm—open exhaust.
Fuel 5 nitro methane, maximum bhp 1.31 at 24720rpm
maximum torque 52oz in at 23490rpm—tuned pipe.
Fuel 25% nitro methane, maximum bhp 1.31 at 23490rpm
maximum torque 50 oz in at 21290rpm—tuned pipe.
Fuel 5% nitro methane, maximum bhp 1.31 at 24720rpm
maximum torque 52oz. in. at 24000rpm—tuned pipe.

Conditions
78°F dry temp. 71% rel. humid.
30in. of mercury pressure.

Supplier of engine
P.B. Racing Products
Manufacturer of engine
Picco, Monza, Italy.



before dropping sharply. There was also an increase in BHP from 1.1BHP at 25,000rpm to 1.3BHP at 24,500rpm.

Nitro content was increased to 25% for the third test. This resulted in a significant increase in torque and BHP at the lower speeds, which can be advantageous, but the engine did peak at 2,000rpm less than before. As an experiment, the tuned pipe length was increased to 195mm and we discovered that this gave even more power at low revs.

For the last test the nitro content was raised to 50%. This gave a fantastic increase in power, both torque and BHP peaking at 24,000rpm, 1.62BHP and 66oz.ins., these figures being achieved with an exhaust length of 175mm.

Conclusion

A fine piece of machinery, this engine is one of the forerunners in the car world, its power and tractability making it hard to beat.□