The Parra Wasp

1.5cc Diesel

Maestro Alberto Parra, Introduces a Little Sibling to the Venerable Parra 2.5cc Diesel. - Maris Dislers

Here's another product of the Spanish-Ukrainian alliance that brought us the Parra 2.5cc engine. As before, Alberto Parra is the project's "impresario" responsible for the general design and subsequent marketing. Vladimir Sosnovsky works on the design details and manufacturing. The Wasp is similar to the established 2.5cc Parra engine, both in overall design and intended application. That is, a modern lightweight design made to a high standard, with a variety of specification options to suit a range of applications.

The buyer can opt for ABC piston/cylinder, or an AAC set-up for a little more performance potential. Then select a glowplug or diesel head, R/C throttle or a range of simple venturi carburettors of different choke areas. There's also a very unusual choice of two crankcase options. While all else is the same, the C-type crankcase's exhaust tube is angled 30 degrees upwards (as mounted in a combat model). The R-type is angled the same amount in the opposite direction, making it more suitable for Mini-Goodyear racing.

If noise is a concern, an optional lightweight (9.3g) muffler of the type used on the Parra 2.5cc engines is available. We found this muffler design quite effective in previous tests with the Parra 2.5cc diesel, recording a noise level reduction of about 10dBA with that engine.

Our test engine is an early production diesel with AAC piston and cylinder and a C-type crankcase, with venturi carburettor.

Structural details

A front induction, rear exhaust engine based on a lightweight one piece investment cast crankcase using the "lost wax" method. Double ball race crankshaft mounting, Schnuerle cylinder porting and assembly with threaded head and backplate. Beam mounting lugs with 13mm longitudinal mounting bolt hole spacing to suit the maker's own combat engine bearers and those from Profi, FORA and perhaps other brands. The Wasp's nominal bore of 12.5mm and 12mm stroke dimensions result in swept volume of 1.47cc and a slightly over-square bore to stroke ratio. The AAC weighs 90g and the ABC weighs 4g more.

The crankshaft has 10mm main journal diameter, reducing to 5mm diameter front journal, threaded M5 for prop mounting. Its generous 11.7mm long valve port funnels towards the 6.5mm gas passage and angles to rearwards to direct incoming mixture. The crankweb with counterbalanced flanks supports a hard chromium plated crankpin of 4.5mm diameter. The plated surface significantly improves crankpin life. This feature is normally associated with engines in a much higher price bracket than the Wasp, which sells for around 100 Euros.

The crankcase is fitted with high quality Swiss bearings. Front is 5x13x4mm with 8 balls and rear is 10x8x6mm with 11 balls. Both have a plastic cage and are unshielded. A longitudinal channel from the intake window connects to an annular groove located in the crankcase midway towards the front bearing.

A 4mm diameter spray bar with short combat-style needle retains the venturi insert. The venturi's intake throat has a shallow taper to a minimum diameter of 2.45mm, where the four peripheral jet holes are located, followed below by an abrupt transition to a large domed section. Alternative venturis with 2.8mm, 3.1mm and 3.4mm throat sizes are available.

The high tensile-machined aluminium alloy conrod with rectangular cross section measures 23mm between centres. Three lubricating holes are drilled into the bronze bushed big end at approximately 2, 4 and 8 o'clock positions when viewed from the rear. An "X" scribed on the rear face is probably intended as an aid to reassembly, so that these holes remain in the intended orientation.

The aluminium alloy piston is machined from the solid, leaving generous bosses to support the 4mm hollow wrist pin, which is retained by wire circlips.

The piston's skirt is "barrelled" to minimise friction, leaving only a narrow sealing band midway between the wrist pin hole and the flat crown. A cutaway in the lower skirt clears the crankweb and reduces obstruction to the charge entering the boost transfer passage towards the bottom of the stroke.

The cylinder is of orthodox flanged drop-in type with hard chromium plated bore and 1.3mm wall thickness, tapering slightly below the ports. Porting is the common Schnuerle loop-scavenged arrangement with mirror image transfer ports either side of the exhaust port and a third upwardly inclined boost port of equivalent width to assist with scavenging.

The elegantly formed passages in the crankcase feed the three transfer ports and careful shaping of the exhaust stub interior suggest a more than casual regard to good gas flow in their design. A threaded clamp ring retains the head assembly which on our engine has a push-pull contra piston adjusted by a hex-head compression screw. Two copper head shims of 0.05mm thickness are fitted as standard.

The intake port opens 25 degrees after BDC and closes 201 degrees later at 46 degrees after TDC. Exhaust duration is 146 degrees, transfers 130 degrees and boost 120 degrees.

The aluminium hex nut for retaining the propeller and brass compression screw need a 3/8 inch AF spanner, and the head clamp ring and threaded backplate are drilled to accept a spanner having four 2.5mm pins equally spaced around a 17mm diameter circle. A combination tool is available from the manufacturer, although the FORA F2D engine tool (and possibly other makes) also fits if you happen to already have one. No special tool is needed for removing the prop driver, which cups neatly over the crankcase nose to minimise ingress of dirt, as it does not jam hard onto the taper of the split mounting collet.

> *"The new Parra Wasp 1.5cc diesel has potent performance and very pleasant manners."*

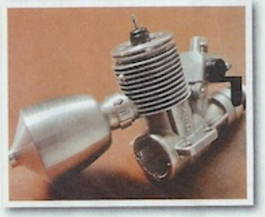
Left or right-angled exhaust stack. Wasp gives you the luxury of choice when ordering the engine.

Performance

So how did all of these nicely made components get along together when put to work? Fit and finish is of a high standard and the Wasp seemed to be quite happy to get on with it. In fact, we found negligible improvement at the end of our test programme over RPM checks made just after the recommended running in procedure had been completed. The test fuel was our usual mixture for such engines, having 15% castor oil, 30% diethyl ether and 55% kerosene, with 1.5% ethyl hexyl nitrate added. This gave slightly better performance than the mixture given in the maker's instructions, with 20% oil content.

Starting is straightforward, but care is needed to avoid flooding the crankcase. Get it too wet and the Wasp plays dead, needing a fair bit of flicking to clear the excess before it comes to life. Better to carefully add only two or three drops in the carburettor as the prime for cold starts, so you know exactly what's going on. Restarting when hot, or even tepid, is easy providing the needle is opened a quarter to half turn from its peak setting, or in a typical control line model side-winder installation where the tank feed pipe is sufficiently outboard to result in the necessary richer mixture on the ground in normal use. A finger choke or two and a few flicks to pump mixture into the cylinder usually does it. Exhaust priming was unnecessary and could easily flood the engine if the exhaust stub is angled upwards. Compression is left at the running setting. No need for the diesel pit man's bash with this well-mannered engine, although that works very well if preferred. The Wasp does not have a kickback when starting hot, even with small propellers and high compression setting. In fact, we completed the entire test program without ever feeling the need for finger protection.

Control adjustments were progressive and precise. However, the Wasp takes its time to reach a stable running temperature, so unduly hastening the process can lead to an over compressed run. It tolerated that quite well, but the dirty exhaust colour certainly indicated extra stress on its internals. We found the best approach for establishing optimum settings was to sneak both compression and mixture close to the mark. Then carefully leaning it out until it just started to misfire would warm the engine up fully, allowing compression to be adjusted accurately. Slightly opening the needle at that point would have it happily singing at full pelt.



Here's the versatile Wasp as an R/C glow engine with muffler.

Internal components are made to a very high standard. Note the enormous intake port in the crankshaft.

Neat and lightweight design uses no machine screws. A special tool accessory makes disassembly for servicing quick and easy.

The effective choke area has a significant effect on engine performance, in terms of power output, fuel economy and the necessary incoming air velocity to give adequate "suction" for the intended purpose. While the difference in choke diameter from one of the four available venturi inserts to the next is only a fraction of a millimetre in this small engine size, the effect on choke area and therefore the desired performance characteristics is significant. The three larger venturi options provide approximately 30%, 60% and 90% more area respectively than the smallest size. In our experience, a 2.8mm diameter is about the limit for use in a 1/2A combat or other aerobatic model. The 2.45mm diameter might, however, be a better overall choice in some instances where the fuel tank is wider or longer than normal. Our flight-testing showed that the largest 3.4mm diameter was well suited for flat out straight-line work, such as Mini Goodyear racing. We ran three performance tests on the bench to assess these scenarios, with the expectation that performance with the 3.1mm venturi could be deduced from the results.

The Wasp was happiest when allowed to run at higher speeds and there seems to be little merit in loading it with larger propellers to below 16,000 RPM. With the 2.45mm venturi on board, a consistent torque level between 16 and 17oz.in is maintained up to around 18,000 RPM before dropping off at a fairly rapid rate as RPM increases. This allows the engine to deliver maximum power output of just under 0.3 BHP at approximately 19,000 RPM. Swapping to the 2.8mm venturi insert added around 1oz. in to torque across the useable speed range and boosted power by 10% to 0.33 BHP. This carburettor size is typical of other 1.5cc engines of this type, so with that important common reference point, the Wasp's performance is right up with the best of the breed.

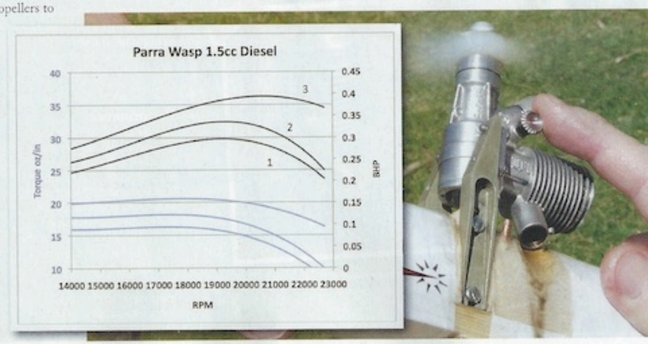
Test Results	Test 1	Test 2	Test 3
Venturi dia.	2.45mm	2.8mm	3.4mm
Propeller			
APC 8x4	12500	13000	13700
APC 7x6	12900	13300	14200
APC 7x5	13700	1500	15600
APC 7x4	15600	16200	17500
APC 7x3	18900	20000	20900
APC 6.3x4	19000	19300	20700
APC 6.5x5	*	*	18200
APC 6.5x5 trimmed to 6	*	*	19600

However, the Wasp's overall design potential is most apparent when fitted with the largest 3.4mm venturi. Torque jumps to over 20 oz-in and its rate of decline at higher speeds is less pronounced. Power output almost reaches a very impressive 0.4 BHP somewhere around 20,500 RPM.

Our test propeller RPM figures are given below. The instructions provide a number of more practical flying propeller options. Based on our flight testing of the Wasp, an APC 6.3x4 works well for combat and APC 6.5x5 trimmed to 6 inches in diameter, or Graupner 6x5.5 are good for racing. The recommended 7x4 size is a good choice for easier going, but sprightly sport flying.

Conclusion

The Parra Wasp is a high quality engine with excellent fits and finish that can be customized to suit a range of specific end uses by taking advantage of the various crankcase and parts options. Power output is very competitive in its class and we found it pleasant to operate both on the test bench and in our flight tests. The Parra Wasp is made in limited numbers and the entire first batch of engines is sold. However, new stock should be available by the time this report is published, allowing Alberto Parra to resume his customary prompt sales and spares/accessories service. The Parra Wasp is available only by internet order via www.clubtamaran.com



Down to work in 1/2A combat model. Short needle valve is almost crash proof and easily adjusted with one finger. Compression adjustment with the multi-tool also keeps knuckles well away from the spinning propeller.