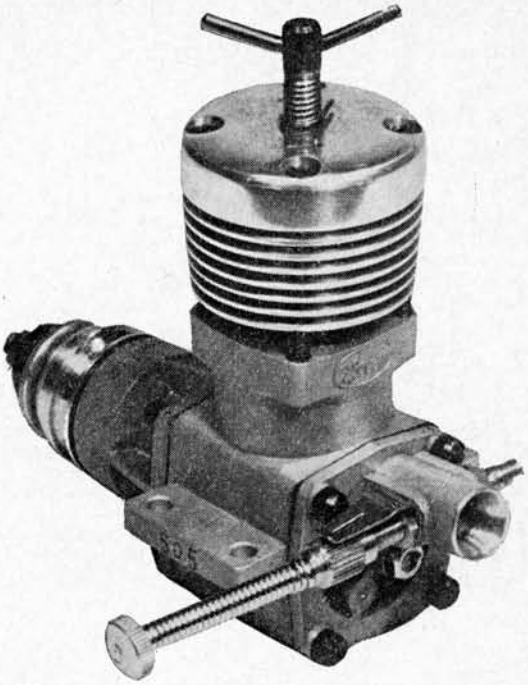
ENGINE ANAYLSIS No. 115

TAIFUN ORKAN

2·5c.c. diesel from Germany

conducted by R. H. Warring

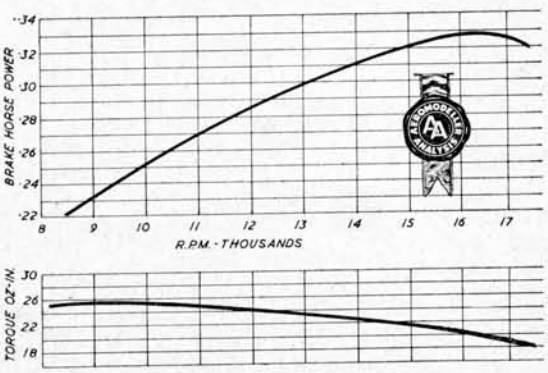


LATEST ADDITION TO the German 'Taifun' range, the 'Orkan' is a 2.5 c.c. diesel developed for 'racing' performance and capable of running quite happily at 20,000 r.p.m. plus on small propeller sizes. Peak power on test was reached at the high figure of (for a diesel) 16,500 r.p.m. at which speed the 'Orkan' developed .328 B.H.P. This was achieved on a 50:30:20 paraffin:ether:oil mixture with the addition of 4 per cent. amyl nitrate (the latter virtually essential to promote smooth high speed running). Performance is somewhat down (200-400 r.p.m. on a given prop, depending on size) with an 'ordinary' diesel mixture containing a higher oil content, but still exceptionally good for a 2.5 c.c. diesel.

Handling characteristics are generally excellent, although with a tendency to be vicious on hand-starting with the smaller propeller sizes. Controls are nicely placed, the upward angled venturi from the rear cover carrying the needle valve at a convenient height above the bearers and the compression screw is quite tall and easy to grasp. A friction lock is fitted to the screw in the form of a single-turn steel spring mounted in the head.

Although a twin ball race engine, some two hours running time were required to eliminate 'drag', especially when using a 20 per cent. oil mixture. It would be advisable, in fact, to use a fuel with a higher oil content for the first 30 to 60 minutes running.

At first sight of the 'Orkan' one cannot help being impressed by the remarkably clean and 'professional' appearance of the engine. Subsequent examination shows that a similar high standard is maintained throughout, with excellent workmanship and finish on all parts. Construction is conventional, employing a 'racing' type crankcase unit with bolted on front and rear covers and a heavy steel cylinder liner secured by a finned jacket held down with four bolts. The front cover carries the two ball races and crankshaft. The rear cover carrying the rotary disc valve and venturi. Both covers sealing on paper gaskets.



The main crankcase casting is of substantial weight and thickness, although rather marginally thin-walled in the region of the mounting lugs. Crankcase chamber and lower cylinder bore are both machined internally, together with the four scalloped transfer ports (two each side).

The hardened steel cylinder is a really substantial affair of .685 in. o/d under the flange and .707 o/d above the flange for a bore of .552 in. Conventional exhaust ports are formed in the flange whilst the transfer consists of four elliptic shaped holes through the cylinder walls at an upward angle. On the inside these hole positions correspond to shallow scallop shaped passages formed in the cylinder walls, terminating in a flap top almost completely overlapping the exhaust. None of these openings appears to have been machined. So presumably the liner is an investment casting. Port hole positions correspond to the four passages in the crankcase unit, thus both internal and external transfer passages are provided in the complete assembly. The bore is honed to finish and the external surfaces finished by grinding.

The piston is of plain cylindrical form in cast iron, of quite lightweight construction for a 2.5 c.c. diesel, machined away to very thin walls below the gudgeon pin. The connecting rod is machined from dural to a generous section and has a plain (unbushed) bearing at each end. The gudgeon pin of silver steel is of generous diameter and press fitted.

The finned cylinder jacket is turned from light alloy and polished all over. The head section is solid and the internal depth continued still further in the form of a spigot to give extra threaded length support for the compression screw. The screw itself being further restrained by the friction spring. The cylinder liner seats in the crankcase casting on a paper gasket (and is virtually an exact fit, with no slack). The cylinder jacket is a quite loose 'plug' fit over the upper cylinder and is retained by four hold-down bolts.

The hardened steel crankshaft is of relatively small diameter, .275 in. over the journal tapering to a .192 in. threaded length immediately in front of the front race.

Data & Prop—r.p.m. figures

Displacement 2.48 c.c. (.151 cu. in.)
Bore: .552 in.
Stroke: .591 in.
Weight: 6¼ ounces
Max. power: .328 B.H.P. at 16,400 r.p.m.
Max. torque: 25.5 ounce-inches at 9,500 r.p.m.
Power rating: .132 B.H.P. per c.c.
Power/weight ratio: .0535 B.H.P. per ounce

Material Specification:
Crankcase: light alloy pressure die casting
Cylinder liner: hardened steel
Piston: cast iron
Contra piston: cast iron
Connecting rod: light alloy
Crankshaft: hardened steel
Bearings: two ball races
Prop driver: dural
End covers: light alloy pressure die castings
Induction: plastic rotor (rear disc)
Spraybar: brass
Needle valve: steel with brass thimble

Propeller	*R.P.M.*
10 x 3½ Top Flite nylon	10,200
9 x 4 Top Flite nylon	12,100
8 x 4 Top Flite nylon	15,100
7 x 4 Top Flite nylon	17,200
7 x 6 Top Flite nylon	15,000
9 x 4 KK nylon	12,600
8 x 6 KK nylon	11,800
8 x 4 KK nylon	14,300
7 x 4 KK nylon	17,400
8 x 4 Frog nylon	14,200
7 x 6 Frog nylon	15,200
6 x 4 Frog nylon	22,000 plus

Fuel: 50:30:20 paraffin, ether, castor plus 4 per cent. amyl nitrate.

The dural prop driver fits on the taper and the propeller nut is of specially shaped form with small 'spinner' nose and .247 in. o/d boss (matching a ¼ in. diameter propeller hub hole). Both ball races are of lightweight type and appear to be of selected quality. The plain length of bearing between the races is free from rubbing contact with the shaft. The shaft itself is hardened and ground all over to finish, including the .197 in. diameter crankpin. The journal length being ground between centres. Sides of the crank web are cut away to provide an arbitrary counterbalance. Extreme care appears to have been given to the fits and finishes of this assembly.

The crankcase rear cover carries a moulded plastic (nylon type) rotor disc mounted on a central screw. This screw emerges from the back of the cover and is locked by a brass nut. It is thus possible to adjust the actual rubbing contact pressure of the disc. The back face of the disc is machined and during running in tended to score grooves in the back cover face. Slackening the retaining screw enables rotor drag to be reduced to a minimum with the oil film maintaining an adequate seal. For an engine intended for racing duties we would favour polishing or lapping the back of the plastic disc on a flat surface as a preliminary to running-in. Normal running is hardly likely to smooth or bed down the plastic surface and any irregularities on this surface will only cut corresponding grooves on the face of the back cover.

The brass spraybar is of conventional pattern and can be fitted into the venturi from either side. Performance can be improved slightly by 'waisting' the spraybar, although the gain is comparatively small. 'Waisting' does, however, definitely increase fuel consumption. The needle valve has a flexible spring extension fitted to the thimble, terminating in a knurled brass knob.

Induction timing corresponds to some 170 degrees opening, with exhaust opening nearly 80 degrees on either side of bottom dead centre (actual opening 157 degrees). Transfer opening period is 147 degrees and in addition there is 28 degrees of sub-piston induction on either side of top dead centre. Efficient 'breathing' is maintained well past 20,000 r.p.m. with the limitation that at low speeds there is appreciable blow-back through the induction tube. The 'Orkan' is, therefore, specifically suited to smaller size propellers and high operating speeds —e.g. an 8 x 4 for free flight and a 8 x 6 for control line.

Summarising, the 'Orkan' is a very well made engine with first class design and workmanship, and a performance to match. It is the first of the 'Taifun' range which has impressed us as having a true 'contest' performance, whilst retaining all the sturdiness and general reliability associated with these German productions. It is also a nice compact engine, if a trifle on the heavy side for free flight work at 6⅛ ounces. Most of this weight is accounted for in the substantial cylinder unit (2 ounces) and shaft and main bearing (1⅞ ounces).