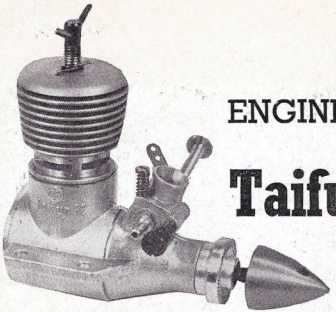


ENGINE ANALYSIS No. 102

by R. H. Warring

Taifun ZYKLON 2·5 R.C.

THE GERMAN-MADE "Zyklon" 2.5 c.c. diesel has been developed specifically as an R/C power plant with the barrel-type throttle housing an integral part of the crankcase rather than a separate attachment. Design layout otherwise is strictly conventional, employing really sturdy construction and excellent workmanship throughout. A sound, consistent, reliable engine which is easy to handle, peaks at quite a moderate speed and should run virtually for ever without wearing out. Power output is adequate for the job, although rather on the modest side for a modern diesel of this size, but with maximum power developed at 12,500 r.p.m. reasonably large propeller diameters can be utilised for increased thrust efficiency. A 9 x 4 or even a 10 x 4 prop. (preferably a 10 x 3½) would be about right for R/C work.

The crankshaft is carried in a well finished plain bearing machined in the crankcase casting (unbushed) with a single ball race at the rear end. This, coupled with a good but not tight piston-cylinder fit gives an engine which requires a minimum of running-in time, although performance may increase slightly over the first hour or so with individual engines. There was no trace of inconsistency of running, even with the engine brand new, except at the very highest speeds. On 7 inch diameter propellers of fine to medium pitch the engine is sufficiently unloaded to be unhappy.

A lot of thought has gone into the design of the throttle unit which, basically, is of the conventional barrel type, mounted in a cubical housing. The barrel rotates independent of the spraybar, which is fixed. Provision is made to lock the throttle in an open position by tightening a small screw on the front (left hand side) of the housing. With this screw loosened to permit throttle arm movement it will eventually vibrate out and be lost, so it would normally be removed entirely when the engine is worked with throttle. On the other hand, using the screw tightened up for normal running ensures that the throttle cannot "creep" under engine vibration and so upset the mixture.

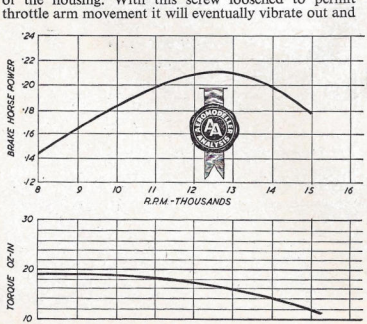
A small screw on top of the housing permits adjustment of the "slow" throttle setting by acting as a stop for the barrel movement. This screw is locked with a coil spring. Further throttle adjustment is provided by an air bleed hole in the front of the housing, the extent of the air opening being adjusted by turning the projecting screw (rather like a smaller needle valve assembly) on the right hand side. Since this adjusting screw comes very close to the propeller disc the head is sensibly slotted so that adjustment can be made with a long screwdriver. Barrel throttle movement is controlled by a conventional angled lever with two holes for alternative moment arms. The lower hole is consistent with a push-pull actuator stroke of approximately 13/32 in. for full throttle movement and thus matches most conventional servo strokes.

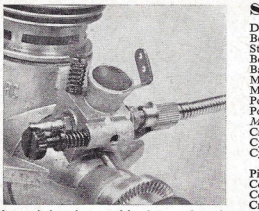
Despite the elaborations not usually found on a small engine throttle, multi-speed performance is strictly limited. Even with the greatest amount of care in adjusting the air bleed and throttle stop, minimum safe slow running speed was of the order of 4,000 r.p.m. Anything less tended to be erratic, with a considerable risk of the engine stopping. The throttle action itself is also abrupt—changing from "low" to "high" and back again with no practical intermediate speed settings. In other words, even if connected to a progressive actuator action the "Zyklon" throttle will not give more than "high" or "low" speed response.

Constructionally the "Zyklon" features a rigid and relatively heavy crankcase casting with long, thick lugs for beam mounting, a screw-in steel cylinder with screwed-on jacket, and a screwed-in backplate. The intake tube and throttle block is integral with the casting, subsequently drilled to throat diameter and laterally to take the throttle assembly.

The main bearing is machined in the casting, with the rear ball race press-fitted into a machined housing. Crankcase taper between full crankcase diameter down to the front of the bearing comprises a solid metal section which undoubtedly contributes great strength over this region. One might almost say the unit appears to be designed with crash-landings in mind!

The cylinder is of steel, hardened and ground to finish. Walls are of substantial thickness, both above and below the exhaust ports. Four transfer ports are milled on the inside of the lower cylinder, tapering off at the upper end to pass between the exhaust port pillars and overlap the exhaust opening by almost 100 per cent. The cylinder screws into the crankcase to seat on its flange with a copper gasket underneath. The cylinder jacket is machined from light alloy, perfectly conventional in pattern but anodised an unusual mauve colour. Only unusual feature is the single turn spring steel wire locking clip carried on the compression adjusting screw thread and located by a turned-down end engaging in a small hole in the top of the jacket. This compression screw lock is much simpler than the usual tommy bar type lock, just as





Integral throttle control in close-up show the air bleed for slow running and throttle stop screw.

Specification

Displacement: 2.540 c.c. (.1548 cu. in.)
Bore: .597 in.
Stroke: .553 in.
Bore/stroke ratio: 1.08
Bare weight: 5¼ ounces
Max. power: .21 B.H.P. at 12,500 r.p.m.
Max. torque: 19 ounce-inches at 9,000 r.p.m.
Power rating: .083 B.H.P. per c.c.
Power/weight ratio: .0365 B.H.P. per ounce
Material specification
Crankcase: light alloy pressure die casting
Cylinder: hardened steel
Cylinder jacket: turned dural (anodised mauve)
Piston: cast iron
Contra piston: hardened steel
Connecting rod: turned dural
Crankshaft: hardened steel (stress relieved after heat treatment)
Bearings: plain with single ball race at rear
Propeller driver: turned dural
Spinner nut: dural, anodised mauve
Crankcase back cover: turned dural
Manufacturers:
Johannes Graupner, Kirchheim-Teck, W. Germany
British agents:
Ripmax Ltd., 80 Highgate Road, London, N.W.5.
British price: £5 7s. 6d.

Propeller RPM Figures

9 x 4 Trucut	10,400
8 x 4 Trucut	12,300
7 x 4 Trucut	14,600
9 x 4 K.K. nylon	11,000
8 x 4 K.K. nylon	12,500
7 x 4 K.K. nylon	14,400
7 x 6 Top Flite nylon	12,800
8 x 4 Top Flite nylon	13,000
9 x 4 Top Flite nylon	10,400
9 x 6 Top Flite nylon	8,000
8 x 4 Stant	11,400

effective and never gets in the way or requires separate manipulation. It seems a very good idea.

The piston is of conventional plain pattern with a slightly conical top, machined from cast iron. Wall thickness is substantial. Connecting rod is machined from dural with "ball" ends and polished. The silver steel gudgeon pin is full floating and neither the big or little ends are bushed. Piston surface finish and bore finish are both excellent. Contra piston is of hardened steel and relatively shallow in depth. The bore is, in fact, on the large size (15 mm. nominal) with a shorter stroke (14 mm. nominal). Despite being over-square the "Zyklon" is not, however, a high speed engine.

The hardened steel crankshaft is a sturdy ⅜ in. diameter (rather odd to find an "English" size adopted), relieved forward of the intake port to reduce the rubbing surface area of the plain bearing length. The crank web is purely circular with a .196 in. diameter crankpin. The shaft unit is finished by grinding between centres and this, together with other evidence of manufacturing techniques, would appear to indicate that the "Zyklon" is produced in relatively small batches rather than mass produced. Certainly it appears to receive a lot of attention as regards good fits and finishes. It also gets its sturdiness without excessive weight, although 5¼ ounces is quite enough for a 2.5 and could produce a C.G. shift on a model designed around an American .15 glow motor. As it will be used on R/C sports type models, however, this is not likely to matter; and in any case it is consistent with the 2.5 c.c. motor weights common to European design practice.

Summarising, we would say that the "Zyklon" offers excellent workmanship and sound design in a tough, rugged power plant for typical R/C "Sunday flying." The throttle is an integral feature, whether you use it or not, and is easily locked open for normal sports free flight. If you are looking for an engine with top performance in the 2.5 c.c. size, the "Zyklon" will not fit the bill. But if you want an engine which will last and last—and survive crashes, if necessary—the "Zyklon" has all the power required from a 2.5 c.c. sports power unit, and it delivers its power at sensible r.p.m. figures. The only aggravating feature from the operating point of view was the ⅜ in. diameter boss on the propeller driver calling for enlarging the holes in propeller hubs to fit—but many modellers like this method of location anyway. We personally prefer to keep as much "meat" as possible in the propeller hub, especially with wooden props.