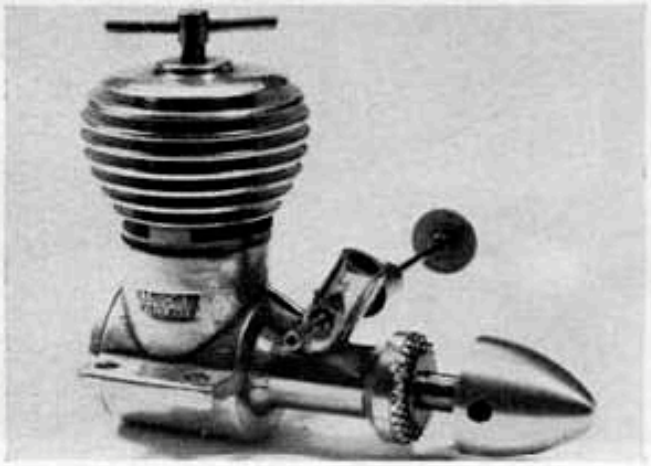


ENGINE TEST
By Peter Chinn

Allouchery Cormoran 1c.c. Diesel Engine

" . . . an interesting different design, attractive in appearance, easy to handle . . . "

AS we mentioned in last month's *"Latest Engine News"*, the Allouchery Eclair engines were among the very first diesels to be manufactured. As with most French makes, they are currently made in only very small quantities and are little known outside France.

Unlike the older Eclair models still in production, the Cormoran is a relatively modern design, employing shaft-valve induction and a compact short-stroke layout. It nevertheless has some features that take it out of the rut. These include multiple transfer passages within the wall of the main casting and, most unusual of all, rotary-valve timing that is decidedly at variance with accepted practice. Externally, the engine is distinguished by large diameter cooling fins and an all-over polished finish.

The design and construction of the Cormoran is basically conventional insofar as it uses a cast aluminium alloy crankcase with integral crankshaft bearing and screw-in rear cover; a hardened steel cylinder liner externally threaded to screw into the crankcase and a screw-on machined alloy finned cooling jacket.

The crankshaft, of heat treated steel, has a full disc web and no counterbalance. It has a 6 mm. dia. journal and a 4 mm. solid crankpin. The gas passage through the shaft is 3.8 mm. and is fed from an oval port in the crankshaft. This allows a normal induction period of 160 degrees of crank angle but is positioned to give uncommonly early opening and closing.

Unorthodox valve timing and transfer porting

It is unusual for a rotary-valve, whether shaft, disc or drum type, to open earlier than 30 degrees after bottom dead centre. Most do not open before 35-45 degrees and some open much later: for example, the current D-C Spitfire, tested in this series last July, was timed to begin admitting gas at 85 degrees ABDC —though it must be remarked that this is almost as unusual, in lateness of opening, as the Cormoran is unorthodox in earliness of opening at only *5 degrees* ABDC. Even more unconventional, however, is the fact that the Cormoran's rotary-valve closes *15 degrees before TDC*. In every other model engine we have tested to date (and these number several hundred), the induction port has closed after TDC, normally not less than 40 degrees ATDC and as late as 50-60 degrees ATDC in a high-speed racing type motor.

The Cormoran's induction timing of 5 degrees ABDC to 15 degrees BTDC might be expected to result in some unusual performance or handling characteristics. In fact, one would not normally notice any marked change but performance tests, as we shall see in a moment, did reveal some differences which may well be attributable to this departure from orthodox timing diagrams.

Ahead of the main journal, the shaft is reduced to 5 mm. for the prop shaft length, the intervening section being tapered to provide a friction drive to the machined alloy prop driver. A hexagon nut and washer, plus an optional machined spinner-nut, are provided. The shaft runs direct in the crankcase material, no bushing being used. The bearing length has a minimum o.d. of 10 mm. and no webs are used to brace it to the crankcase except at the top behind the air intake. The air intake, bored 4.4 mm., is raked forward 30 degrees from the perpendicular and carries a brass spraybar, externally threaded for needle-valve adjustment, via a soldered on brass split thimble. There is a wire circlip around the thimble which maintains just the right amount of stiffness in the adjustment. The needle-valve stem terminates in a large diameter brass adjusting knob.

That part of the crankcase casting which forms the lower cylinder casing is internally threaded to accept the screw-in cylinder liner. The wall of the casting is 2.8 mm. thick at this point and, instead of using transfer flutes in the casting or the cylinder liner, this thick wall is employed to transfer the charge by means of twelve 1.5 mm. dia. holes bored vertically through it and spaced at 30-degree intervals. An annular chamber is formed at the top of these multiple passages and, from this, the gas is fed into the cylinder via three groups of three small transfer ports, through the cylinder wall immediately below the flange. These ports which also have a diameter of 1.5 mm., are inclined at approximately 30 degrees to the cylinder axis and each group is spaced at 120 degrees around the cylinder, breaking into the bore between the three exhaust ports. They open approximately 15 degrees after the exhaust ports have opened. Cylinder port timing, according to measurement of the test engine, was: exhaust 63 degrees of crank angle each side of BDC; transfer 48 degrees each side of BDC.

The piston is of simple design, with shallow conical crown and a thick (1.5 mm.) skirt. The gudgeon-pin is fixed in the piston, apparently by peening the ends, the pin being unhardened for this purpose, and the connecting-rod is a very substantial item of hardened steel.

Performance

The Cormoran test sample was acquired by the Editor, while in France, from the manufacturer and it was obvious that the motor was already adequately run-in as received. We nevertheless gave it a further thirty minutes running time prior to actual testing. No silencer was supplied with the engine and so far as we are aware, Allouchery does not, as yet, offer such accessories. The Cormoran was therefore tested "unsilenced".

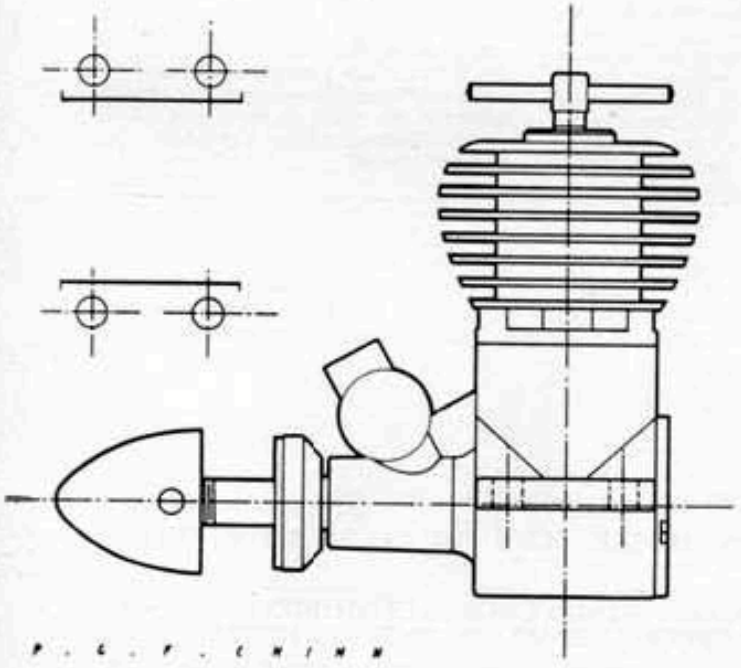
The Cormoran liked to be port primed when cold but started easily at all times. Except when re-starting the engine quickly after a run, we found it best to open up the needle-valve slightly, from the best running position, and to then close the needle again only after the engine had warmed up and the compression adjustment had been re-set. If the needle-valve was closed too soon, there was a tendency for the engine to cut out abruptly during compression adjustment.

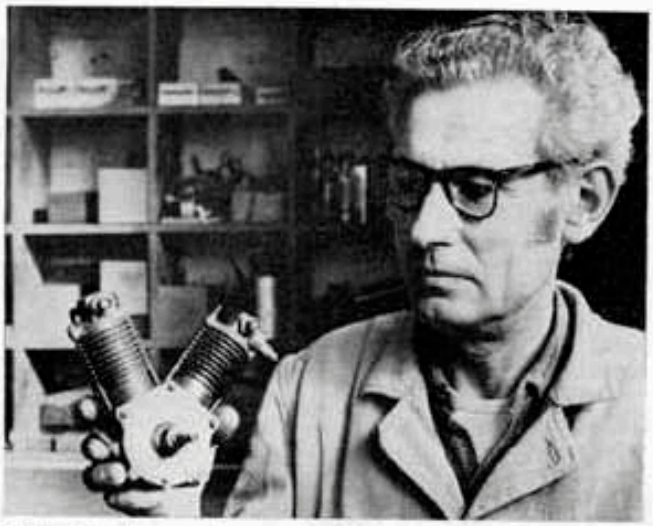
Maximum torque recorded by the Allouchery on test was 8.4 oz. in. at 8,000 rpm. This is quite good for a 1 cc. engine. Beyond this speed, torque declined at an ever-increasing rate and when plotted, indicated a peak bhp of just on .085 at 12,000 rpm. This is somewhat less than the output delivered by the most powerful of current 1 cc. class engines and it seems reasonable to suppose that the very early closing of the rotary-valve (which much inevitably limit the breathing ability of the engine at high speeds) is, to some extent, responsible for this.

These performance characteristics are, of course, reflected in the speeds achieved with various props, which, when compared with the performance of other 1 cc. engines, clearly show that the Cormoran is at its best on props no smaller than about 7 x 4 in. On test, for example, we obtained 7,600 rpm on an 8 x 5 PAW, 8,200 rpm on an 8 x 4 Top-Flite nylon, 8,800 rpm on an 8 x 3½ Top-Flite wood, 10,300 rpm on a 7 x 4 Top-Flite nylon, 10,750 rpm on a 7 x 4 Top-Flite wood, 11,600 on a 7 x 3 PAW, 12,100 on a

Continued on P.90

SIDE ELEVATION FULL SIZE





Numa Allouchery, veteran engine designer with a 1919 vee twin of about 35 c.c. which he used in a model. His son, Serge is also in the business.

SPECIFICATION

Type: Single-cylinder, air-cooled, reverse-flow scavenged two-stroke cycle, compression ignition. Crankshaft type rotary-valve induction. Plain bearings.
Bore: 11 mm. (0.4331 in.) **Stroke:** 10 mm (0.3937 in.)
Swept Volume: 0.9503 cc. = 0.0580 cu. in.
Stroke/Bore Ratio: 0.909 : 1
Weight: 2.7 oz.

General Structural Data

Cast aluminium alloy *crankcase* and unbushed main bearing unit. Hardened steel *crankshaft* with disc web, 0.236 in. dia. journal, 0.157 in. dia. crankpin and 0.150 in. bore gas passage. Screw-in hardened steel *cylinder liner*, flanged at exhaust belt. Screw-on machined aluminium alloy finned *cooling jacket*. Lapped cast-iron *piston* with fixed 0.118 in. dia. solid non-hardened *gudgeon-pin* and hardened steel *connecting-rod*. Lapped cast-iron *contra-piston*. Machined aluminium alloy screw-in crankcase *backplate*. Machined aluminium alloy *prop driver* fitted to taper on crankshaft. Machined aluminium alloy *spinner-nut* or plain steel hexagon-nut and washer. Brass spraybar assembly. Beam mounting lugs.

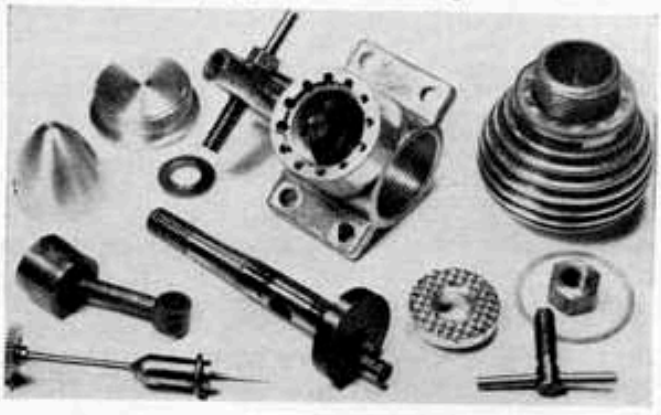
TEST CONDITIONS

Running time prior to test: Manufacturer's use 30 mins.
Fuel used: Keilkraft diesel.
Atmospheric temperature: 44 deg. F.
Barometer: 29.1 in. Hg.
Silencer type: Nil.

MANUFACTURER

Moteurs Eclair Allouchery, 19 rue de la Maison-Rouge, 94 Fontenay-sous-bois, France.

Parts of the Cormoran, showing the drilled multiple transfer passages in the main casting.



7 x 3 Top-Flite wood and 13,100 on a 6 x 4 Tornado nylon.

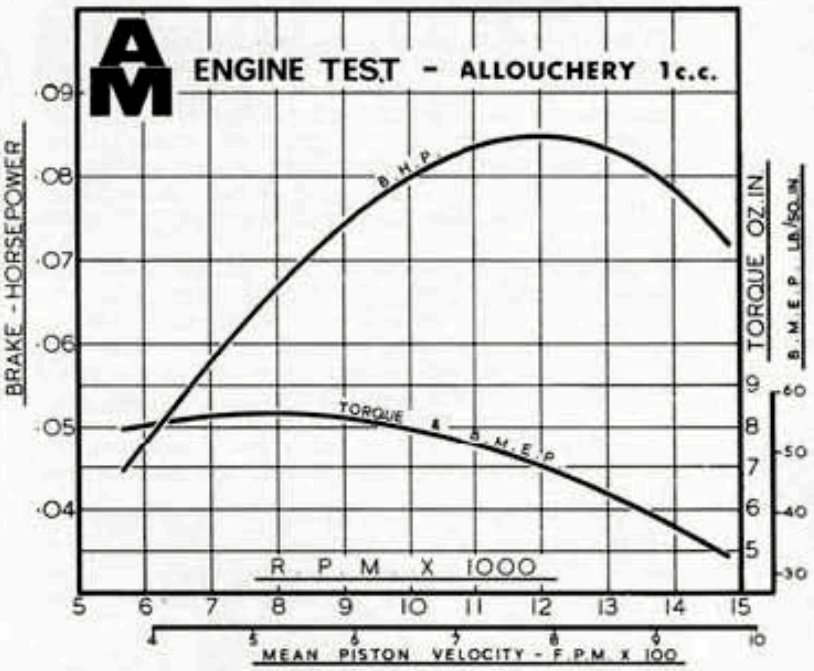
At the lowest speeds tested (6,000-9,000 rpm) we experienced a fair bit of vibration. This decreased as load was reduced and, as diesels go, the Cormoran was quite smooth at speeds corresponding to the peak of the power curve. There was no power loss with warming up at these speeds.

Controls were easy to adjust and held settings firmly. The contra piston was obviously a good fit in the bore. It did not seize when the engine was hot and would return to a lower compression setting immediately when the compression screw was slackened. At the same time, the contra piston fit was still close enough to obviate any risk of unwanted movement which might cause the compression screw to loosen.

To summarise, the Allouchery Eclair Cormoran 1 cc. diesel emerged from our examination as an interestingly different design, attractive in appearance, easy to handle, not too heavy and with a performance adequate for all but hot contest models.

Power/Weight Ratio (as tested): 0.50 bhp/lb.

Specific Output (as tested): 89 bhp/litre.



GOLDEN WINGS AEROMODELLER MODEL CLUB

Dear Sir,

I would be very grateful if you could name the diesel engine which I have acquired and give me some indication of its performance.

The crankcase is of a single light alloy casting and on the left side of the cylinder block is the letter "T" in relief in a circle. On the other side is 1.5, also in a circle. The screw on alloy fins are red anodised and the vernier screw has a compression locking lever. The engine is of the front rotary valve type, the carburettor assembly being made of brass. Below the needle valve is a threaded lug which is integral with the casting. I presume this is for the mounting of a spring steel needle valve grip.

The inside of the engine bearers is ⅜ in. and the holes are ⅝ in. apart. Also, the piston top comes to a point.

This engine is very powerful for use in my *Keil Kraft Radian* but I found the plane to be sluggish with a *Cox Babe Bee*. With the diesel I have executed loops and vertical 8's. I have recently made an exhaust which runs the length of the fuselage—from plastic (does not melt).

I would also be pleased if you could tell me where I could get a 2 volt accumulator for starting a *Cox Medallion* (with resistance) since I have been unable to do so.

I look forward to the Aeromodeller each month and also to reading the club articles.

North Leigh, Oxon. *Mark Noel.*

The engine you have sounds like the Australian **Taipan 1.5cc** *and this is made by Gordon Burford and Co. Peak B.H.P. is 0.1 at 10,000 r.p.m. and it will perform well using a 7x6 in. propeller in a control line model such as the* **Keil Kraft Radian.** *Two volt accumulators are on sale at several large model shops and can be purchased cheaply at Government Surplus stores, try Rolabd Scott Mail Order. To reduce the 2 volt output of the accumulator as the Medallion uses a 1.5cc glow head, fit a six ft. long pair of leads. This should prevent burning out the glow head.*

Dear Sir,

Last Saturday (September 17th) I was at Chobham Common, near Guildford, test gliding a K.K. *Caprice* which I had just built. With the help of my Uncle I trimmed the glider and then we tried a few tow line launches using about 50 feet of line.

However on our 4th or 5th successful launch the plane disappeared over the other side of the hill. It must have flown into a thermal because we finally saw it as a dot in the sky disappearing through the clouds about 2,000 ft up. I did not have a D/T fuse on the plane and certainly learned the hard way.

I know the chances of recovering the glider are very small, but I would be very pleased if I could locate its whereabouts. The plane has a black fuselage with orange nose, tail fin, and wing leading edges. If anyone has any information about this plane I would be pleased to receive it. I would be willing to pay a small reward if the glider is recovered. Clive Taylor, 'Desley', Upper Lambourn, Nr. Newbury, Berks.

C. Taylor.

Dear John Bridge,

I am between 10 & 16 years of age and would like to become a member of the "Golden Wings Club". With this application I enclose postal order (International Money Order) for 2/6d. to cover cost of the enamel club badge, two coloured transfers and membership card.

NAME IN FULL .....

ADDRESS .....

.....

YEAR OF BIRTH.....**SCHOOL**.....

NAME OF ANY OTHER CLUB OR CLUBS TO WHICH I BELONG (if any) .....

SEND TO:- GOLDEN WINGS CLUB, AEROMODELLER, 13-35, BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.