

the 100 hours type tests imposed by the Air Ministry. Any engine capable of passing successfully this severe test may be assumed to have left the experimental stage behind it.

### Changes in Design.

A brief outline of the changes in design which have been incorporated in the series III "Cherub" may be of interest, the older "Cherub" being already familiar to readers of FLIGHT. To begin with, the bore has been increased to 90 mm. and the capacity to 1,228 c.c. The cylinder heads have been redesigned, and have new type valves with triple-valve springs. An extra gas ring has been added to the pistons, and a scraper ring of new design is used. The crankcase has been re-designed with dry sump, and is now more robust, smaller and more symmetrical. There is now a full floating bush big end bearing, and the lubrication system is of the full pressure type by engine-driven duplex gear pump, one suction and one pressure unit. The rear of the engine has been modified to allow easier attachment of engine mounting, and a special "Cherub" type of Zenith carburettor is tucked up more snugly to the engine, with new float mechanism. The ignition control is automatic, inter-connected with the throttle. The altitude control is inter-connected with the throttle so as to ensure automatic return to ground position when throttle is closed.

### The Type Tests.

Concerning the Air Ministry Type Tests, which took place in December last, the essential information may, perhaps, best be given in the form of tables. One of our illustrations this week shows the power, etc. curves taken before and after the type tests, from which it will be seen that the power given at the end of the 100 hours was greater than before the test. Attention may also be drawn to the fact that the official report on the condition of the engine after being stripped stated that "The general condition of the engine was excellent."

A synopsis of the type tests is as follows: First run of 1½ hours on Froude dynamometer, during which the first power curve was taken; 40 hours on Froude at 90 per cent. power at 2,900 r.p.m.; 50 hours on hangar at 90 per cent. power, at

2,900 r.p.m.; 9 hours on Froude at 90 per cent. power and 2,900 r.p.m.; 1 hour on Froude at full power and 2,900 r.p.m.; 1 hour on Froude at high speed of 3,350 r.p.m.; 10 mins. on Froude, slow-running at 890 r.p.m.; 1 hour on Froude, high power of 36.9 b.h.p., at 3,190 r.p.m.; and finally 1½ hours on Froude, during which second power curve was taken.

### Details of 100 hours Test at 2,900 r.p.m.

The following table shows particulars of the 100 hours test:

Hours Run non-stop.	Power at End.	Average Consumptions.				
		Fuel. Gals./h.	Fuel. Pts./hp./h.	Oil. Pts./h.	Oil. Pts./h.p./h.	
1	10	34.2	1.94	0.59	1.22	0.046
2	10	34.5	1.9	0.58	0.98	0.037
3	10	34.5	1.9	0.58	0.612	0.023
4	10	34.2	1.93	0.59	0.570	0.022
5	10	Hangar	1.94	—	0.625	—
6	10	Hangar	1.94	—	0.75	—
7	10	Hangar	1.92	—	0.56	—
8	10	Hangar	1.91	—	0.48	—
9	10	Hangar	1.94	—	0.42	—
10*	10	34.2	1.91	0.58	0.58	0.022

\* The last hour of this run was at full power. The fuel used was 60 per cent. petrol and 40 per cent. benzol. The average consumptions for the 100 hours were: Fuel, 1.92 gals. per hour = 0.586 pts./hp./h. Oil: 0.68 pints per hour = 0.026 pts. h.p./h.

The following table shows the average wear on major components during the 100 hours' type tests:—

Component.	Average Wear.
Cylinder Bore .. .. .	0.001
Piston Skirt .. .. .	0.0015
Piston Pin Bore .. .. .	Nil
Gudgeon Pin Diameter .. .. .	Nil
Con. Rod Small End Bush Bore .. .. .	0.0027
Con. Rod Big End Bush Bore .. .. .	Nil
Crankpin Floating Bush O Dia. .. .. .	Nil
Crankpin Floating Bush I Dia. .. .. .	0.0007
Crankpin Diameter .. .. .	0.0003
Crankshaft Rear End .. .. .	Nil
Cam Timing Internal Wheel .. .. .	0.0001
Camshaft .. .. .	0.0002
Rocker Box Bush .. .. .	0.0002 oval
Rocker Shaft Diameter .. .. .	0.0005 oval
Cam Fingers .. .. .	0.0008
Valve Guides .. .. .	Nil

It will be agreed that the above figures are very good indeed, and that the "Cherub III" withstood the very searching test with flying colours.

### GENERAL DESCRIPTION

The "Bristol" Cherub engine is of the two-cylinder opposed type, and has a total swept volume of 1,228 c.c.

The bore and stroke are 90 mm. and 96.5 mm. respectively.

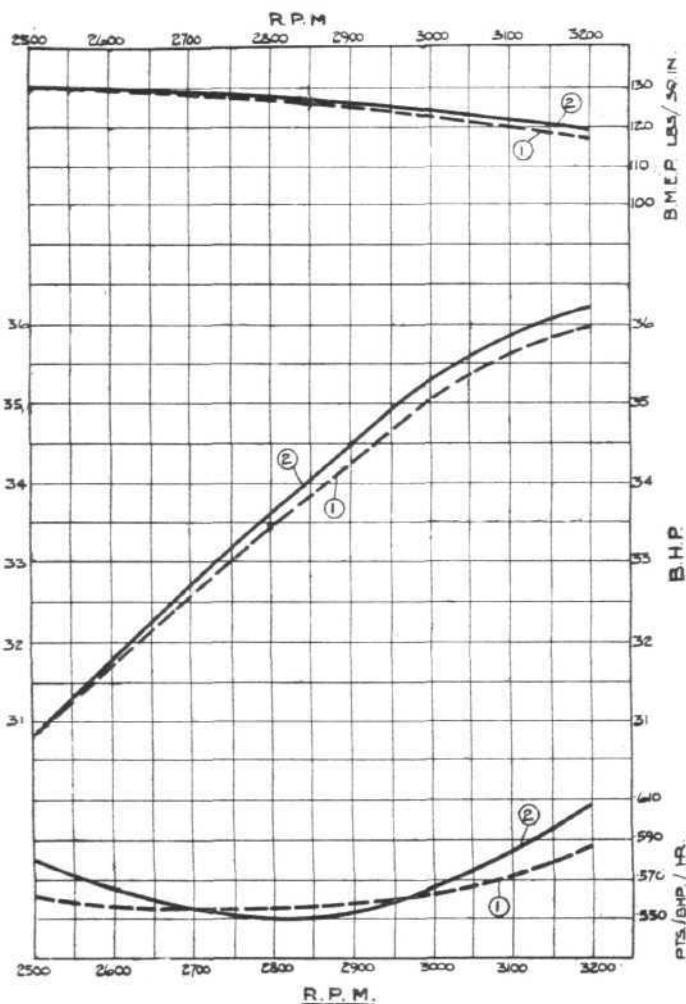
**Crankshaft.**—The crankshaft is a case hardening alloy steel stamping of ample dimensions, carried in four bearings; the crankcase is an aluminium casting, split vertically on the engine centre line, and provided with separate front and rear covers.

**Bearings.**—There are three main journal bearings. The front one is of the deep groove type, located in the nose of the conical front cover, and transmits the propeller thrust from the crankshaft to the case. The other two are of the double-row self-aligning type, and situated adjacent to the crank throws, one in front and the other behind, and are housed in the front and rear half crankcases respectively. The tail end of the shaft is supported in the rear cover by a plain white metal bearing, which provides an oil seal, allowing oil to be supplied through the hollow tail end and drilled oilways to the big end bearings. On the shaft between the two rear bearings a spur wheel and two spiral gear wheels provide drives for the camshaft, tachometer and magneto and oil pump, respectively.

**Connecting Rods.**—Connecting rods are alloy steel forgings with hardened liners, pressed into the big ends, the proportions of which are such that the rods may be threaded over the shaft. When in position, the split bronze floating bushes are inserted and the two halves secured to each other by high tensile steel screws which are locked by split pins.

**Pistons.**—The pistons are of aluminium alloy fitted with three rings, the lower one of which serves as a scraper and returns surplus oil from the cylinder walls through drain holes in the piston skirt. The hollow gudgeon pins float both in the piston bosses and in the connecting rod small ends and are located endways by bronze buttons pressed into their open ends.

**Cylinders.**—The cylinders have steel barrels, but the inlet



Power curves of the Bristol "Cherub," Series III: Curves No. 1 show readings taken before the 100 hours type tests, and curves No. 2 readings taken after the type tests. The fuel used was 60 per cent. petrol and 40 per cent. benzol.