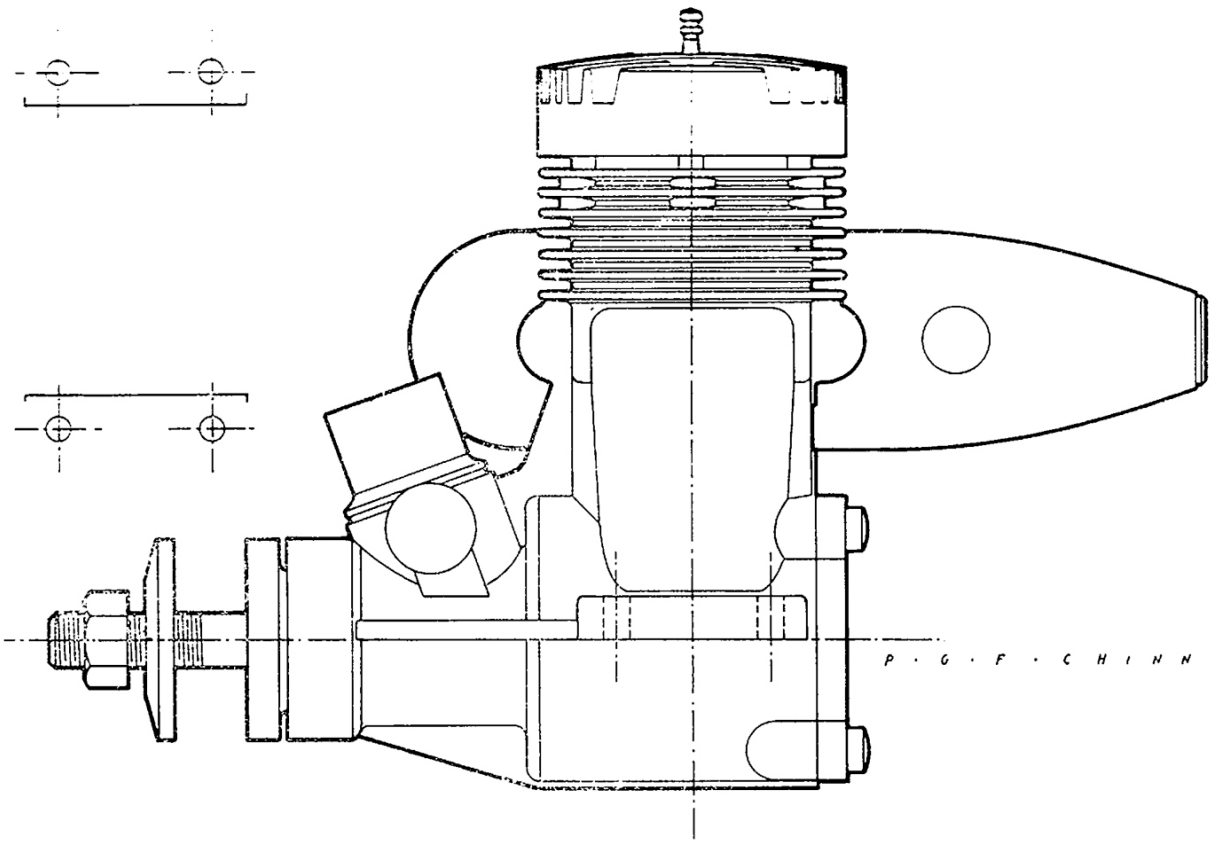
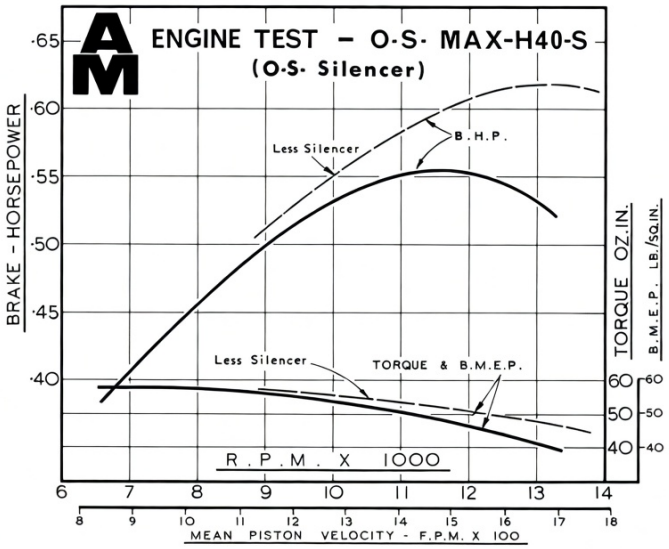
O.S Max-H 40S



ENGINE TEST by Peter Chinn O.S.-H40-S

There are at the present time, four separate models in the 6.5 c.c. O.S. Max-H.40 range, each of which has been developed for a specific section of the market. All are ball-bearing equipped shaft rotary valve engines with ringed aluminium pistons and outwardly they all look very similar but, in fact, there is only a limited interchangeability of parts between them. At the top, performance-wise, are the very powerful twin ball-bearing H.40-P and H.40-R designed, respectively, for high-performance radio-control (including racing) models and control-line rat-racing. Then there are the H.40-SP, intended for more general R/C use, and the H.40-S.



AeroModeller Magazine January 1971 by Hlsat

O.S Max-H 40S

The last-named, subject of our present report, is the most recent addition to the range and has been specially de-tuned for control-line aerobatics.

O.S. already have a very good C/L stunt engine in the Max-S.35, a lightweight, bronze bearing, lapped piston motor that is well suited to the type of aerobatic control-line model that has been popular for many years. The H.40-S is not intended to replace the S.35. Rather, it has been introduced for the benefit of those users who, for various reasons, find that an engine capable of delivering a little more power than the popular .35's is desirable (e.g., for some of the more elaborate stunt models now being flown, and/ or to make up for the loss of power through the obligatory use of silencers).

The Max-H.40-S has quite a bit more power than any of the current stunt 35's and, even with a standard silencer, still has an edge over them. It is between one and two ounces heavier than some of the more popular 35's and requires a slightly wider bearer spacing, but remains a fairly compact motor and, for a stunt motor, offers a good power/weight ratio.

A control-line stunt engine calls for operating qualities quite different from those of other types of engine. It must keep running, irrespective of the model's attitude and the gravitational, centrifugal and aerodynamic forces acting upon it. However, in accordance with modern aerobatic techniques, it must not simply keep going flat out: full power is reserved for manoeuvres in order to maintain taut lines and precise control, whereas, at other times, the engine should automatically slow the model by breaking into 'four-cycle' operation. In other words, a stunt motor must not be totally oblivious to changes in fuel delivery pressure, but should make proper use of them.

When the Max-H.40 design was first laid out some six years ago, it was certainly not envisaged that it would, at any time, be required to form the basis of a C/L stunt engine: this role had already been allocated to the Max-S design. However, the design staff at O.S. includes former C/L stunt flyers and they were, of

course, well aware of what was wanted when the H.40-S was being developed.

Compared with the other Max-H.40 models, the H.40-S has considerably shorter induction, transfer and exhaust periods. The rotary-valve opens at 45 degrees ABCD and closes at 40 degrees ATDC for an induction period of 175 degrees of crank angle compared, for example, with 180 degrees for the 40-SP and 195 degrees for the 40-R. The transfer and exhaust periods are a modest 105 degrees and 125 degrees as against 120 and 142 degrees for the 40-R. The combustion chamber shape, unlike the high-compression wedge pattern of the 40-P and 40-R, is a shallow hemispherical type as on the 40-SP, but compression ratio has been further reduced.

The effective venturi choke area - necessarily small in a C/L stunt engine in order to ensure plenty of fuel suction - is 15.8 sq. mm. (The 40-R has an effective area almost four times as large). The skirt transfer ports in the piston and cylinder are retained primarily, one would guess, for their usefulness in scavenging stagnant gas from inside the piston, thereby aiding its cooling.

Performance

On test, the H.40-S created a most favourable impression from the beginning. It started on the second flick of the prop and without a port-prime: we had simply guessed at the required needle setting and choked the intake for a few turns before connecting the plug. Hot re-starting, moreover, was equally good,

O.S Max-H 40S

thanks to the engine's very good piston seal, even when brand new.

The docile handling characteristics and apparent readiness to run at a fast two-stroke, straight out of the box, is fairly typical of the ringed piston Max-H engines and has encouraged some users to believe that the recommended rich mixture running-in period is unnecessary. The results of ignoring this advice, in some instances, have been overheated cylinder liners and pistons, causing excessive small end wear. Purchasers are therefore urged to give their Max 40'sthe courtesy of a proper running-in procedure.

After running-in (on a straight 75/25 mixture of methanol and caster oil) we checked the H.40-S on a number of props, using a standard 5 per cent nitromethane test fuel and with the O.S. Type L silencer. Figures obtained on suitable sized props for C/L stunt work included 10,300 r.p.m. on an 11x6 Power-Prop maple, 11,000 on an 11x5 Power Prop standard and 11,300 r.p.m. on a 10x6 Top-Flite maple. The silencer had both of the optional restrictor rings removed. (This was, to some extent, done to lessen the risk of overheating while the engine was still quite new.) In this condition, the silencer deducted about 400 r.p.m. from the static revolutions on 10x6 props. Replacing the restrictor rings cost another 400 r.p.m., but made for considerably quieter operation.

In the true stunt engine manner, the 40-S refused to be upset by wide variations in fuel mixture strength. Increasing fuel head or the needle setting (to stimulate the pressurising effect of centrifugal force in level circular flight) slowed the engine to a four-stroke cycle at which it continued to run steadily even after considerably greater enrichment. On the other hand, weakening the mixture to well below the maximum power setting-even to the point of temporarily interrupting fuel flow-did not cause the 40-S to abruptly cut out: it merely slowed down, picking up again immediately that proper fuel flow was restored.

In all, this seems to be a nice engine. It has a good power/weight ratio with plenty of pulling power at the more moderate speeds used for C/L stunt;

Latest in the line of O.S. 40 engines, the stunt version is an extremely well-made unit, and is one of the few engines made specifically for control line aerobatic use. Compact size and modest weight enables it to fit even the most modern shaped aircraft, and would form an ideal unit for the larger. Continental, trend of design.

more it is flexible, very easy to handle and is well finished.

Power/Weight Ratio (as tested):
0.92 bhp/lb with silencer.
1.18 bhp/lb less silencer.

Specific Output (as tested):
86 bhp/litre with silencer.
96 bhp/ litre less silencer.

SPECIFICATION
Type: Single cylinder air-cooled glow-plug ignition two- stroke. Shaft type rotary-valve induction. Single ball-journal main bearing plus bronze outer bush.
Bore: 20.6 mm. (0.8110 in.).
Stroke: 19.5 mm. (0.7677 in.).
Swept Volume: 6.499 c.c. (0.3966 cu. in.). Stroke/Bore Ratio: 0.947:1.
Weight: 237 grammes - 8.38 oz. (less silencer).
267 grammes-9.42 oz. (with silencer).
274 grammes-9.66 oz. (with silencer plus extension duct).

General Structural Data

Pressure diecast aluminium alloy (crankcase/

O.S Max-H 40S

cylinder/main bearing housing with detachable rear cover secured with four Phillips screws. Case hardened steel counterbalanced crankshaft with 13 mm. dia. main journal, 9.7 mm. bore gas passage and 6.35 mm. dia. hollow crankpin. Shaft runs in one 13 x 28 mm. 8-ball steel-caged ball journal bearing at rear and 13 mm. i.d. phosper bronze bushed bearing at front. Gravity-cast and machined aluminium alloy piston with baffle, single compression ring and two 6 mm. dia. skirt transfer ports. Fully floating case-hardened 5.5 mm. dia. tubular steel gudgeon-pin with brass pads. Machined duralumin connecting-rod with two oil holes at big end. Hardened steel cylinder liner located in cylinder casing by flange at top and secured by cylinder-head. Pressure diecast and machined aluminium alloy cylinder head with cast-in brass thread insert for glow-plug, recessed 0.8 mm. soft aluminium gasket and secured to cylinder casing with six Phillips screws. Machined aluminium alloy carburettor venturi insert retained by plated brass spraybar assembly with flexible needle-valve extension. Beam mounting lugs.

OPTIONAL EXTRAS

(a) O.S. Jetstream Type 'L' expansion chamber silencer.

(b) AMA safety pattern spinner nut.

TEST CONDITIONS

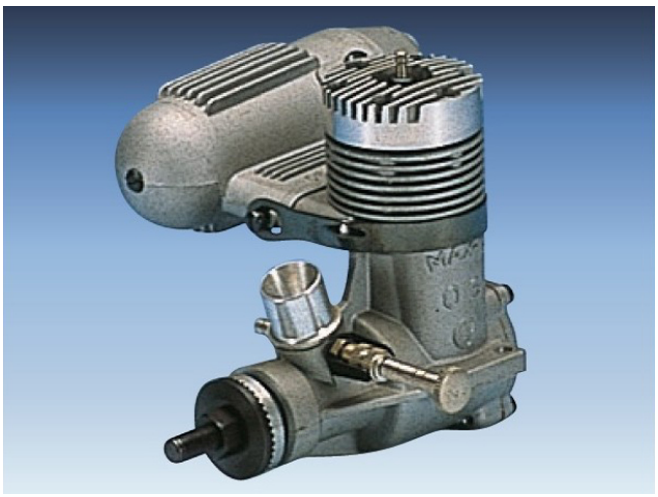
Running time prior to test: 1 hour.

Fuel used: 5 per cent pure nitromethane, 25 per cent Duckhams Racing Castor-oil, 70 per cent I.C.I. Methanol.

Glow-plug used: O.S. No. 7 bar type, platinum filament, medium reach.

Air temperature: 72 deg.F (22 deg.C). Barometric pressure: 30.30 in. Hg.

Silencer: O.S. Jetstream Type L with extension duct, less restrictor rings.



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