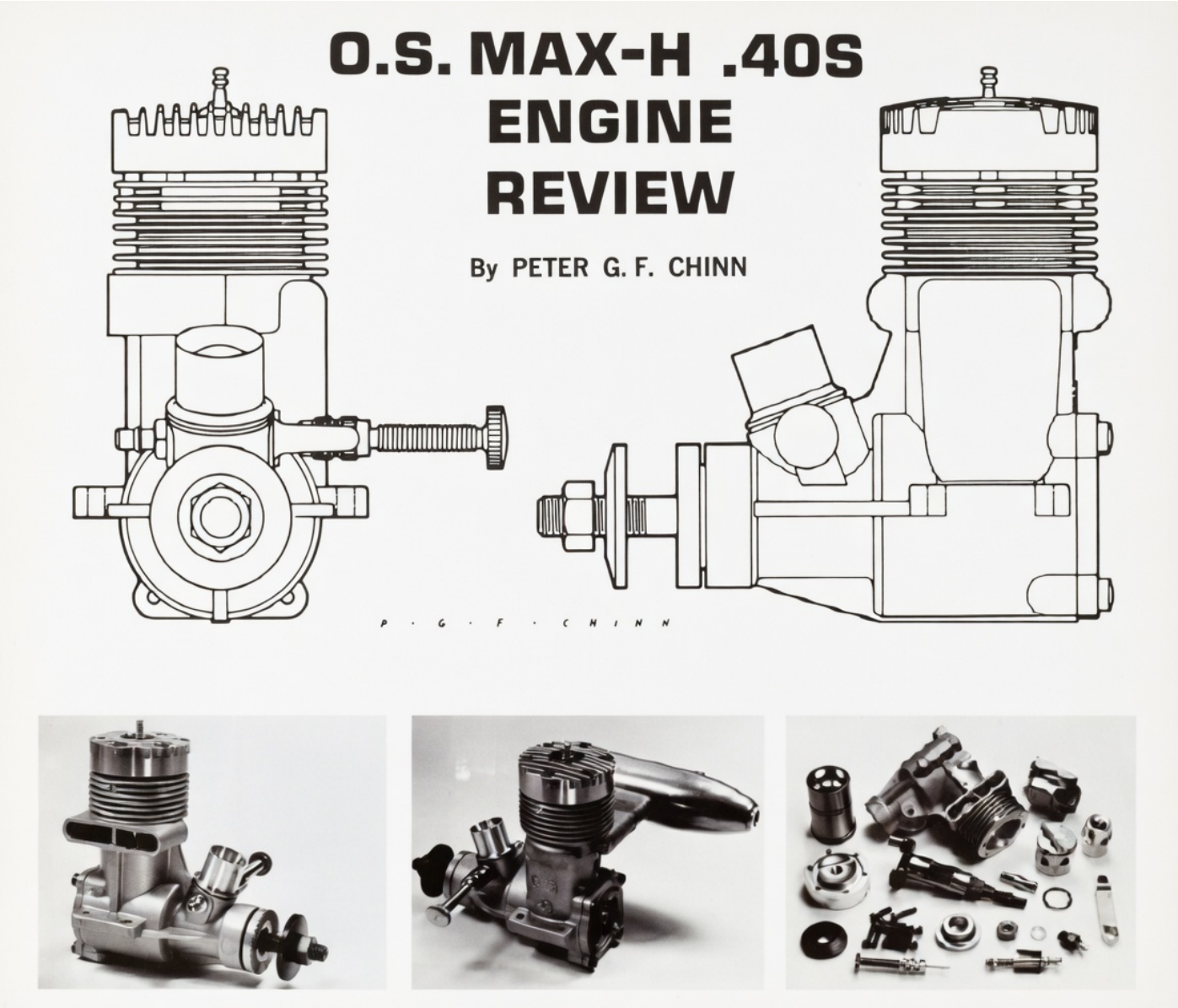
O.S Max-H 40S



• For the past twenty years, control-line stunt circles have been dominated by .35 size motors and, in all probability, the traditional .35 cu. in. displacement stunt engine will remain the most popular choice for C/L aerobatics for a long time to come. However, if recent international events are any indication of future trends, it looks as though we may be seeing, for contest work at least, a renewed challenge from engines of increased displacement and power. In the 1970 World Championships, for example, the number of .35's used was just about balanced out by an equal number of larger motors ranging from .40 to .49 cu. in.

The subject of our report this month is a member of this new generation of stunt engines. For many years O.S. have been offering a conventional stunt package in the shape of the Max-S.35. The Max-S.35 conforms to the highly successful stunt formula (originated with the Fox 35) of a compact, lightweight, shaft-valve layout with bushed main bearing and lapped piston, ported for medium speed per formance and good transition between two- cycle and four-cycle running through a stunt pattern. This popular engine will continue to be available but, for the benefit of those who demand more power for larger and more elaborate models, O.S. have evolved a new stunt motor hosed on the .40 cu. in. Mnx-H.40 series.

A side-by-side comparison with the Max-S.35 reveals that the Max-H.40-S is 3/16 in. longer from back-plate to prop

O.S Max-H 40S

driver face and needs a 5/64 in. wider bearer spacing. It is, however, only about 1/16 in. taller above the center line and although its weight al 8.38 oz. is 25 percent up on that of the ultra-light S.35. it is by no means heavy for a .40 cu. in;, motor. Appearance is similar to that of the S.35 except for a much heftier looking body casting.

The Max-H.40-S is the latest in a series of four current models that have been developed from the original two Max-H.40 engines introduced some six years ago. Those curlier motors (the H.40-RR and H.40-R/C) had lapped cast-iron pistons and were distinguished by a tumble polished casting finish. The present four models all have ringed aluminum pistons and a shot-blasted finish. In addition to the new stunt model, they include the throttle- equipped H.40-SP for pattern R/C, the throttle-equipped H.40-P for extra high performance R/C including pylon-racing and the H.40-R for control-line rat-racing and contest free-flight. The two latter models each have twin ball-bearings while the “SP” and “S” have a single ball-bearing supplemented by a bronze outer bush. All four engines use 13 mm dia. crankshafts and have the same bore and stroke dimensions, but very few parts are interchangeable between them as each has been developed to produce the most desirable performance characteristics in its particular class. Port timings, intake areas, compression ratios and combustion chamber shapes have been modified on each model to achieve these qualities.

Like most of the current range of O.S. engines, the Max-H.40-S uses a one-piece pressure-cast body unit comprising crankcase, front housing and cylinder casing with drop-in cylinder sleeve. The sleeve has four exhaust ports timed to remain open for 125 deg. of crank angle and four bypass ports that are open for 105 deg. The aluminum piston has two 6 mm dia. skirt ports on the bypass side which register with two similar ports in the cylinder sleeve and is equipped with a single compression ring. Complete with ring the piston weighs 7.6 grams (0.27 oz.). It has the usual baffle on a flat crown and is fitted with a full-floating 5.5 mm (0.217 in.) dia. hardened steel tubular wrist-pin with brass end pads.

Each of the piston bosses has two oil holes to aid wrist-pin lubrication.

The hardened and ground crankshaft runs in a 13 X 28 mm 8-ball steel-caged ball-bearing at the rear and a cast-in phosphor-bronze bushing at the front. The shaft has a 9.7 mm bore gas passage fed from a rectangular valve port that is timed to open at 45 deg. ABCD and to close at 40 deg. ATDC. It is counterbalanced by means of both a crescent counterweight and cutaways each side of the 6.35 mm (0.250 in.) dia. tubular crankpin. The connecting-rod is of machined duralumin and has two lube holes at the lower end.

The pressure cast and machined cylinder-head has a shallow hemispherical combustion chamber, as on the Max-H.40-SP. but a thicker aluminum gasket (0.8 mm .031 in.) is used in order to slightly reduce compression ratio. Six Phillips head screws secure the head to the casting,

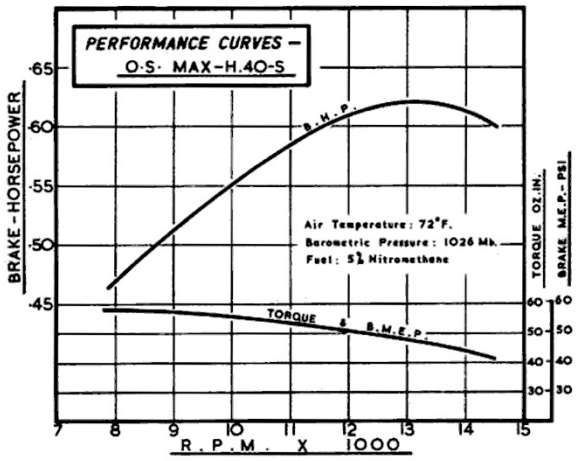
A machined aluminum venturi is fitted into the intake boss and. as befits a C/L stunt motor, choke area is small. Choke bore is 7.5 mm and this is further restricted by a 3.9 mm dia. spraybar, so that the effective choke area is approximately 15.8 sq. mm.

Our test model Max-H.40-S was a stock unit and had not been run beyond the normal factory check when we received it. Equipped with an O.S. No. 7 bar type glow-plug it was set up on the bench with a stunt type Veco tank filled with straight 3 to 1 break-in mixture of methanol mid castor-oil. An 11x6 Power-Prop Super-M propeller was installed for an initial check on starting qualities prior to break-in.

The needle setting was guesstimated and no exhaust prime was used: we simply choked the intake while flipping the prop to bring fuel up to the needle valve and into the engine. Whereupon the 40-S started on the second flip after energizing the plug. Running at a safe rich four-cycle, the 40-S was allowed to empty its tank which was immediately refilled to enable hot restarting to be checked. Again an instant start.

This exceptional ease of starting was maintained throughout the subsequent tests on a wide variety of

O.S Max-H 40S



props, with and without mufflers, using both straight and nitro fuel blends. The 40-S was. in fact, a most pleasant-handling engine, one that could safely be started on any appropriate propeller without risk to one's fingers.

From new, the 40-S showed little sign of needing a protracted break-in period, but we would add a word of caution here. Past experience of certain of the "H" series O.S. engines has indicated that the willingness of these engines to run at a fast two cycle when new without any outward sign of protest (such as tightening up) should not be taken as a go-ahead to ignore the usual rich mixture break-in treatment Overheating can still occur (indicated by severe discoloration of the cylinder liner) which may seriously accelerate wear in the wrist-pin bearings. It is even more important to stick to the rules if a muffler is being used. Ideally, it is probably better to run the engine without a muffler at first. However, since stunt engines are usually set to four-cycle in level flight, leaning out to a fast two-cycle only in maneuvers, break-in is easily accomplished in the air. The idea is to just circulate at a steady four-cycle during the first few flights (for say, 20 minutes total running time) then to gradually introduce full power maneuvers over the next 30 minutes.

The appropriate O.S. muffler for the H.40-S is the O.S. Jetstream "L" type. Like the other O.S. mufflers, this is an orthodox expansion chamber, pressure cast in two half-shells and is attached to the engine's exhaust stack with two concealed screws. It has a single internal baffle and is supplied with two detachable machined dural 7 mm. i.d. restrictor rings, one in the baffle and one in the outlet nozzle, which limit the outlet area to 38 sq. mm. This is a fairly small area for a .40 and. while it makes for a very reasonable muffling effect, it does reduce power appreciably, knocking something like 1,000 rpm off the inflight rpm on a 10x6 Top Flite prop. Removal of the rings approximately halves the power loss. Naturally, noise emission is substantially increased, though not to quite such high levels as is presently being tolerated (?) with some venturi type mufflers.

The most suitable prop sizes for C/L stunt work with the .40-S would appear to be 11x6, 11x5 and 10x6. We checked the engine out at 10,700 rpm on an 11x6 Power-Prop Super-M. 10,800 on an 11x5 Top Flite standard, 11,400 on an 11x5 Power-Prop standard and 11,700 rpm on a Top Flite Super-M.

From our dynamometer tests on the .40-S a fairly typical set of "stunt engine" curves emerged, with maximum torque developed at medium speed (7,000-8,000 rpm) and the torque curve declining steadily as load was reduced, to give a brake horsepower peak at around 13,000 rpm. Here a maximum power of 0.62 bhp was determined. These figures were obtained on a standard 5 percent nitromethane stunt type fuel and without the muffler. With the muffler (less rings) maximum torque was not seriously affected, but the torque curve declined more rapidly un-der reduced load so that the power curve, in turn, levelled off about 1500 rpm earlier with a reduction in peak bhp of about 11 percent.

The modifications that the O.S. experimental department have carried out to the basic Max-H.40 design in order to make the H.40-S perform as a good C/L stunt engine should, seem to have been successful. In particular, response to varying fuel delivery pressures, such as arc produced through stunt maneuvers, was very good indeed. It was difficult to make the .40-S cut, even with quite severe variations in mixture strength. From a normal needle setting for steady two-cycle running, excessive fuel delivery slowed the engine until it broke into a four-cycle in the required manner and it would then continue to accept considerably greater enrichment.

Model Airplane News Magazine February 1971 by Hlsat

O.S Max-H 40S

Equally, quite severe fuel starvation was also tolerated, the engine simply slowing down instead of cutting out. Nor did temporary interruption of fuel flow from the tank cause the .40-S to cut; it could be slowed almost to a stop and would then pick up again instantly as full fuel flow was restored.

As we remarked at the beginning of this report, it is a safe bet that the traditional stunt 35 (for “traditional”, read “Fox”) will remain the number one choice among the majority of stunt fans for a long time yet. For anyone who wants to try something a little more powerful however, the Max-H.40-S might well be the answer.

Summary of Data

Type: Single-cylinder, two-stroke cycle with crankshaft rotary-valve and single ball-bearing plus bronze bush. Muffler optional.
Weight: 8.38 oz. (less muffler).
Displacement: 6.499 c.c. - 0.3966 cu.in.
Bore: 20.6 mm. (0.X110 in.)
Stroke: 19.5 mm. (0.7677 in.)
Stroke/Bore Ratio: 0.947:1
Specific Output (as tested): 1.55 bhp/ cu.in.
Power/Weight Ratio (us tested): 1.18 bhp/lb.
Manufacturer: Ogawa Model Manufacturing Co. Ltd., Osaka, Japan.
U.S. Distributor: World Engines Inc.. 8960 Rossash Avenue, Cincinnati, Ohio 45236