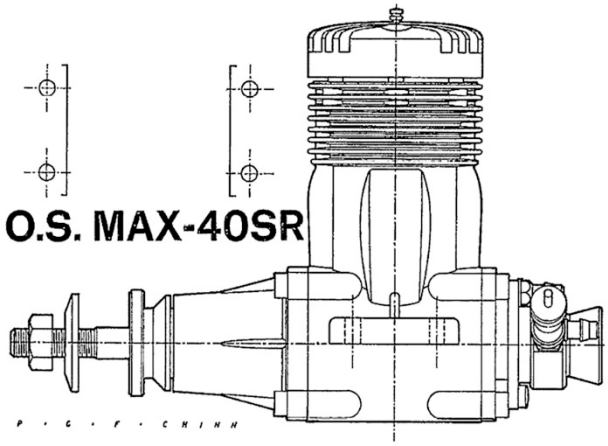
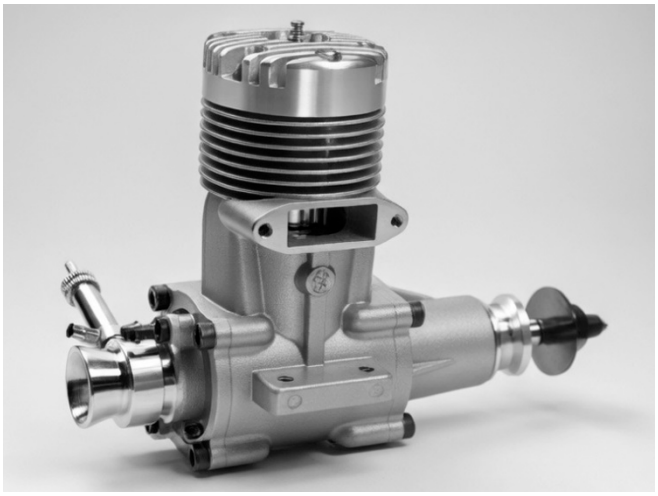
O.S Max-40 SR-STD



ENGINE TEST by Peter Chinn



This completely new O.S. engine features a number of departures from, previous O.S. practice. It is, for example, the first O.S. production motor to feature Schnuerle loop-scavenging. It is also the company's first racing type 40 and their first 40 to use rear rotary valve induction.

The engine is aimed primarily at the radio-control pylon racing and control line rat racing classes. It may also be of interest to those looking for a motor of extremely high power/weight ratio for the larger type of contest free flight model. It is exceedingly well finished inside and out and, as we shall see in a moment, has a performance that entirely fulfils the promise of its technical specification.

The 40SR has the same bore and stroke as the current O.S. Max 40 R/C shaft valve engine. However, beyond this and the fact that it has dual ball bearings and a Dykes ringed piston, it has little in common with its front induction brother. Instead of a one piece body casting with integral front end, for example, it has a unified cylinder casing and crankcase barrel with detachable front housing. Not needing a large diameter shaft main journal to accommodate a large bore gas passage, the maximum shaft o.d. is reduced from 13 mm. to 3/8 in. (9.52 mm.). Interestingly, the shaft is 3/8 in. o.d. not 9.5 mm, it runs in English size ball bearings (of Japanese manufacture) rather than metric sizes, these being chosen because bearings of more compact outside dimensions were available in the English size.

The shaft itself has a full disc type web with peripheral counter balancing slots each side of the crankpin.

By comparison with other .40 cu. in. racing engines (all of which are of the disc valve type) the Max 40SR is unique in using a drum type rotary valve. In this it follows the Max H60 and H80 rear induction engines. The O.S. Experimental Department tried various disc valves in prototype 40SR engines but could find no advantage performance wise and presumably because of their greater experience with drum valves, decided to stick with the latter. The valve is of the reverse drum' pattern i.e. the outer end of the valve is open and the actual valve port is within the crankcase. This brings the intake venturi exactly on the engine's center line and to enable the needle valve to clear the engine bearers, it is angled upwards.

As one expects of an engine intended for racing performance, the 40SR is generously ported in the interests of free breathing at high r.p.m. The venturi has a very large throat (10 mm. i.d.) and, after allowing for the jet, this gives an effective choke area of some 65 sq. mm. A pressurised fuel feed is, of course, essential and provision is made for this through an untimed tapping from the crankcase. From the throat, the venturi gradually opens out to coincide with the valve rotor i.d. (11.2 mm.) and mixture is released into the crankcase through a large rectangular valve port timed to remain open for some 220 degrees of crank angle, closing very late at 67 deg. ATDC.

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The exhaust period is also very long at 156 degrees. The transfer timing, on the other hand, is more conservative with the two main ports opening for 118 degrees of crank angle. The third port opens only about two degrees later. The port design follows the orthodox Schnuerle layout of a centrally bridged exhaust flanked by two transfers angled to direct the incoming charge towards the opposite side of the cylinder where it is then joined by the flow from the third port. The third port has its top edge inclined steeply upward to sweep the charge up into the com-bustion chamber and thereby assist in scavenging the exhaust gases from the cylinder. Like the O.S.40 R/C, the 40SR uses a single Dykes type piston ring and phosphor bronze bushes in the piston bosses as well as both ends of the connecting rod.

Performance.

In view of the present confusion resulting from the lack of a firm ruling as to what constitutes a legal silencer for pylon racing engines, this is the one and only O.S. motor with which the manufacturer docs not supply a silencer. The exhaust duct has tapped holes that will enable an HP 40 silencer to be fitted, but we found that, on the 40SR, the HP silencer caused a quite surprising power loss, at high r.p.m. (it actually raised output slightly at the lower end) while offering negligible noise suppression and all tests, therefore, were (as in the case of our report on the K&B 40-S earlier this year) conducted without a silencer in order to obtain a true assessment of the engine's potential

According to the manufacturer, the 40SR is intended primarily for operation on high nitro content fuels but, in order to assess the engine's capabilities for F.A.I. class pylon racing, a series of tests were first made on straight 4 to 1 fuel. Torque and r.p.m. figures plotted on this mixture indicated a maximum output of just over 1.35 b.h.p. at around 20.500 r.p.m. This is slightly above the best levels previously recorded for a stock racing .40 on F.A.I. fuel and, in terms of prop, r.p.m. should mean a gain of up to 300 r.p.m. at the peak. This was confirmed by subsequent prop r.p.m. tests. Static revs on a 9 x 7 Top Flite speed prop cropped to 8 ¼ in. (much-favoured for pylon racing) were 17.800.

Switching to a fuel of 50 per cent nitro rating (specifically, K&B Speed Fuel), substantially improved torque over the whole load-speed range and raised the maximum b.h.p. to 1.65 at the same peak. Taking into account the differences in atmospheric conditions at the times of testing, this is at least equal to the best performance previously obtained for a racing 40.

The 40SR proved easy to start and ran very steadily, especially on K&B Speed Fuel. Vibration levels, clearly indicated with our Frahm meter, were notably low and the test motor proved to be surprisingly economical on glow plugs: even on 50 per cent nitro, one O.S. No. 9 plug lasted all through the dynamometer tests, including several full tank runs at 22.000 r.p.m. The fact that, in stock trim, the 40SR has a lower compression ratio than some of its rivals (approx. 11.7:1 geometric, according to our measurement) and a

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piston to squish band clearance of approximately 12 thou., may have something to do with this.

SPECIFICATION

Type: Single cylinder, air cooled glow plug ignition Schnuerle loop scavenged two stroke with rear rotary drum valve and twin ball bearings. For operation on pressurised fuel feed only**.**
Bore: 21.2 mm. (0.8346 in.)
Stroke: 18.4-mm. (0.7244 in.)
Swept Volume: 6.495 c.c. (0.3964 cu, in.)
Stroke/Bore Ratio: 0.868:1
Checked Weight: 275 gr. - 9.7 oz.

GENERAL STRUCTURAL DATA

Pressure die cast aluminum alloy crankcase barrel and cylinder casing with drop-in hardened steel cylinder liner. One-piece hardened steel crankshaft with open peripheral slot counterbalancing end 5.5 mm. dia. crankpin having 3.0 mm. dia. spigot for rotary-valve drive take off. Shaft supported in one 2/8 x 7/8 in. Koyo steel caged ball journal bearing at rear and one ¼ x 7/8 in. NMB steel caged ball journal at front. Pressure die cast aluminum alloy front housing. Reflectorless flat crown aluminum alloy piston with Dykes type piston ring and bronze bushed gudgeon pin holes. Hardened tubular 4.5 mm. o.d. gudgeon pin retained by wire circlips. Machined aluminum alloy connecting rod, bronze bushed at both ends, with oils slit in small end and two oil holes in big end. Pressure die cast aluminum alloy crankcase back-plate and rotary valve housing. Hardened steel drum type valve rotor 13.4 mm. o.d. and 11.2 mm. i.d. with large rectangular valve port. Flange fitting machined aluminum alloy 10 mm. i.d. intake venturi with special needle valve assembly. Screw in back plate nipple for fuel pressurisation system. Machined aluminum alloy cylinder head with 12.8 mm. dia. bowl-shaped combustion chamber and 4.2 mm. wide squish band. Recessed 0.4 mm. soft aluminum alloy head gasket. Machined aluminum alloy prop driver mounted or brass split taper collet. Cylinder head, crankshaft housing and rear housing attached to main casting with chromium molybdenum socket head cap screws.

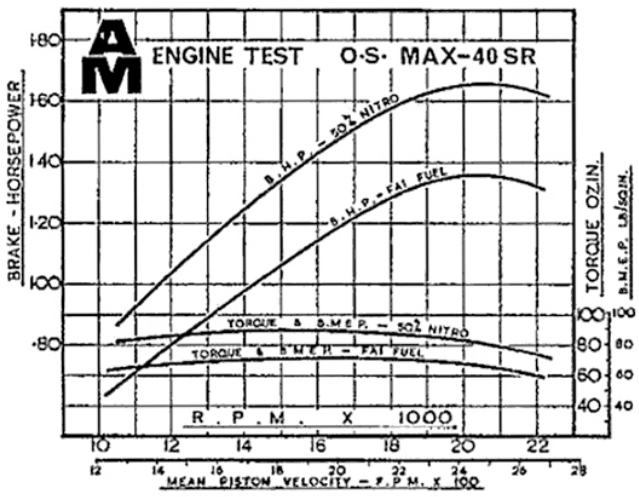
Also included
(a) Allen key for assembly screws.
(b) Spanner for needle valve locknut.
(c) Screw in back plate nipple for fuel pressurisation system.

TEST CONDITIONS

Running time prior to test: 1 hour approx.
Fuels used.
(I) 25 per cont Duckhams Racing Castor oil and 75 per cent methanol. (Running in).
(ii) 20 per cent Duckhams Racing Castor oil and 80 per cent methanol. (Test 1).
(iii) K&8 Speed Fuel - approximately 50 per cent nitromethane. (Test 2)
Glow plugs used: O.S. No. 9 medium reach, platinum filament.
Air Temperature: 20°C (68°F)
Barometric Pressure: 1008 mb (29.77 in. Hg.)

Power I Weight Ratio (as tested - less silencer)
2.24 b.h.p./lb. on FAI fuel.
2.72 b.h.p./lb. on 50 per cent nitromethane

Specific Output (as tested - less silencer):
209 b.h.p./litre on FAI fuel
254 b.h.p./litre on 50 per cent nitromethane



More: https://flyinghlsat.com/search.php?search_keywords=O.S-Engines

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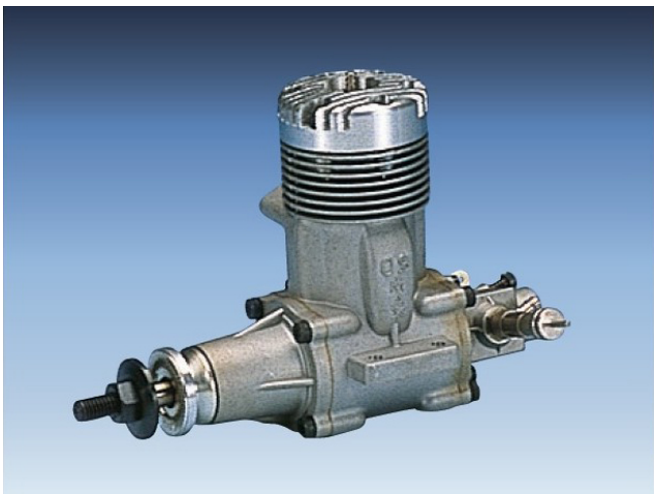

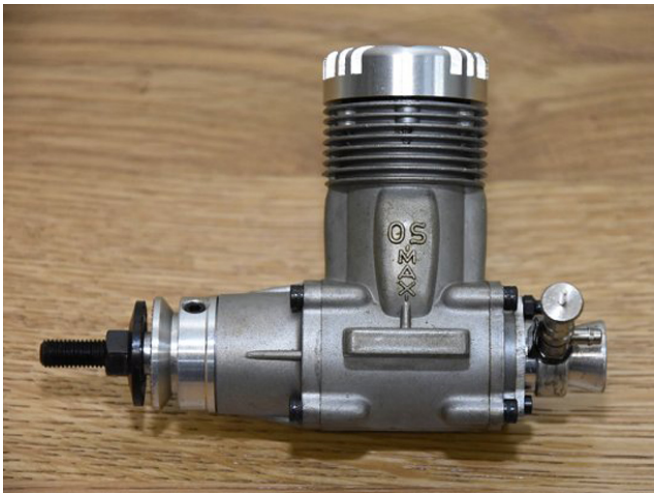

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