INSTRUCTIONS FOR O.S. FS-60 FOUR STROKE CYCLE ENGINE

The O.S. FS-60 is an overhead-valve, four-stroke cycle, air-cooled engine for model use and runs on a different principle from that of existing model (two-stroke) engines. Because of its quieter and lower-pitched exhaust sound, no special silencer is needed. Scale enthusiasts, in particular, will be pleased to find that it gives a more "scale" sound.

SPECIFICATIONS

Displacement	9.95 c.c. (0.607 cu. in.)
Bore	24.0 m.m. (0.945 in.)
Stroke	22.0 m.m. (0.866 in.)
Practical R.P.M.	2,000 ~ 10,000 r.p.m.
Weight	560 gr. (19.75 oz.)

INSTALLATION

Use a strong engine mount, at least as firm as is used for existing 10 cc engines. Installation should be made in such a way that maintenance, checking and valve tappet adjustment can be done easily.

FUEL

The FS-60 runs on standard commercially available model glowplug engine fuels. Fuels containing castor-oil and/or synthetic lubricants are acceptable, but for the best performance and reliability, a fuel containing 5 ~ 10% nitromethane is recommended. A fuel tank of only 240 cc (8½ oz) capacity will run this engine for 15 ~ 20 minutes because of its economical fuel consumption.

GLOWPLUG

With a four-stroke engine, ignition of the fuel charge takes place at every fourth stroke of the piston instead of every second stroke. Because of this, conventional two-stroke glowplugs do not suit this engine. The special O.S. Type F glowplug supplied is recommended.

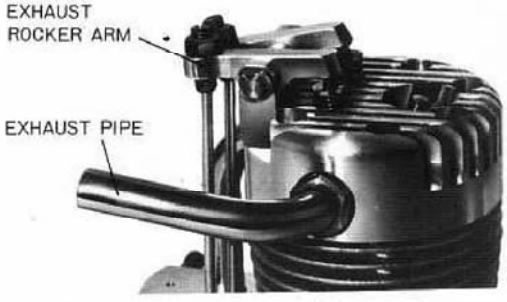
PROPELLER

Suggested propeller sizes are 12 x 6 or 13 x 5½. As the specification implies, the output of this engine equals that of 6.5cc two-stroke engines, but with maximum power developed at much lower revolutions, hence the need for larger propellers. It is not practical to run this engine at high r.p.m. on smaller sized props. The most suitable models are those of relatively low wing-loading, such as scale models between 3 and 4 kg (6.6 ~ 8.8 lb.) with wing areas exceeding 45 dm^2 (700 sq. in.).

STARTING

With a two-stroke engine, hand starting is performed by cranking the engine counter-clockwise after priming. For the FS-60, the following starting procedure should be observed:

1) The propeller should be fixed in such a way that it is positioned horizontally as compression is first felt when turning the prop counter-clockwise.



2) Open the throttle valve fully and unscrew the needle valve approximately 5 turns from the fully closed position.

3) Turn the propeller until the rocker arm compresses the exhaust valve spring.

4) Prime the engine fairly generously through the exhaust pipe.

5) Crank the engine clockwise (i.e. 'backwards") so that fuel is drawn well into the cylinder.

6) Gradually turn the propeller counter-clockwise until compression is felt

7) Connect the glowplug to the battery and crank the prop clockwise from the centre of the right blade. The engine will then bounce in the counter-clockwise direction to the point where ignition and expansion of the charge takes place. If the engine stops again, make sure that fuel is reaching the carburettor from the fuel tank, then repeat procedures 3) to 7). Generous priming is the secret of easy starting.

8) When the engine starts, keep it running, initially, with the original needle-valve setting. If the engine slows up because the mixture is excessively rich, screw in the needle-valve slightly. Then disconnect the battery from the glowplug and slowly close the needle-valve so that revolutions increase. Adjust the needle-valve gradually. Abrupt closure of the needle-valve may cause the engine to stop, especially when it is new and insufficiently run-in.

9) To restart the engine when it is hot, after a run, first prime through the exhaust port, as for a cold engine. Initially, the high temperature inside the combustion chamber will turn the liquid fuel into gas and emit it through the exhaust pipe. Therefore, repeat the priming prodecure once or twice until the cylinder becomes cool enough for another start.

RUNNING-IN ("Breaking-in")

For long life and high performance, your FS-60, like any other engine, requires the correct running-in, or breaking-in, procedure. The same basic rules apply as for a 10 cc two-stroke engine — i.e., when new, the engine must be operated on a very rich needle setting in order to promote cool running and maximum lubrication. It is recommended that initial running-in is done on a bench mount using a 12 x 6 propeller.

First, start the engine and run it for about 10 seconds with the needle-valve set for 6,000/7,000 r.p.m., then open the needle-valve to reduce speed to approximately 4,000 r.p.m. and run for 20 seconds at this cooler setting. Keep the throttle fully open, using only the needle-valve to reduce speed.

Repeat this procedure, alternately running the engine fast and slow with the needle-valve, but gradually extending the short periods of high speed running until a total of at least 20 minutes running time has been accumulated. For those who do not have a tachometer, the exhaust gas colour can be a help: e.g., as the needle-valve is screwed in, the exhaust gas will turn lighter, from the original grey colour.

Following the initial break-in of 20 minutes minimum on the bench, the engine shoule be installed in your model and run-in for a further period in the air. For the first flights, have the needle-valve set as rich as possible, consistent with adequate takeoff power and, if necessary, readjust the throttle rotor stop so that the engine does not stop when the throttle is fully closed.

With each successive flight, close the needle-valve slightly, until, at the end of 10 flights, the needle-valve is set for maximum power. The carburettor can now be re-adjusted for optimum throttle performance.

THROTTLE VALVE ADJUSTMENT

The carburetor of your FS-60 has been set for the approximate best result but the settings may, in some cases, vary slightly in accordance with fuel and climatic conditions. If the desired throttle response is not obtained with the settings as received, re-adjust the controls in the following order:

1) Break-in your engine well and install it to your plane.

2) With the throttle fully open, set the needle valve for the best running position. (This is with the needle-valve slightly opened up from the maximum r.p.m. setting.)

3) Set the throttle-stop screw so that the throttle rotor stops at the obtainable minimum idling speed.

4) Hold your model and slant the nose, with engine idling, slightly (approx 20 degrees) upwards or downwards listening to the rotating sound of engine with attention.

5) If idling speed is increased when nose is up or down, it means idling mixture is not correct. With proper mixture, idling speed should gradually decrease, when nose is up or down, and finally misfires or stops.

6) If idling speed is increased when nose is up, this is a sign that the mixture is too rich. Unscrew the airbleed screw (i.e. screw on the side of carburettor) one or two turns to increase the air supply.

7) If, on the other hand, you get increased idling speed when nose is down, the mixture is too lean. In this case, screw in the airbleed screw.

8) When you get ideal mixture, by adjusting the airbleed screw as above, idling speed should increase slightly at the original setting of throttle-stop screw. Re-set the throttle-stop screw to maintain desired idling speed.

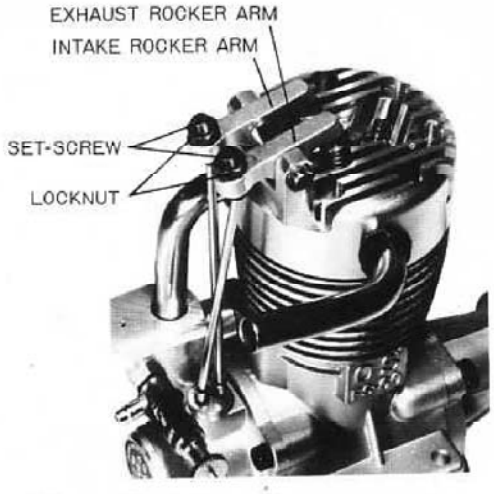
9) For the best result, repeat 4) through 8) above.

10) Idling adjustment is recommended to be done on your model rather than on a test bench, where it is difficult to get the same result as the former. In case, however, adjustment is done on a test bench, see to it that the fuel tank is so positioned, in relation to engine, as is when installed in the model. Then, alter the tank position upwards or downwards. This alteration of tank position corresponds to the nose-down or nose-up adjustment in 4) above. Hence, tank level is down for nose-up, and tank level is up for nose-down.

VALVE TAPPET ADJUSTMENT

Valve tappet clearances on this engine are NIL when the engine is cold.

Valve clearances are correctly set before the FS-60 leaves the factory but, while the engine is being run in, the slight wear that takes place, between the rocker arm and valve, enlarges the tappet gap. This should be adjusted, with the spanner (wrench) supplied and when the engine is completely cooled off:



1) Turn propeller until compression is first felt, then turn it one quarter turn and stop. Both valves should now be closed.

2) Check intake valve rocker for free movement between rocker and valve stem, visually or with very thin feeler gauge. If a gap is found, adjust as follows:

3) Loosen locknut intake rocker arm with spanner (wrench) supplied. Screw in set-screw just sufficiently to eliminate gap and retighten locknut.

4) Do not screw down set-screw more than is just sufficient to take up free movement, otherwise the valve will not seat correctly, compression will be lost and the engine will not run properly. Check this by turning prop. If compression is reduced, loosen locknut, unscrew set-screw to correct adjustment and re-tighten locknut.

5) Carry out the same procedures for the exhaust valve as in 1) to 4) above.

Note: It is essential to properly maintain valve tappet adjustment at all times, otherwise the

performance of the engine will be seriously affected. Make a habit of checking tappet clearances when the engine is cold and readjust whenever necessary.

LUBRICATION

Apply a few drops of lubricating-oil to the overhead valve parts (rocker-arm surfaces and rocker-shaft bearings) before and after each flying session. Ordinary motor-oil, or machine-oil, is suitable for this.

All other parts of the FS-60 are automatically lubricated by the oil content of the fuel mixture.

EXHAUST PIPE DIRECTION

The direction of the exhaust outlet may be altered in accordance with individual installation requirements. The angle is easily adjusted by loosening the nut that secures the exhaust pipe to the cylinder-head.

PARTS LIST

Code No.	Description	Code No.	Description
45001000	Crankcase	45030000	Camshaft Bearing (L)
45001602	Front Housing	24831001	Camshaft Bearing (S)
45001819	Rear Housing	45081003	Carburettor Assembly
45002008	Crankshaft	45060008	Valve Assembly
45003109	Cylinder Liner	45061005	Rocker arm Assembly
45003202	Piston	45061419	Support Frame
26603400	Piston Ring	45061503	Rocker arm shaft
45004002	Cylinder Head	45061607	Rocker arm Spacer
26705004	Connecting Rod	45061700	Rocker arm shaft Retainer Set
26606008	Piston Pin	45062002	Camshaft
26617004	Piston Pin Retainer	45067319	Camshaft Set-screw
45007004	Rear Cover	41808001	Camshaft Gear
26708119	Drive Washer	45063019	Camshaft Gear Set-screw
28009002	Propeller Washer	45064007	Cam Follower
45010002	Propeller Nut	45066001	Push Rod
45013004	Screw Set	45065004	Ball Bearing Retainer
45014001	Gasket Set	45067102	Drive Gear
45015009	Carb. Rubber Packing	45067206	Drive Disc
26731002	Ball Bearing (Front)	45067319	Drive Disc Set-screw
26030019	Ball Bearing (Rear)	45069003	Exhaust Pipe Assembly
22131001	Drive Gear Bearing	28024004	Spinner Nut

The specification is subject to alteration for improvement without notice.

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