

O.S. Max-25SF-R/C

Products in use inside the O.S. Max-25SF

BY STU RICHMOND

The prettiest model engines in the world are those very few that are machined from barstock ... like the British Lasers. The second prettiest in the world are the O.S. model engines from Japan! It doesn't matter if you're eye balling O.S.'s FR5-300 five-cylinder four cycle radial or a simple two-cycle like this month's Max-25SF, the quality of the die casting and machining is absolutely impeccable! And this astoundingly beautiful outside appearance of the entire O.S. engine line isn't just external eyewash. The same polished machined look is inside these engines too.

We're now hearing stories in the USA that O.S. has a new prohibited-entry engine factory running in Japan. I don't know of anyone who's been in the new facility to report on it. Rumors are that the newer style O.S. engines are made in that factory and that the work is practically all done by industrial robots!

I expect this new O.S. Max-25SF came from the robotic factory, al-though the old factory is reportedly also still in production.

We had our choice of either of two versions for this month's review. The higher priced one is the Max-25SF ABC, which is made with an aluminum piston running in a chrome plated brass cylinder. We chose the lower cost ringed version with a nickel plated steel cylinder as being more durable for sport flying.

I believe the non ABC engine is always the better choice for the sport flyer, as it usually takes more abuse in terms of dirt tolerance. ABC engines usually run a bit faster because the actual windows or ports through the cylinder walls are of bigger total free area. The use of a cast iron piston ring requires a series of smaller windows in the cylinder so that the piston ring doesn't bulge out and catch the top or bottom lip of these square porting windows



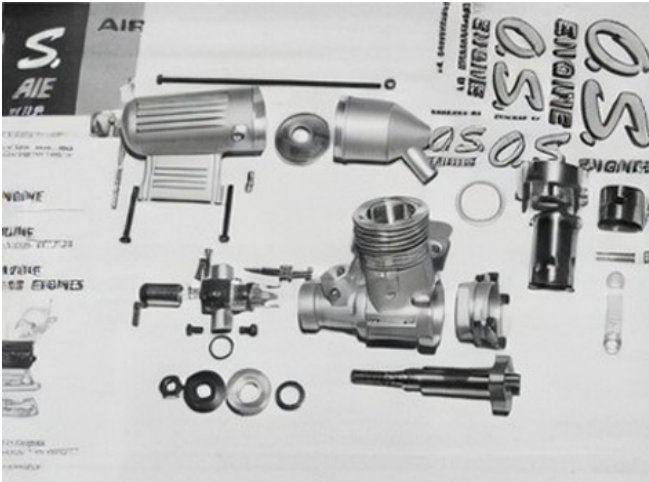
In finish and workmanship, O.S. engines are unsurpassed and they're just as pretty inside as they are outside! This engine, the 25SF, replaces the popular O.S. 25 FSR and is considerably more powerful than the lower priced O.S. 25FP.

That's why when you look into the exhaust stack of a ringed engine you always see the series of closely spaced square windows, it's the vertical steel between the windows that keeps the ring from getting caught as it rides up and down inside the cylinder. It is also these vertical sections that restrict breathing a bit. So, generally speaking, an ABC will run faster than a ringed engine.

As I've said before, a model engine with a cast iron piston ring tends to take more long-term abuse. One piece of grit can destroy an ABC's soft aluminum piston. The same piece of grit in a ringed engine will usually only get crushed at the edges of the iron ring as it passes a porting window, and the engine keeps on running.

So I opted for the lower priced ringed Max-25SF for this review, but surprise, surprise the first look in this engine's exhaust shows it has no piston ring! All the Great Planes (they're the importers) advertising says the non ABC version is ringed, but this O.S. Max-25SF is not! It has the same three great big intake ports and the same big oval-shaped exhaust port as the ABC version ... no little square windows to minimize the port area of this little powerhouse ... no verticals to hold in a dragging piston ring and to restrict the engine's breathing.

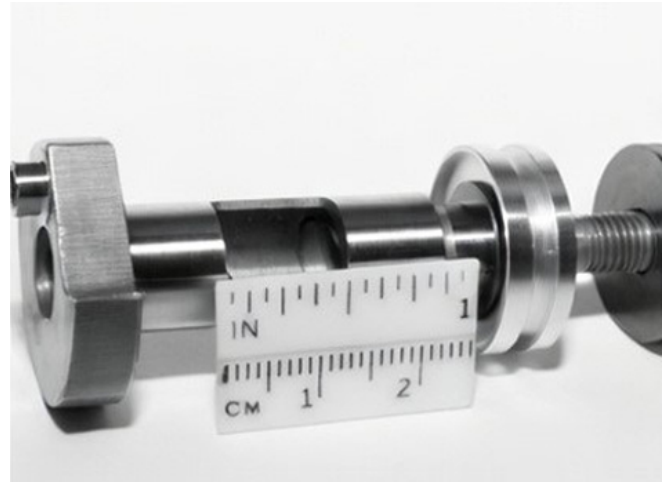
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With few exceptions, the O.S. 25SF is of pretty much standard design. Stu suspects the engine is made in O.S.'s new robotic factory purported to be operating in Japan.

This month's engine has the time-tested and well-proved mix of a precision, center-less ground, cast iron piston running in a nickel plated tapered steel cylinder. Our review engine has its maximum horsepower rated by O.S. running at 16.000 rpm and the ABC engine has its maximum horsepower rated at 18.000 rpm . . . we're into apples and oranges. I strongly suspect both engines will produce virtually identical power at 16.000 rpm. I'd suspect the ABC version has a slightly higher compression ratio (the cylinder head's part number is different). That engine comes with a 2FB carburetor, which has an inside diameter of .235 inch, whereas this review engine's 2F carb measures only .225 inch, I feel the smaller carburetor throat contributes to the slow reliable idle speeds the sport flier often enjoys... and gets in this lower priced version. There's no fun in trying to shoot touch and go landings with an idle well above 2.500 rpm. So much for engine philosophy this month, let's get inside this new beauty!

Four 2mm socket head bolts hold the back plate on, and six bolts hold the cylinder head in place. The engine comes with both a 2mm hex key wrench and a 7mm open end wrench for carburetor nuts. I recommend never taking a new engine apart. . . not to look for loose pieces of metal (this engine had none) ... not to look for things that are wrong (you'll be disappointed). . .

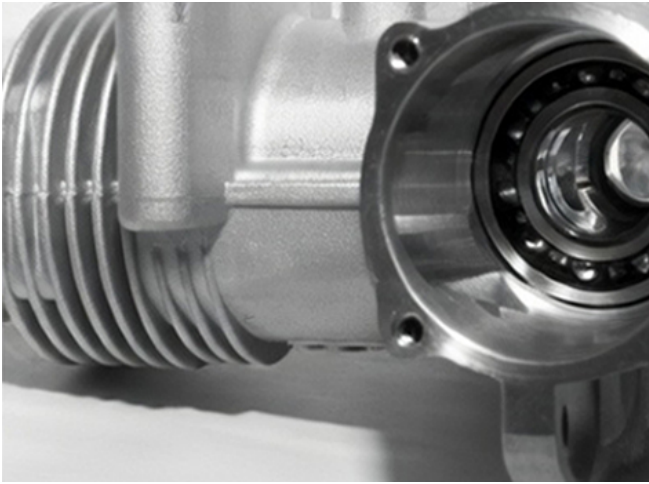


The crankshaft's disc is extra thick to aid balancing.

not to satisfy your curiosity (look at the Inside Engines photos instead). This engine has a nonmetallic gasket between the back plate and crankcase and another between the fuel nipple and the carburetor body so it is alright to lightly snug here, but don't loosen anything! That's what your generous two year guarantee is for!

As the cylinder head was removed it was apparent the .012 inch soft aluminum head gasket that forms the head to cylinder seal was put in place and then the head was machine spun a bit to enhance the seal ... clever. A tiny steel roll pin in the rear top surface of the crankcase locates the cylinder so the three intake ports align properly in the crankcase. The top of the combustion chamber is a single bowl (not spherical) that looks like an inverted dishpan, the outer squish band is .135 inch wide and is angled to squish towards the glow plug's coil at ten degrees. Angled squish bands seem to extend glow plug life. My two favorite glow plugs (because they perform best) fit to the bottom of the head's internal threads well. The K&B #4520 with the welded-on idle bar has the bar and bottom coil protrude into the combustion chamber; the Fox Miracle Plug has its snoot protrude .050 inch down into the chamber. For model engines that are expected to idle well, these two styles of construction are simply the best in the world'. When one doesn't seem to work to my satisfaction in a particular engine, the other one always does!

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Even a close up shot reveals faultless workmanship. Lubrication for the front ball bearing is via the groove in the crankcase casting (11 o'clock position).

As this month's engine came without a glow plug, I installed a K&B #4520 with the welded-on idle bar. It's lasted through all the break-in and testing and is still running while the engine sport flies in a Great Planes PT-20.

The O.S. Max-25SF's steel cylinder is electroless nickel plated. Its cylinder walls are .042 inch thick and the cylinder is an easy no-heat slip fit into the crankcase. The cylinder's bottom inside diameter measures .707 inch and the top measures .705 inch; this indicates the modern slight internal taper that's usually found only in today's ABC engines. You cannot push this engine's piston up and out the top of its cylinder like in the old days. The cold piston gently starts to bind in its cold cylinder just after the normal top dead center position. This fit maximizes the piston-to-cylinder fit as combustion starts, to minimize leakage and enhance power.

Exhaust timing measured 143 degrees; not pipe timed but good on fuel economy. The stroke measured .630 inch and the displacement computed to be .247 cubic inch. The compression ratio calculated to 10.2:1 (on the high side) and this showed up as the engine tended to kick back a lot during initial break-in starts. The rubber hose I use for a chicken stick was cut a bit by the 8x4 break-in prop! The wrist pin is .155 inch outside diameter, is hoi low, and carries two Teflon anti-scuff pads. The cast iron piston is machined on every surface ... its skirt or lower section is only



These internal parts really shine. Conrod is machined from aluminum bar stock and is bushed at both ends, the piston is cast iron and runs in a plated steel cylinder. This engine is made to last!

.015 inch thick. The piston's outer walls are ground so well and so shiny that it's hard to believe it is a cast iron surface.

Quite cleverly, the connecting rod is cut or sliced from an aluminum extrusion bushed at both ends, and the bottom socket that gets so very much motion usage has two .050 inch drilled lubrication holes; one is a bit forward and the other is a bit rearward. In short, this rod is essentially made from bar stock and no cast rod normally can be as strong. The rod's minimum cross section measures .120 x .235 inch near the top socket. Also the finished rod is mirror buffed like a fine piece of sterling jewelry. The combined weight of the .25's piston/rod assembly is 12 grams (28 grams = 1 ounce).

The front ball bearing is shielded against dirt entry and is lubed by a tiny channel that shows in one of the photos. The crankcase casting has the bottom of the mounting lugs lightly milled to trueness. The crankcase is a terrific example of premier die casting quality.

The crankshaft's journal is .468 inch out-side diameter and the hollow fuel/air passage is .330 inch inside diameter. The shaft is all one piece and weighs 43-1/2 grams...about 20 percent of the engine's total. Twin opposed flats on the shaft accept the prop driver. A small hardened steel washer fits on the shaft between the prop driver's

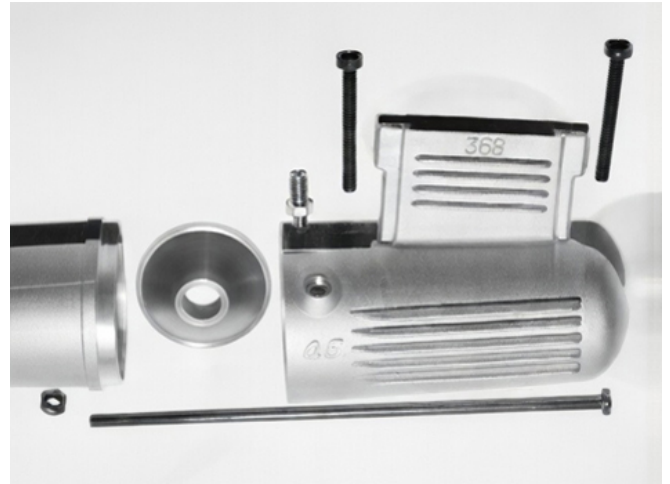
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The O.S. 2F carb comes with a piece of silicone tubing installed to prevent air leakage through the needle valve threads a good idea. Carb barrel is easily removed for cleaning.

rear surface and the inner race of the front ball bearing. The shaft's intake window is a big .470 inch front-to-back and .300 inch wide ... huge compared to the throughput area of the 2F carburetor. Prop threads are standard 1/4-28. The crank's disc follows the "thicker is better" modern trend; it's .255 inch thick, symmetrically cut away for balancing, and I judge this engine's vibration level to be below average.

For years, many of us have slipped a short piece of silicone fuel line over a needle valve, sized in length to seal between the needle valve and the carburetor, to inhibit any airflow between the needle's external threads and the body's internal threads. Unwanted airflow here always gives erratic fuel draw. This 2F carb comes with a 1/4-inch length of silicone already in place! This is smart attention to a small detail that's most welcomed. Our test engine's carb had a slight bind at the low speed travel end that disappeared during break-in. The fuel line nipple was also a bit loose against its white sealing gasket. All nonmetallic gaskets compress a bit with time; this is normal. It's a very simple carburetor to clean. Remove the near-vertical idle set screw and its spring. The barrel will then slide out. Watch for the coiled spring behind the barrel to come out too. The large diameter end of the spring pushes against the barrel. Then remove only the grey high speed needle, remove the tank's fuel line



Text talks about the round conical insert between the O.S. muffler's front and rear sections.

from the fuel nipple, and back flush openings with squirts of WD-40.

O.S. is doing progressive work on effective sound control for their mufflers. The picture shows the 25SF muffler has a small conical insert (with a .310 inch hole through it) that fits between the front and back muffler castings. The muffler's exit hole is .275 inch. This muffler design allows you to do some interesting and simple experimenting, like removing the insert and measuring rpm gain and judging sound increase. Also, it's easy to omit the conical insert and small rear casting and bolt on to the front casting one of the Davis Diesel Development mufflers made for the smaller size four cycle engines. This small DDD unit's chamber is 2¼ inches long and 1¼ inches in diameter ... in effect it doubles the volume of the front original chamber, costs no rpm and adds a meager single ounce for much quietude. An SASE to DDD, Box 141, Milford, CT 06460 will get you details.

Our O.S. Max-25SF was carefully broken in with the new Golden Break-In Fuel blended by Power master Products, 7807-H Telegraph Road, Montebello, CA 90640; (213)887-0801, using the directions attached to the jug. This new product should be available everywhere as you read this. The K&B #4520 plug lasted through all testing. All rpm figures are with Master Airscrew props and are read using the GBI fuel.

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PERFORMANCE

Prop Size	High RPM	Low RPM	Richmond Speed Ratio
-			
8 x 4	15.300***	2.800	5.46:1
9 x 4	14.750*	2.500	5.90:1
9 x 6	12.400	2.300	5.39:1
9½ x 6	12.600**	2.250	5.60:1

A speed ratio below 4:1 is unsatisfactory.
 A speed ratio of 4:1 is barely satisfactory.
 A speed ratio of 5:1 is average performance.
 A speed ratio of 6:1 is superb performance.

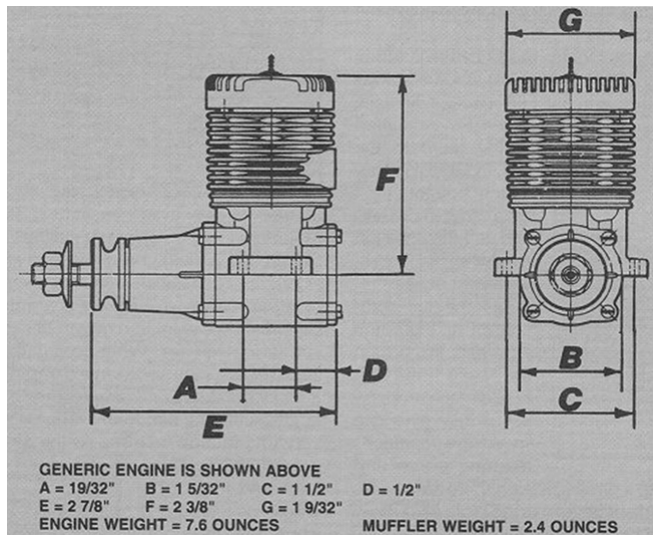
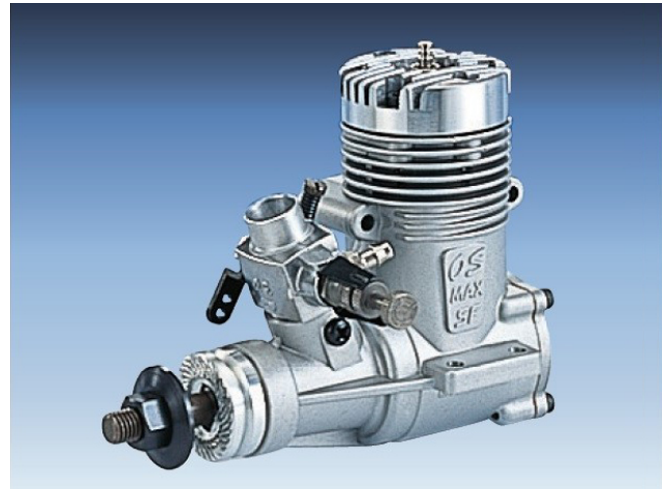
*With the muffler off (open exhaust) this figure became 15.850 rpm, indicating the stock muffler cost 1.100 rpm.

**The 9½ x 6 high rpm figure represents an anomaly in that the 12.600 figure should be below that of the 9 x 6's high speed. This test engine was not comfortable with the 9½ x 6... seemed to strain and act over propped. Best performance was with the 9x4 ideal for the PT- 20.

***With the muffler off, this figure, towards the end of the break-in, readily surpassed 18.000 rpm as the fuel line was briefly pinched.

It was very interesting to observe that the acceleration from idle was significantly improved when the round conical insert was removed from between the muffler's front and rear castings. The sound change was insignificantly higher.

Retail price of the O.S. Max-25SF at testing was \$134.95. Imported by Great Planes Model Distributors, Champaign, Illinois, and generally available from your favorite hobby supplier with a two year guarantee. **MB**



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