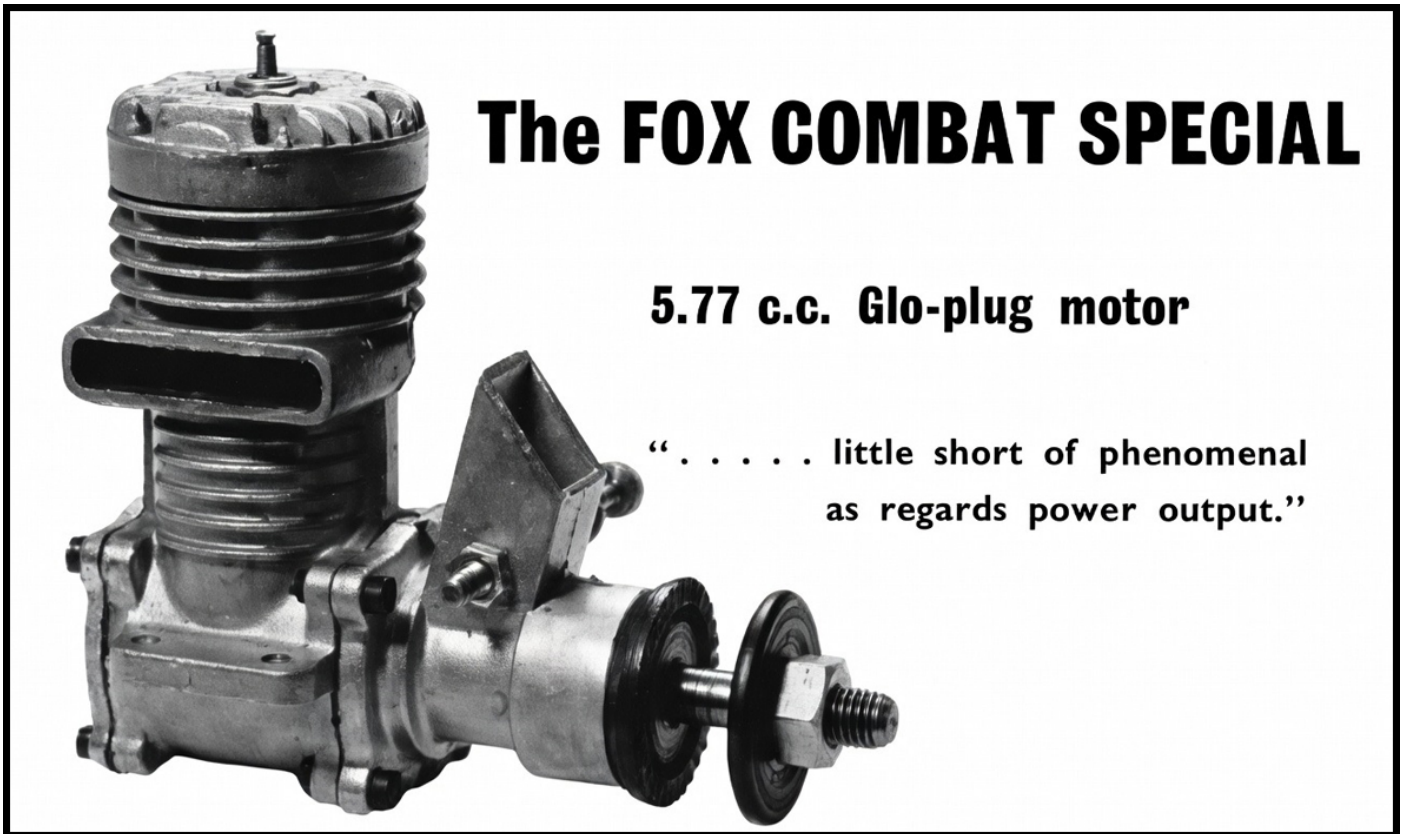


Fox 35 Combat Special Series III



In the U.K., C/L combat models are limited to engines of 3.5 c.c. maximum and the usual choice is a 2.5 or 3.5 diesel, for which peak outputs range between 0.28 and 0.40 b.h.p. In contrast, American rules permit 0.35 cu. in. (5.8 c.c.) motors and the popularity of combat events has led to the development of special "combat" versions of 0.35 stunt glow plug engines in which power outputs on suitable "hot" fuels have been raised to the 0.65-0.75 b.h.p. bracket.

In general, the main differences between the "stunt" and "combat" 35's, are to be found in the latter's opened up intake system. Carburettor venturi inserts are enlarged or discarded entirely, valve apertures anti crank shaft ports are enlarged and or altered in shape and the gas passage through the shaft is usually enlarged also. To compensate for the loss of fuel suction resulting from large carburettor choke areas, it is usual to employ a pressurised fuel system.

The most common solution here is to utilise the positive pressure differential within the crankcase by means of a small nipple in the back plate, conducting the low pressure so obtained to a scaled fuel tank via fuel tubing.

The Fox Manufacturing Company Inc., of Fort Smith, Arkansas, have, of course, been well known for their 0.35 class stunt engines for many years and they were among the first to introduce a combat version with their original black head Combat 35.

More recently, however, they have designed and put into production a completely new engine designated the Fox "Combat Special" which moves further away from the basic 35 stunt layout retained by all previous combat engines and, in so doing, presents an entirely new standard of 0.35 cu. in. performance.

The Combat Special, the subject of this test report, is, in fact, little short of phenomenal as regards power output. Our test sample, which we ran in from new and which was absolutely standard in all respects, reached 0.87 b.h.p. on 30 per cent, nitromethane.

This, equal to a specific output of over 150 b.h.p./ litre, is comparable with the highest levels yet reached with model i.e. engines, irrespective of type.

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The most original and interesting feature of the Combat Special is its use of needle bearings to support the crankshaft. Unlike previous Fox 35's, the main bearing housing is not an integral part of the main casting. The main casting, comprising crankcase and cylinder block only, is basically the same as that used for the black head Combat 35 and the cheaper red-head Rocket 35 models, but is modified with four point lug and flange mounting for the new bearing housing. Each bearing consists of 27 needle rollers in a steel race, the needles running in contact with each other and with the shaft journal which is surface hardened to Rockwell C-62 for satisfactory operation with these bearings.

As one would expect, porting is generous and in accordance with the latest developments. The square sectioned carburettor has internal dimensions of 3/8 in. X 3/8 in. and opens into a rectangular valve aperture which registers with a rectangular valve port in the shaft. This gives rapid opening and closing of the rotary valve to make full use of the 180 deg. induction period and large bore (3/8 in.) gas passage. The exhaust port occupies 180 deg. of the cylinder circumference and is 3/16 in. deep. The very deep transfer port (5/16 in.) overlaps approximately five-sixths of the exhaust port depth to give very advanced transfer opening.

The cylinder liner is of leaded steel and, in contrast to a trend in European diesel design, wall thickness is quite modest only 0.037 in. It is an easy push fit in the main casting, being located at the top by a flange which also makes the head joint, via a 10 thou, aluminum gasket recessed into the die cast and machined cylinder head. Internal head shape has been modified by comparison with previous Fox 35's, Compression ratio is high at 12:1. The piston, with 5/32 in. dia. tubular gudgeon pin, is notably light in weight.

In accordance with usual Fox practice, a Desaxe cylinder arrangement is used i.e. the cylinder is offset to the exhaust side relative to the crankshaft.

Specification

Type: Single cylinder, air-cooled, loop scavenged two-stroke cycle, glow plug ignition. Crankshaft rotary valve induction. Baffle piston. Central ignition plug.

Bore: 0.800 in.

Stroke: 0.700 in.

Swept Volume: 0.3519 cu. in. = 5.767 c.c.

Stroke/Bore Ratio: 0.875 : 1

Compression Ratio: 12 : 1.

Weight: 7.5 oz.

General Structural Data

Pressure die-cast, silicon aluminum alloy crankcase and cylinder unit with leaded steel cylinder liner.

P.d.c. silicon aluminum alloy front bearing housing containing two 1/2 in. i.d. needle bearings and attached to main casting with four Phillips screws. Counter balanced 1/2 in. journal alloy steel crankshaft with 7/32 in. dia. hollow crankpin and ease hardened to Rock well C-62.

Lightweight Meehanite piston with fully floating tubular 5/32 in. dia. gudgeon pin, ease hardened and fitted with brass eyelet end pads.

Connecting rod of 24ST alloy with plain unbushed eyes. P.d.c. silicon aluminum alloy finned cylinder head with recessed 0.010 in. soft aluminum gasket and secured to cylinder with six Phillips screws. Pressure die-cast silicon aluminum alloy crankcase back plate with central brass nipple for fuel tank pressurisation and attached with four Phillips screws. Steel drive washer splined to crankshaft. Brass spray bar with one piece steel needle and double spring ratchet device. Beam mounting lugs.

Test Engine Data

Running time prior to test: 4 hours.

Fuel used: KK Record Super Nitrex (30 per cent, nitromethane).

Ignition plug used: Maker's 1.5 volt as supplied.

Performance

One of the most pleasing characteristics of the Combat Special is its remarkably easy handling

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qualities. Starting was as straightforward and trouble free as anything yet encountered in the .35 class. When starting from cold, an exhaust prime invariably gave a quick start and, with the engine hot, two or three flicks were usually the only preliminary to a rapid restart. With pressure feed, intake choking is, of course, ineffective, and the preliminary flicks serve to pump the fuel through from tank to carburettor. If the engine is stopped with a partly filled tank, however, it is necessary to remember that residual pressure in the tank may tend to flood the carburettor unless the needle valve is closed. The best way to stop the engine and, at the same time, avoid this risk is to release the tank pressure.

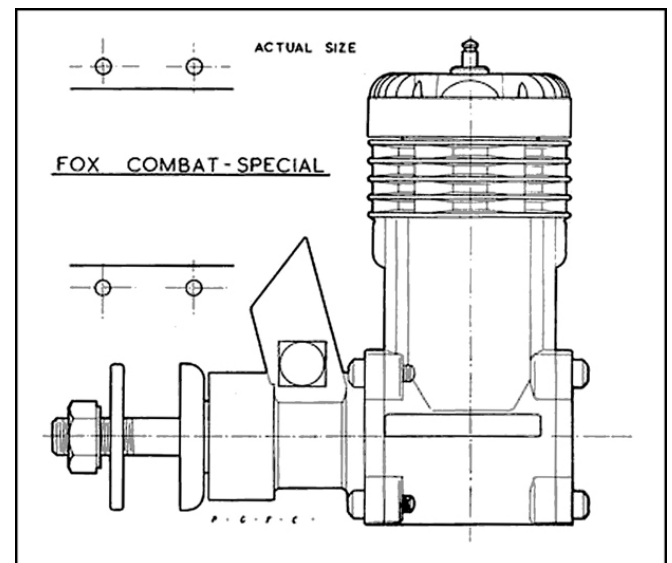
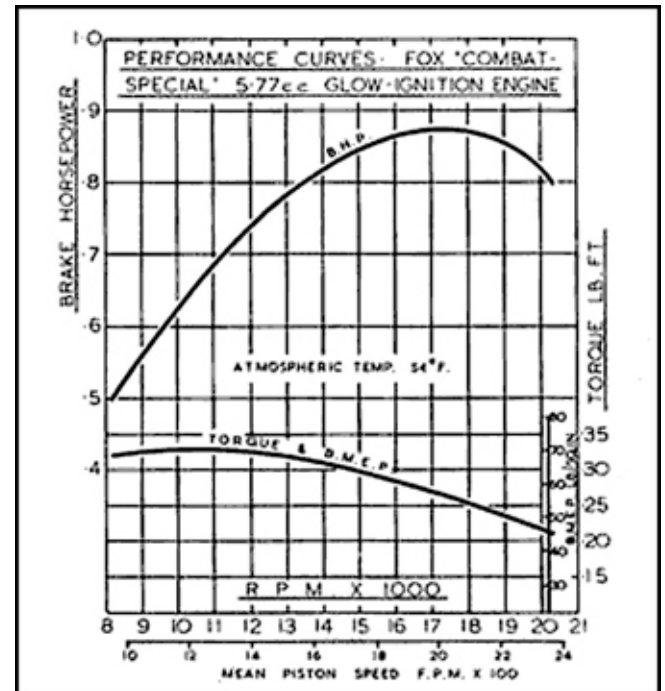
The ultimate performance that can be realised with the Combat Special is largely dependent on the fuel used. For normal use, Fox recommend a blend containing 20 per cent, nitromethane but state that the engine's construction is such that there is practically no limit to the amount of nitromethane that it will take under suitable conditions and when really well run in. In other words, given ideal climatic conditions, one might use 50 or 60 per cent, nitro to gain absolute maximum power output. For our tests, a 30 per cent, nitro methane mixture was chosen.

Under these conditions, the Combat Special developed a maximum torque of 0.33 lb. ft. at 11.000 r.p.m. which, equivalent to a brake mean effective pressure of just over 70 lb./sq. in., is unsurpassed by any engine yet tested in this series and gives a clear indication of the very high power available even at speeds well below the peak. Actual maximum horsepower reached was, as already mentioned, some 0.87 b.h.p., this occurring at between 17.000 and 18.000 r.p.m.

The ability of the Combat Special to run happily at speeds well in excess of this already high peaking speed is quite remarkable. We had our test motor up to 20.000 r.p.m. At this speed it was smooth and absolutely steady. As a matter of interest, the Combat Special turned a PAW 9X4 prop at 16.900 r.p.m., a 9x6 at 13.300 and a 10 X 6 at 12.500.

Power/Height Ratio (as tested): 1.86 b.h.p./lb.

Specific Output (as tested): 151 b.h.p./litre.



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