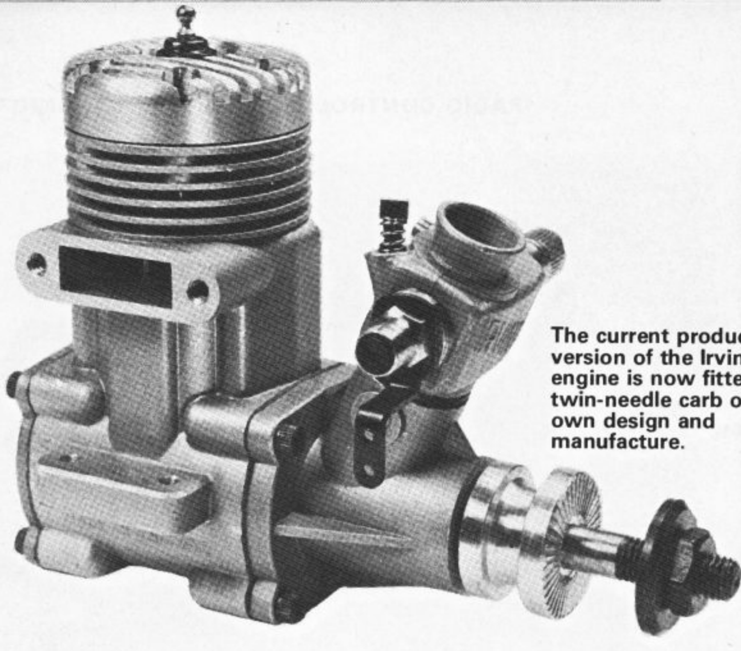


The current production version of the Irvine 40. The engine is now fitted with a twin-needle carb of Irvine's own design and manufacture.

Peter Chinn's RADIO MOTOR COMMENTARY

Irvine 40

New British engines are all too rare nowadays and, although a pre-production example of the *Irvine 40* was briefly covered in an article some time ago, changes have been made to the engine since that time and the opportunity to closely examine a pair of current production models was therefore keenly welcomed.

The *Irvine 40* is one of the only two British engines in the popular .40 cu. in. R/C engine class, the other being the *Meteor 40* (see RCM&E September 1977) but both feature Schnuerle scavenging and, of course, twin ball bearings. The *Irvine 40,* designed by **Ron Irvine** and made at his Barnet works, was actually under development for at least three years before being put into production, during which time both front induction and rear (disc valve) induction versions were built and various structural features tried out. The original intention was to use gravity castings for the crankcase, etc., but the company supplying these failed to meet Ron Irvine's standards and, in view of the fact that anticipated production volume would not justify, at this stage, the adoption of pressure die castings, it was decided to employ investment castings instead. The success of this subsequently led to the use of such castings for the production of several other parts of the engine.

One of these is the cylinder liner. Instead of being machined from the solid, this comes as a steel investment casting, complete with all ports accurately formed and, therefore, requiring a minimum of machining before being hardened and ground. The liner has the usual Schnuerle scavenging arrangement of angled transfer ports flanking the exhaust, plus an upwardly inclined third port between them. The exhaust port has a central bridge and is timed to remain open (our measurements) for 145 degrees of crank angle. The two main transfer ports are fed from deep, suitably angled channels in the casting and are open for 124 degrees. The third port is large, is fed via a rectangular window in the piston skirt and a short transfer passage in the side of the casting and is open for 118 degrees of crank angle.

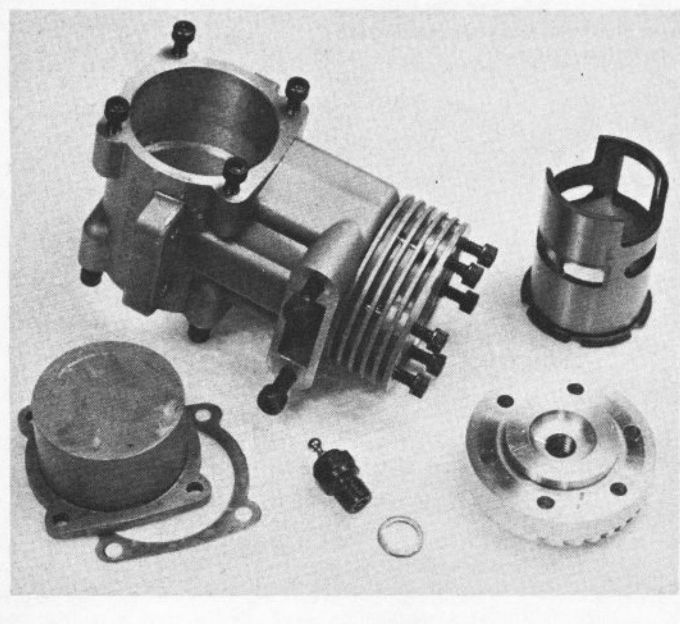
The piston is also an investment casting: in this instance it is made from a low-expansion silicon-aluminium alloy. It is fitted with a radially pinned Dykes type piston-ring and has rectangular skirt cutaways fore and aft to avoid masking the transfer channels at the bottom of the stroke. The piston bosses carry a fully-floating 0.203in. o.d. (5.15mm) tubular gudgeon-pin retained by wire circlips. The robust connecting-rod is forged from high duty aluminium alloy and is equipped with bronze bushes and oil holes at both ends.

The cylinder head is machined from aluminium bar, has a wide (4.2mm) flat squish-band and a small bowl-shaped central chamber. No head gasket is used and, on the two engines examined, the piston crown to squish band clearances were .006in. and .008in. which, with the relatively small combustion chamber volume used, gave uncommonly high compression ratios of around 15:1. The manufacturer recommends straight 4/1 methanol/castor-oil fuel or a 5 per cent nitromethane blend for general use, but approves up to 15 per cent nitro for contest work.

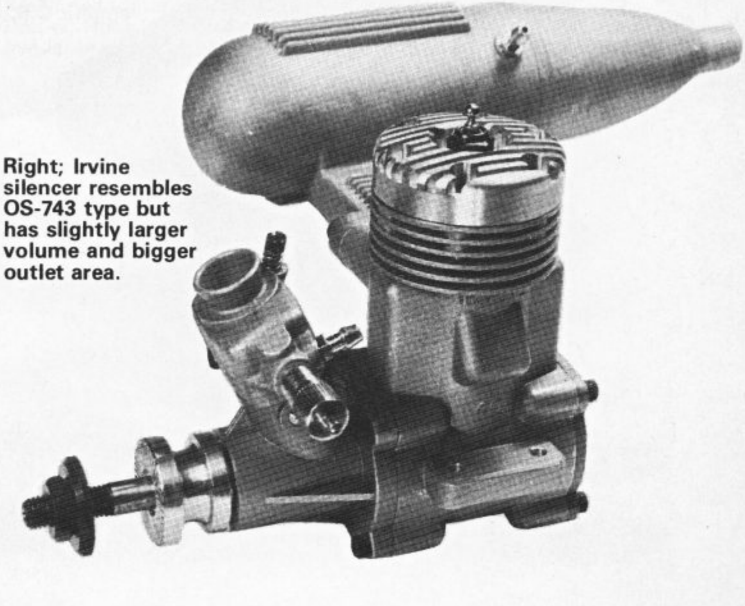
In general, the design of the *Irvine 40* is in line with current high performance .40 cu. in. R/C engine trends but whereas some other recent designs have moved away from ½in. (12.7mm) and 13mm crankshafts and are using 15mm journals, the Irvine still has a ½in. shaft – presumably in order that more readily available bearing sizes (½×1⅛in. rear, ¼×⅝in. front) may be used. The idea behind employing a large diameter shaft in a front rotary valve engine is, of course, to enable it to be bored out for a larger i.d. gas passage without physically weakening the shaft. However, not every engine using a large shaft journal takes full advantage of this. For example, although the O.S. 40F-SR's 15mm shaft is bored out to nearly 11mm, the 15mm shaft of the Webra 40 R/C (which develops similar power) is bored only 9mm. The Irvine's shaft i.d. of 8.6mm is only slightly smaller and still leaves plenty of material, added to which the shaft is, in any case, made of nickel-chrome steel for increased strength. It has a separate, solid crankpin of 7/32in. nominal diameter that is pressed into a very thick (11mm) counterbalanced crankweb.

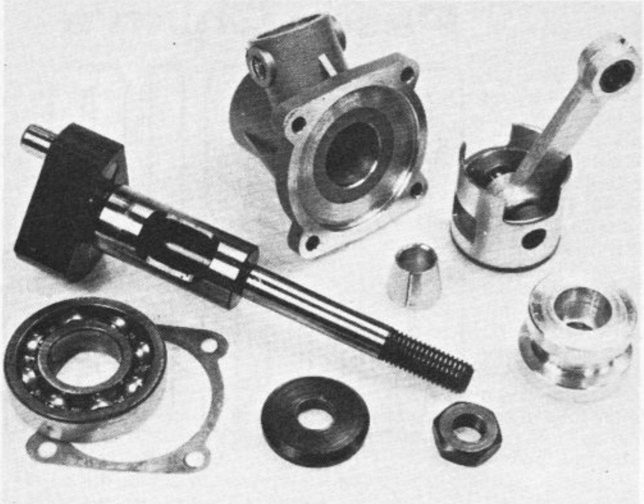
Readers may recall that early examples of the *Irvine 40* were fitted with the American-designed, German-made Perry carburettor, although it was always the intention to use a British carb. Orders were, in fact, placed with a UK manufacturer but, due to delivery delays, Ron Irvine eventually decided to produce his own carb for the engine and this is the

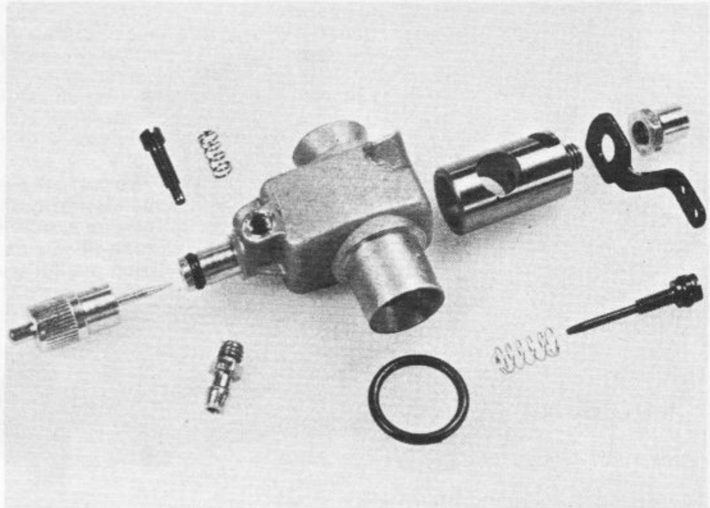
Below; Irvine 40 makes extensive use of investment castings; not only for aluminium parts but also for steel cylinder liner.



Right; Irvine silencer resembles OS-743 type but has slightly larger volume and bigger outlet area.







unit shown in the photos. Basically, the Irvine carburettor is a two-needle, barrel-throttle design, similar in principle to other carbs of this type but with one or two worthwhile minor refinements, such as O-rings on both needles for smooth adjustment and the elimination of leaks. The choke size is 0.300in. (7.62mm) and, after allowing for the spraybar, effective choke area is approximately 25 sq. mm.

The *Irvine 40* is supplied complete with an expansion chamber type silencer. This is very similar to the OS-743 but has a very slightly larger volume (80 ml. instead of 75 ml.) and a bigger outlet nozzle (8.15mm instead of 7.5mm) which increases outlet area from 44 to 52 sq. mm.

The *Irvine 40* is built to Imperial, rather than metric, dimensions and has a bore and stroke of 0.840in.×0.720in. (the same as for all the K&B .40 cu. in. models) giving a swept volume of 0.3990 cu. in. or 6.539 c.c. The engine checks out at 313 grammes (11.0 oz) which is increased to 398 g (14.0 oz) when the silencer is added. It is hoped to run some performance tests on the engine in due course and when these have been completed the results will be published.

Two New High Performance 3.5 Motors

The increasing international popularity of R/C racing car and boat classes calling for powerful engines of 3.5 c.c. maximum capacity, has resulted in the establishment of a new engine class, slightly bigger than the once very popular '19' that was designed to come within the AMA 0.20 cu. in. (3.277 c.c.) displacement limit.

Already well established are the American *K&B 3.5* and the Italian *OPS 3.5* and *Super-Tigre X.21*, the former with a nominal bore and stroke of 0.650×0.640in. for a swept volume of 0.2124 cu. in. or 3.480 c.c. and the latter two with a 16.6×16.0mm bore and stroke combination giving a displacement of 3.463 c.c. The German *Webra 'Speed 20'* also comes into this group, being nearer a '21' than a '20' since it has a bore and stroke of 16.5×16.0mm for a capacity of 3.421 c.c. or 0.2088 cu. in. Very close to the limit is the Italian *Cipolla Master 3.5* with a bore and stroke of 16.0×17.4mm giving a displacement of 3.498 c.c. or 0.2135 cu. in.

Other manufacturers are expected to respond to the demand for high

Above left; Irvine crankshaft looks "thin" but has hefty crankweb and is made of nickel-chrome steel.
Above; Irvine carburettor parts. Low-speed mixture needle (right) can be adjusted when engine is idling.

performance engines of this size and Keilkraft are now offering a new Schnuerle scavenged 3.5 c.c. O.S. motor, the *Max 21F-SR*. We managed to get hold of a couple of these from the factory prior to their release and, as the photos show, they closely resemble the already well established *Max 25F-SR* aircraft engine. There are two models: the 21F-SRM, with a machined bar-stock water-cooled cylinder head for marine use, and the 21F-SRC car engine with a deeply finned aircooled head, also machined from the solid, to which an optional heat-sink can be added.

Whereas the 25F-SR has an 18×16mm bore and stroke for a displacement of 4.072 c.c. or 0.2485 cu. in., the 21F-SR has its bore reduced to 16.6mm, while retaining the same stroke. It is not, however, merely a sleeved down 25. The 25F-SR is intended primarily for aircraft use and was designed to produce high performance on the most useful prop sizes and reliable operation through aerobatics, as well as developing plenty of low speed torque for helicopter use, whereas the primary objective with the 21F-SR is maximum top end power and it has been modified accordingly.

For example, its 12mm crankshaft has a longer and wider valve port and the gas passage through the shaft has also been enlarged. The cylinder ports are bigger, are open longer and the thicker cylinder wall should result in improved directional gas flow.

Taking the effects of these changes in order, the rotary-valve, according to our measurements, opens at 35 deg. after bottom dead centre, which is the same as on the 25F-SR but now closes at 59 deg. after top dead centre, or 14 deg. later than on the 25F-SR. The gas passage through the shaft is now 8.8mm i.d. compared with 8.4mm for the 25F-SR, an increase in area of nearly 10 per cent. Deeper cylinder ports extend the exhaust period to 156 deg. of crank angle, the main transfer period to 128 deg. and the third port period to 118 deg. of crank angle. The upwardly inclined third port, incidentally, is much larger, being wider as well as

Below left; new 3.5 c.c. engine for R/C cars is O.S. Max 21F-SRC now available from KeilKraft dealers. Engine seen here fitted with optional O.S. heat sink and OS-762B car silencer.
Below right; new 3.5 c.c. O.S. Max 21F-SRM marine engine. O.S. silencer, flywheel and U/J coupling are optional extras.