

The McCoy Omnitech conversion uses a bolted-on inlet manifold. I have used a number of these heads on my Elan and done many many race miles with them and the conversion has proven to be well engineered and reliable. These come in both road ported or race ported versions. John has normally done a couple of batches a year of the conversions. How long he keeps doing that I guess depends on the availability of good quality used Stromberg heads and the competition from the new heads now being produced. I still have a spare barely used Stromberg head that I may get converted at some stage as many were removed early in their life and put under benches when replaced by Weber heads.

John has been one of the few people doing modern development work on the Twincam with modern CNC machining equipment and his porting has been evolving overtime, and he has experimented with different inlet lengths (as Lotus did originally) and has also developed a range of excellent cam grinds suitable for developed road engines or race engines. A couple of photos of converted heads from his web site is below. More information can be found on the Omnitech-engineering website.

You will note that the conversion machines off the original oil disengaging chamber for the breather system so alternate arrangements for blowby venting and a catch tank are needed. Photos from the Omnitech-engineering website.

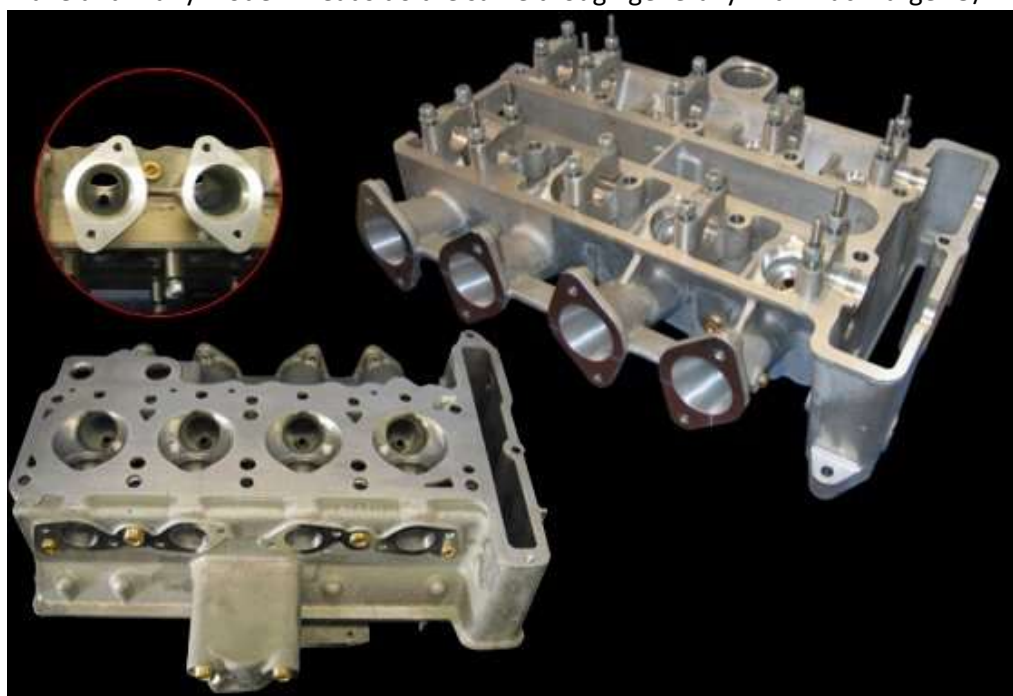


New replica heads are now being cast by three companies QED, SAS, and Dave Bean Engineering. None are cheap, especially by the time you get them to Australia but if your old head has gone soft or cracked such that it cannot be economically repaired then it may be the only option. The new heads are also a good basis for a new race engine where the cost is less likely to be a barrier compared to sourcing and porting an original head or a McCoy conversion

QED say that their new heads are made using the original Lotus tooling, but they also sell a large port version with bigger inlet tract castings in addition to the small port version that appears based on the original tooling



The SAS head copies the later Mk2 Lotus heads like the QED head does but one major change is to run the cams direct in the alloy housings rather than in bearing shells. This makes it cheaper to make and many modern heads do the same though generally with much larger O/D cam bearings.



The Dave Bean Engineering heads are a US development. They use a profile that looks like the Mk1 die cast heads with the half moons in the spark plug well but also have larger cast inlet tracts like the SAS and QED heads and other elements of the Mk2 heads. A write up on the heads from Bill on LotusElan.net follows

The DBE head is a new design by John Stowe and was designed to be legal for all racing venues. John used modern tools like Solid Works and created an electronic file to print the sand cast tooling. John tried to fix a lot of the known problems in the head design yet remain legal for racing.

DBE owns the tooling.

The heads are cast by John Fell at Buddy-Bar Casting. I believe DBE contracts out the basic machining and I think he is about 2-3 months from having the first batch of heads ready for sale. He is taking orders now.

The intake ports start out round at the carb interface, transition to a D-shape at the valve guide, with the D-flat on the valve guide side of the port, and then transitions to a reversed D-shape with the D-flat on the short side turn before the valve pocket. If one were to look down the intake port, one could see a good bit of the back of the intake valve.

There are structural enhancements to the head, some in the form of compression columns in the casting.

DBE quoted me \$4250 for the bare head and about \$3500 for all the fixings including cams. I believe the bare head has the cam bores align bored and most of the finished machining done, but no valve seats or other hardware are included. This allows for customization. I believe the cams run without shell bearings.

Ted Wenz did the development testing. Steve Jennings recommends this head for his LTC blocks and he is the one who introduced me to John Stowe.

Bill

I am not sure about the statement above that these heads don't use bearing shells for the cam bearings as I think only the SAS head does this.

A photo of the DBE head from the Tony Ingram Lotus7.com web site



Other cylinder head component variations

I will not go into the details of variations in cam shaft type, carburation variations or cam covers as these are well covered in the Wilkins book. They were all easily interchangeable and many current standard engines have been modified to the final Lotus "Big Valve" specification

Head Numbering

A final area for discussion on production of cylinder heads is head numbering. This appears to be especially important for Americans, where "matching numbers" cars seem to be much more valuable for some reason.

Originally most of the heads came with the engine number stamped on the rear face of the head (in addition to it being stamped on the Exhaust engine mount boss on the block)

The numbering on the head was of the format LPnnnn – up to around 67 and LP 7xxx? This form of numbering using the engine number appears to have stopped with the introduction of Mk2B head and the movement of engine assembly to Hethel

From around 67/68 a new numbering format for the heads was introduced using a 4-digit alpha numeric code of the form AAnn. The first Alpha digit seems to match a possible year code with the second digit being a batch code and the final 2 numbers being a batch sequence number.

Unfortunately, I have never seen an official description of this coding and no records were kept by Lotus of cylinder head number versus car or engine number. Some heads have none of these numbers which was just maybe Lotus forgetting to do the needed stamping, or it may match heads and engines supplied to Ford on engines for Cortinas or Escorts.

The boss at the front of the sparkplug well was also used to denote cylinder head type in the later years of production after 1968 by stamping a letter on it.

The Wilkins book details these as follows

H = High Compression only (10.3:1)

N = High compression and big valves (Inlet)

S = Big valve, federal only, standard compression (9.5:1)

There are lots of other numbers on heads such as LM8 and LM25 which is a casting alloy material type number. Lotus part numbers and William Mills (WM) part numbers also appear on the heads. There is little consistency to these numbers and if and where they appear in general, they don't appear to have recorded any meaningful difference in head manufacture. There are also often later stamped in numbers done by engine reconditioners to record a cylinder head as having been worked on by them and probably matching a job number in their records

Blocks

The block story is much simpler, and blocks used by Lotus were generally the current production version from Ford with a few Lotus specific modifications.

Development of the Twincam started based on the 105E and 109E 3 bearing blocks, it is not clear if any actual engines were built based on the 105E block and potentially only a couple of the first prototypes were built based on the 109Es. Serious prototype development started when the 116E, 5 bearing block was released. As Ford moved production to later blocks, Lotus followed using the 116E, 122E, 120E, 2731, 3020, 681F and 701M blocks over the development and production. Always in the 1500 height version where multiple height versions existed such as for the 681F.

During some periods of production, the Ford casting type numbers were ground off for some reason and that has never been documented so it's hard to know for certain what actual casting numbers were used for some Lotus blocks. The 701M block was a Lotus only version based on the 1500cc block height as by that time all the other Kent blocks were either short 1300cc versions or tall 1600cc versions numbered 711M, but Ford also sold 701M blocks as a replacement block for 1500cc cars in the UK

I will discuss in more detail some of the block modifications required in later chapters but the key variations in the standard block assemblies used specifically for Lotus Twincams are listed below.

Some aspects of block modifications for Lotus

"L" Blocks

"L" appeared on a few blocks used by Lotus in various locations from early production, but they were not consistently appearing until around 1967/68 cast into the exhaust engine mount boss. There are many myths about what the "L" meant, and I will discuss that in more detail in a later chapter but as far as I can tell the main purpose was to aid identification of the 1500 height blocks once Ford started making 1600 height blocks that were visually very similar especially as a raw casting and easy to mix up in the foundry or production line.

Bore

Apart from the standard Ford 81mm bore in the first few 1500 Elans, the production engines all used a Lotus specific 82.5 mm bore in all the various version of the block used until the end of production. Occasionally "L" blocks are found with 81mm bores in the UK, and these have typically come from when Ford were supplying replacement blocks and engines for 1500cc cars and Lotus "L" blocks found their way into this program

Cranks and Main Caps

The standard Ford 4 bolt rope seal crank was used in the Mk1 Twincam engines. The Mk2 Twincams used a Lotus (and maybe Cortina GT) crank with larger counterweights and also the then current Ford 6 bolt lip seal crank arrangement. Ford used round main caps until the 1600 block engines were introduced and then changed to a much stronger square main cap presumably to prevent failures with the heavier loads from the longer stroke and heavier reciprocating components of the 1600 engines. This square cap was also adopted for the Lotus 1500 block engines at around the same time.

Rods and Pistons

Pistons were always Lotus specific to suit the 82.5 mm bore, perhaps the first few Elan 1500 engines used a standard Ford piston with the 81mm bore. In the Mk1 Twincams using the 4-bolt crank rods was a Ford rod number 116E with 5/16th inch rod bolts. The Mk 2 Twincams with the 6-bolt crank

moved to a Lotus specific Ford part 125E with 3/8th inch rod bolts. This later 125E rod appears to have been developed by Ford / Lotus based on the Cosworth rods used in the Cosworth Mk13 engine.

Sumps and Oil pickups and pumps

The Elan, Cortina and Europa all used the pressed steel front bowl sump from the Cortinas of the time as far as I can tell and used the standard oil pump and pick up arrangement for the relevant block. The early 4 bolt crank blocks used a screw in pick up that was located central in the sump bowl. When the engine changed to a 6 bolt crank Ford blocks also changed to using a press in pickup that was biased to the right-hand side of the sump bowl. This was a backward step and creates a problem with oil moving away from the pickup and loss of oil pressure in right hand corners that has plagued enthusiastically driven Twincams ever since.

Block Stamping for Lotus

The blocks supplied for Lotus by Ford were graded after boring to 82.5mm using mechanical calipers through the various sand core holes. This gave several spot measurements but was by no means a complete bore wall thickness survey and I will discuss the issues later in the block modification chapter

The following letters can be found stamped on the block front face under the chain cover

LB = minimum thickness 0.100 inches so not suitable for over boring above Lotus standard 82.5mm

LA = minimum thickness 0.140 inches so suitable for over boring (maybe! see my later comments on block modifications)

LAA = minimum thickness 0.140 inches but outside tolerances so suitable for over boring to 83.5mm and not suitable for a standard engine

Other engine block accessory details

I will not go into all the details of other block components like distributors on the standard engines as these are well documented in the Lotus workshop manual and the Wilkins book, but you need to be careful with some of this data as it is not without error, especially the ignition advance curves used.

Ford Motorsport blocks

Modern replacement blocks are now being produced by Ford Motorsport in the US. This appears to have been driven by demand for Formula Ford 1600 blocks to the 711M pattern, but they are also making 701M equivalent 1500 height blocks as the casting variation is very small to make the shorter block. I have measured up a couple of these blocks and apart from less variation in casting wall thickness or core shift the casting appears very close to the original blocks which you would expect as they are certainly based on the original Ford design drawings.

When first launched the marketing from some resellers advertised these blocks a great for 85mm bore large capacity engines. My ultrasonic measurements and Ford Motorsport information also now says these blocks are not suitable for more than 83.5mm bores which is what I would expect given the design is the same and the casting techniques the same.

The one significant difference with these blocks is that they use the full 360-degree crank thrust bearing from the later SOHC cam 2000cc Pinto engine design