Development of an MGB Twin Cam

This is in a sense a reprint of an article I published in 1980 in the Namgar magazine documenting the development of a Twin Cam conversion on a 5 main bearing MGB engine. I have been reluctant to offer advice on this project as I did not want to encourage what I consider the waste of genuine Twin Cam parts on often ill-conceived projects more often than not doomed to failure. I have yielded to behind the scenes requests to make this available for two reasons – the information is already out there, if difficult to find after 27 years, and in the absence of data like this, people are more likely than not to end up destroying irreplaceable parts.

Be aware that I still do not condone this conversion, as I feel that stock Twin Cam engines are rebuildable and can be made to be durable. I have added pictures and commentary from subsequent experiences with these conversion engines.

Building an MGB Twin Cam is rather like the weather – everyone talks about it but no one actually seems to do anything about it. I had retired my MGA from racing for a few years, but when vintage racing started up in my area around 1978, I brought it out again, and since the rules regarding engines were few and mostly unenforced, I decided to have some fun building unusual racing engines.

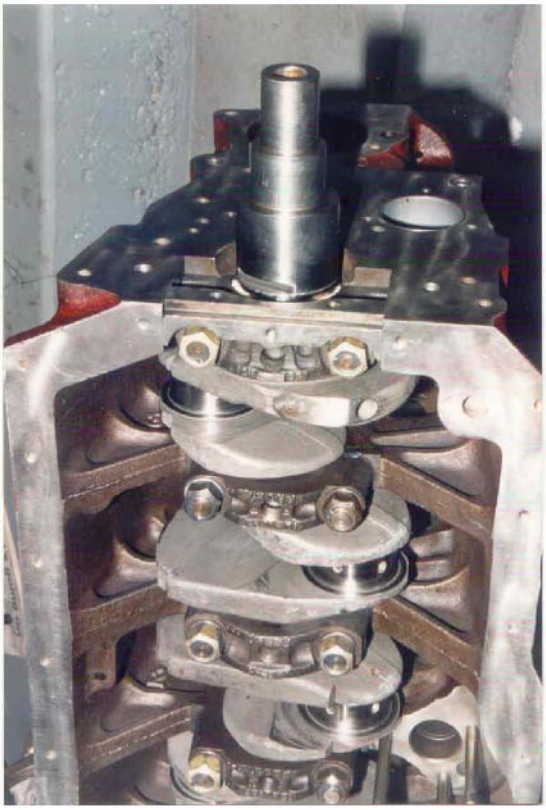
I had always run basically stock 1588 cc. and 1622 cc. engines, and a 12:1 1622, mostly in ICSCC production, and wanted to try something with more power. One of my favourite motors was a 0.80" overbore high compression 3 main bearing MGB engine with an original HRG crossflow head and Twin Webers putting out 140 BHP or a bit better. I felt that this represented a fair compromise between power and reliability; the SCCA racers claiming 160 BHP and higher on cast iron heads were using an RPM range not conducive to long lasting engines.

Then I thought about a project often raised at MG BS sessions – what if MG had not discontinued the Twin Cam engine, but had carried it on into MGB production in 1798 cc. form? I decided to take a shot at actually doing this in 1979.

The people that actually got as far as laying a Twin Cam head gasket on a pushrod version would see that while the bore centres are the same, not a lot else lines up properly. I decided that if I were to go to all the trouble and expense of attempting this job, I would do it in the form of a race engine for use in vintage racing and the rest of this article should be read with that in mind, although there is nothing to prevent a lower tune engine being built along the same lines for street use.

I opted for a 5 main engine as a basis, even though using a 3 main bearing MGB would have been easier. Problem # 1 – the stock crank starves # 2 and 3 rod bearings of oil at anything higher than about 6500 RPM. While this wouldn't be an issue for a pushrod car until you got into very serious competition, it was an issue for a Twin Cam right from the beginning as the stock power peak at 6800 RPM and stock redline at 7000 RPM exceeded the usable range of a stock 5 main MGB crankshaft. It was necessary to either crossdrill and preferably nitride a stock tested 5 main crank, or to do what I did and source one of the now rare factory nitrided crossdrilled racing crankshafts (C-AEH-822).

I then had to carefully measure a Twin Cam crank, compare it with the MGB part and design and have made a special crankshaft nose piece that would be pressed onto the MGB crank, and internally keyed to it. By the way, I also discovered that the internal thread on all the MG cranks is a BSF thread and needed to find someone that could machine that thread on a new longer crank bolt.



You then need to start with a Twin Cam engine, or at least everything above and in front of the block, and graft it all onto the MGB block. This sounds much easier than it turned out to be.

You could use Twin Cam connecting rods, but they would work easily only on a 3 main conversion which uses the same offset rods. It would be a shame to machine down the Twin Cam rods and so I sourced new old stock late model MGB rods – the horizontal split style with the press fit small ends, by choice, as that is one less thing to come adrift in a race engine (I've seen bores ruined by errant wrist pins). Competition aftermarket rods are also an option.

The half speed shaft substitutes for the camshaft, BUT you need the oil pump drive gear as it is a reverse cut from the pushrod version, as the first stage of the drive from crank to half speed shaft is done on a Twin Cam via gears instead of chain and the shaft turns the opposite direction.

There are various holes that need to be created and various holes that must be plugged. Here is a short list:

- need 2 drain holes for oil that collects in the front timing case to get back into the sump

- A threaded hole (carefully measured) to bolt the oiling tower that squirts oil on the gears to be attached – it needs to tap into an existing oil gallery. Miss and go find a new block.

- Plug the old holes for the Renold chain tensioner

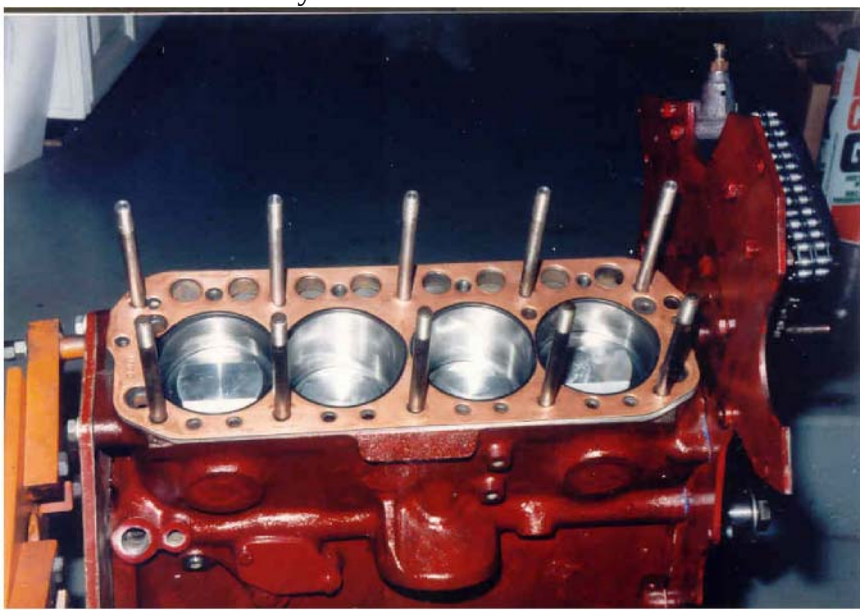
- Redrill and rethread the head stud holes a size up – you need to create some anew

Drill cooling passages from block to head.

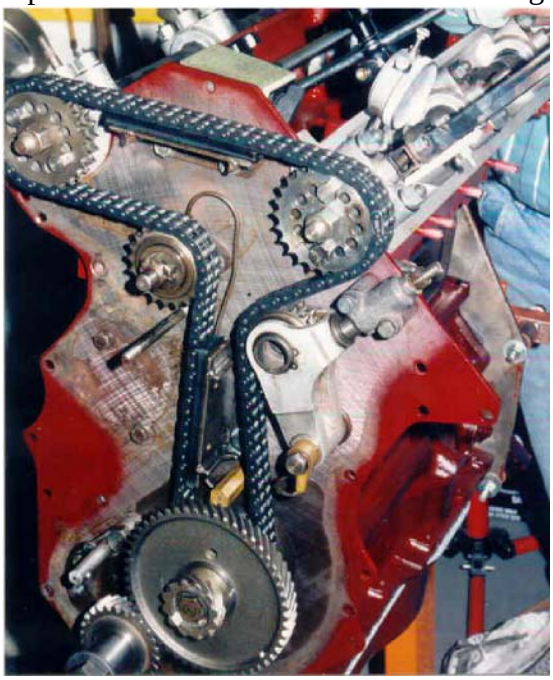
Some of the problems with all this include the fact that one head stud is very near the pushrod oil passage to the head, which needs to be blocked off. The new head studs

should be machined from scratch as stock Twin Cam studs have grooves to allow oil to be expressed when tightening into the block, but some of the new holes you have to drill in the MGB block go right through into water passages and of course you need to make these leak proof.

The new water passages require that you drill at an angle down into the top of the water jacket by the cylinders, and these holes start in the same place as four of the pushrod head stud holes – angle drilling through the side of a threaded hole without breaking off a bit or two is great fun. A competition MGB head gasket was modified with a wad punch and block of lead to create the necessary new holes



It is a good idea to rectify a few shortcomings on the Twin Cam engine while you are doing the project. The top chain tensioner is notorious for having the threads strip – it is



an alloy housing and all the whipping of the chain no doubt takes it's toll. I replaced it with specially made cast steel tensioner body.

The new chain is a Mercedes Benz chain of approximately the correct length with a master link joining the ends.

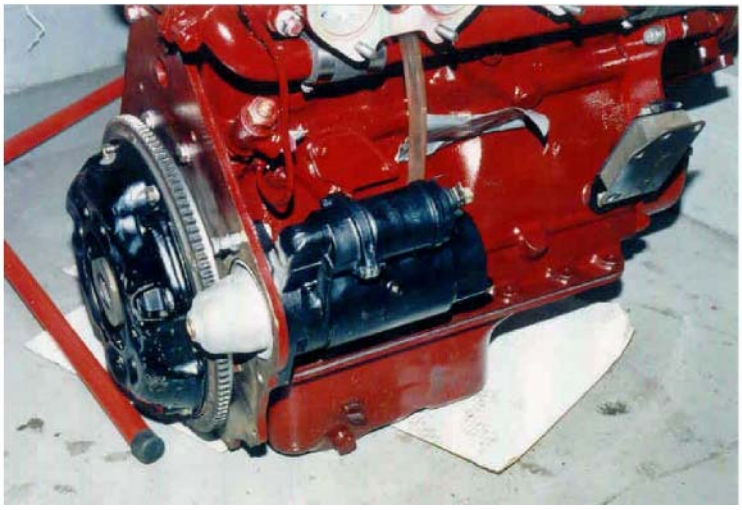
I had one set of pistons made in cast material (Jahns) and found that the clearance between the valve and piston at TDC was too small – to the point where I had to retard the cams quite a bit, despite which the engine still pulled like a train. After a winter's layaway, I fired the engine on stale gas and holed one of these anyway, and that gave me an excuse to get some really good forged pistons made by Ross Racing. They are flycut to give sufficient clearance with the cams I am running, and I retained a decent skirt below the pin, unlike many racing pistons, as the chance of cocking in the bore with all that weight in the crown didn't bear thinking about. I used the smaller MGB wrist pin size to match the rods I was using.

The stock high compression dome gives you around 12:1 compression in the bore size I use, which is 83.5 mm., but if you use the stock low compression dome (you'd have to send it to someone like Ross and tell them you want it in a new piston size) you'd get close to 10:1. It is my opinion that 83.5 mm. is the largest safe bore size and should be alright in 95% of the blocks – don't blame me if your block happens to be in the 5%. I overbored a couple of blocks and then broke them apart to measure wall thickness before arriving at this maximum. One block broke through on final honing (a 2000 cc version). Unfortunately BMC casting was subject to local inclusions and voids that preclude anything larger without using dry liners.

The stock Twin Cam alloy oil pan is a pretty piece of casting, but it is heavy, not easily baffled, and a right bugger to install in the car, and it doesn't match the bolt pattern of the 5 main block anyway, so a properly baffled steel pan went on the engine and the alloy pan hangs on the wall looking nice.

The hole for the pushrod distributor was blanked off (some blocks have a blanking plate) and a new dip stick hole arranged. An oil temperature sender and a knock sensor were installed in the block.

A 15 pound flywheel and MGB competition diaphragm clutch were fitted and a pre-engaged starter motor (I used a Marina starter as this was before the days of the fancy – and expensive – Japanese lightweight high torque starters).



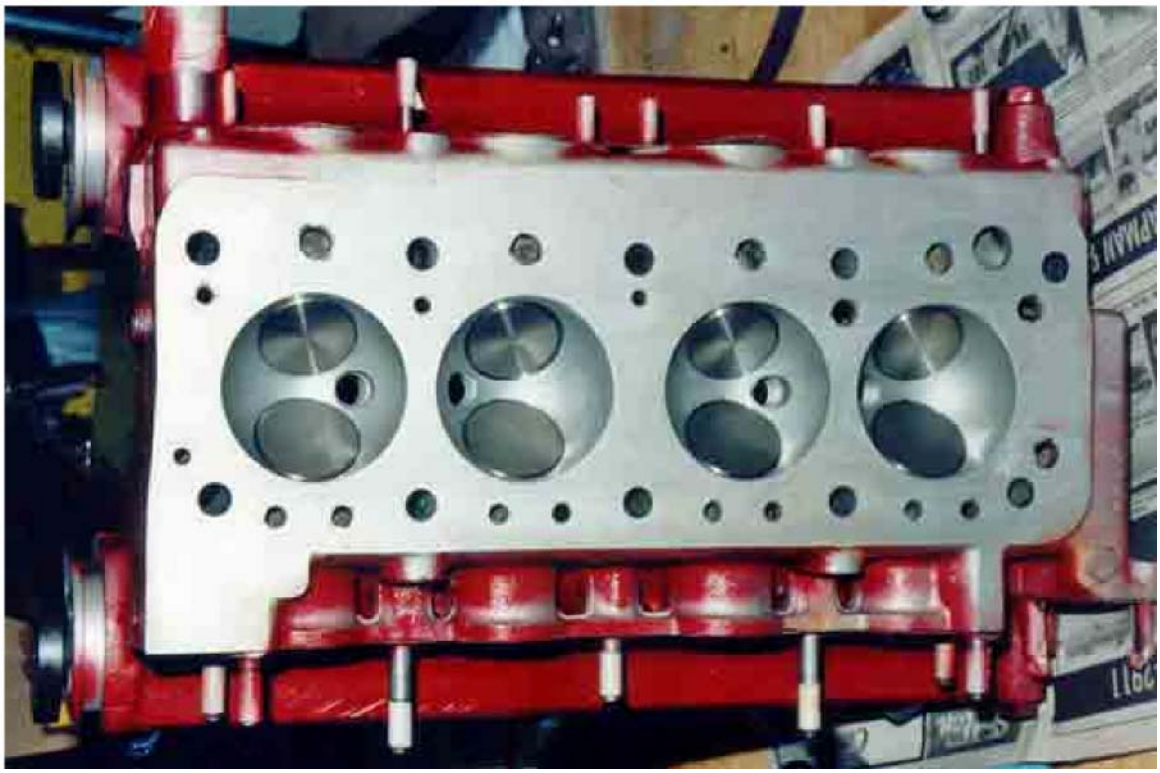
That left the head to be prepared. Larger valves were fitted and new longer chamfered cam followers were used on a late model sleeved head. The head saw some careful port work, not too much or in the wrong place. The ports are large already, but there are gains to be made in the throat area. I fitted bronze guides, cut flush with the port walls, and all sharp edges in the chambers were rounded including the edge of the chamber and the first couple of threads in the plug holes which could give rise to hot spots.

I gave considerable thought to what cam grind to use and finally settled on a Cosworth L1 profile used on 1600 Lotus Fords, which has 306 deg. of duration and 102 deg. of overlap, with clearances of .008 and .009" (IN and EX). I used cup style valve shim caps from the thicker competition range for Alfa to set clearances. It is difficult to get high lifts in a hemi chamber with large valves, lest the valve and pistons hit, but with the new pistons the clearance was a happy .090" at closest approach.

Carbs were 45 DCOE on short manifolds sourced from Lyle York, originally cast for 40 DCOE but reworked by me for the larger size. The stud for the generator never lined up (anyone know why?) so I fabricated an offset bracket to adapt it.

As they came, the ports were mismatched with the manifolds, but fortunately I had to enlarge the manifold anyway and was able to accomplish an excellent fit and match without having to add any material. I believe he may have sourced these intakes from Peter Wood, and would be interested in hearing from anyone else that has the same part. I think John Wright may have bought another set at about the same time in the late 1970s or early 1980s.

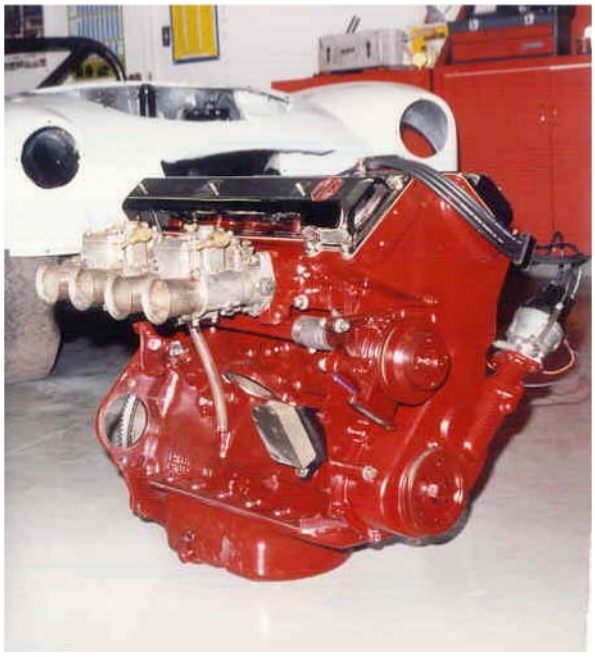
I won't repeat the business about rigid carb mounting causing the piston burning that plagued the Twin Cam, but they finally did notice that none of the Weber carb engines ever suffered it, and that may have finally twigged someone's comprehension, sadly, after the model had been cancelled. Steve Woodyard's factory racer has rudimentary flex mounts incorporated, though I don't know if this was a first move toward the light from the factory or an attempt by a later owner to prevent problems with the SUs. I believe that flex mounts were recommended by the factory for the 1 3/4" carbs on the pushrods and the 2" carbs on the competition Twin Cams, during or slightly after the production period.



At the time I did this conversion, the Twin Cam Registry in Britain didn't know of any other conversions that had been done, but I believe that there have been several since, presumably proceeding along similar lines.

The results in a race engine are gratifying, after the inevitable sorting out period – Webers are wonderful when set right but torture to get there in the first place. The engine runs strongly from 4000 RPM, right through 7500. I use 7800 as an absolute RPM limit for safety although valve bounce is probably a couple of hundred higher on the springs I use.

It pulls like the proverbial train and I keep it from self-destructing with a rev limiter and a knock sensor and cockpit operated timing control. I daresay there are a few more ponies in there to find, but I have never had the time to dyno tune the car,, so I won't make any unfounded guesses as to output. It runs with supersports Morgans with Weber carbbed 2.2 engines and other larger displacement cars not normally the prey of a modest MGA, and that is sufficient fun. It has also beat (with a great deal of effort, I admit), 2 litre 4 cam 356 Carrera Porsches, something I take delight in.



It would be possible to do a street conversion using original SU carbs and a 10:1 compression ratio to run pump premium gas, that would produce around 125 BHP in 1800 cc. form or 135 – 140 BHP in 1950 cc. form, but as most of these engines see only infrequent street use and rarely are run above 5000 RPM anyway, it would seem to me that this would be spending many thousands of dollars for mere bragging rights.

For 99% of today's Twin Cam use, the stock engine is perfectly adequate and the only reasonably useful spin-off of my project that I can see would be the production of crankshaft nose pieces to convert a 1622 or 3 main 1798 crank for those who can't find a good original.

The original Twin Cam crankshaft is reputed to be made from better steel than the pushrod units used, and the fact that many have a red finish on them is used as evidence of different treatment. The 3 main MGB crank is good to 6500 RPM plus without the need to crossdrill, and perhaps a forged racing crank made for this motor could be utilised with a crank extension, with main bearing diameters reduced for the stock Twincam block.

I'll finish this with a picture of my development mule – a TVR Grantura Mk 3 race car that I used in the early days as it offered much better access to the Twincam engine. It was also rather peppy, given the 1800 lb. weight range. And yes, I chromed the cam covers (easier to keep clean) and no, the red lettering was never stock – I just liked it.