

The Perils of an American Crate Engine by Ian Cowan >>

Or how to learn the hard way!

When I first decided to build my GT40, I browsed the internet idly, looking to see what Ford V8 engines were available. As those of you who have read my article on the car build will know, I initially fitted a Ford Granada engine in order to get an age-related plate and to be issued with a log book which would require 1984 emission levels. This had the added advantage that the cost of the engine was £100, which suited my budget.

There were a number of companies in the UK advertising some rather smart engines at prices which were way above what I had available. Unfortunately the general attitude seemed to be less than helpful once I had asked for a budget package. On more than one occasion, after gently suggesting that some of the crate engines seemed good value for money, I was told not to waste it, but the attraction of the exchange rate (at that time £1=\$2) and a glossy photograph was a bit like dangling a big fat worm on a hook in front of a hungry fish.



I still think it looked rather nice, and I contacted the company in the States who were advertising this unit. On paper it seemed OK and was supposed to produce around 320bhp. (Having since looked at the claims made for some American engines, I am now convinced that American horses are the size of small ponies).

The company's sales information (Five Star Engines www.fivestarengines.com) certainly looked good on paper.

New parts to include:

- Sealed Power hypereutectic pistons and rings.
- Fel-Pro gaskets.
- Competition Cams performance camshaft.
- Clevite 77 rods, main and cam bearings.

- High-volume oil pump, pickup screen and drive-shaft.
- Professional Products polished dual-plane intake manifold.
- Chrome timing cover, valve covers, oil pan, dipstick tube and breather pan.

Machining work:

- Engine block, cylinder heads and crankshaft thermally cleaned, shot-blasted, and Magnafluxed. All crankshafts reground, oil holes chamfered and micro-polished.
- Thorough cleaning, including all oil galleys; engines are absolutely clean inside and out.
- All blocks are bored and honed using torque plates.
- New cam custom fitted.
- Connecting rods fitted with new bolts.
- Rotating assembly Sunnen computer balanced. (balance sheet included).
- All cylinder heads completely remanufactured, including new guides, new seals.
- Engine painted with high-gloss engine enamel, in your choice of colour.

The guy from the company was very helpful on the phone and added a flywheel to the package - 'and you can have it any colour you like'. I was hooked, and a few weeks later I was the proud owner of a 302 V8 for my car. The glossy crated engine arrived in July 2008 and was rolled to the back of the garage and carefully stored until October 2009, when my car had passed the newly introduced IVA, and was ready for her new 5 litre engine.

And this is the story of what went wrong. In my defence, I should say that the engine as received managed to get me down to Le Mans in 2010 and enabled me to find out what a great car the GT40 was to drive.

Before running the engine in the car, I had removed the sump in order to move the oil pick up point to the rear, to fit a gated baffle system to reduce oil surge and to reduce the overall depth, making a very low engine mounting possible. While I was doing this I was impressed with the state of the engine internally, and all the components certainly looked new. However the first time I started the engine there was a dreadful, loud noise. Off with the nice shiny rocker cover and, as the photo overleaf shows, I found one rocker completely misplaced. This must have been assembled incorrectly when the engine was built in America.

The offending rocker was removed and replaced in the correct position, after checking that the pushrod was still straight by rolling it across a surface plate and establishing that it would stop in any position.

The car was then driven a few hundred miles to run the engine in and flush out any more gremlins. None surfaced, but I did find it had a tendency to misfire when cornering. I thought the Edelbrock carburettor was flooding, and despite following the technical ad-

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vice from the kind American gentleman, 'fill up the transverse channel linking the left and right hand float chambers with Araldite', I never overcame this problem. A certain Mr Frank Catt had told me previously that the best use for an Edelbrock carburettor was as a fishing weight, and he was probably right! I tried to find a Holley in time for our trip to France, but nothing was available at short notice, and so our progress through the chicanes at Le Mans was 'in fast, and out slow'!

The first signs that the engine was perhaps not quite as good as it looked manifested itself during the track laps at Le Mans. After 2 laps the temperature started to rise, and I backed off and restricted the engine to 3000rpm. This made for a dramatic difference between our speed and some of the Ferraris on the circuit at the same time.

However, the car made it back to the UK and I rather optimistically put the overheating down to the high temperatures in France. I was already considering fitting fuel injection, and in order to get a baseline to measure any improvement, the car was run on the dyno. This gave a maximum of just over 260bhp and showed that the American figures had been wildly optimistic. The engine was also very reluctant to run much over 5000 rpm. I thought this might be due to spark crossover between cylinders 7 and 8. Note - all power figures quoted in this article are flywheel horsepower, obtained on a 500bhp rolling road.

On the basis that one should change only one thing at a time while developing anything, I decided to change the camshaft as well as fit the fuel injection system. It was during a telephone discussion with Comp Cams concerning tappets, camshafts and valve springs that I found the American engine company had not fitted the recommended springs to match the camshaft in my engine.

In order to maintain the specified valve collet-to-head dimension for the new, correct springs, the head and valve seats needed machining - and if this was necessary it seemed logical to me to fit a slightly more ambitious version of Comp Cams' camshaft. Of course all

this was going to involve more expense, but whoever thought the hunt for more power was going to be cheap?

Looking back at all this, I should have expected that the extra stresses of a higher lift cam and stronger springs might give rise to problems - they did!

A loud noise from the engine while reversing into the garage was very quickly diagnosed as terminal failure of a rocker stud. I was about to learn more about Ford engineering!

This may be an appropriate time for a beginners guide to Ford 302 valve gear.

The movement of the valve is caused by tappets being pushed up by the lobes of the camshaft. These in turn move the pushrods sitting in the top of the tappets. The pushrods cause the rockers to rock (surprisingly) and thus push the valve stem down, opening the valve.

I have described below the various types of follower, pushrod and rocker systems that I have come across (and also found rather confusing).



There are two types of followers, hydraulic and solid. Most Ford V8 engines are fitted with the hydraulic type, as they are quieter in operation. Solid lifters are used in high performance applications, where engine speeds are over 6000 rpm; lifter mechanism clearances can be adjusted to suit the application. Performance hydraulic lifters allow higher engine speeds than the standard version.

The pushrods are tubular steel, to allow oil to flow up the rods to the rockers, and in the case where guide plates are used, must be hardened. Performance rods are made from alloy steel and are made in one piece, as opposed to normal rods with tubular parts welded at each end. (These can become detached, as I found to my cost!).

The rockers are where things become complicated. The Ford system is to mount each rocker individually, as opposed to the traditional system of mounting them on a long shaft. This means that some method has to be used to keep each rocker lined up. There are 3 ways to achieve this: