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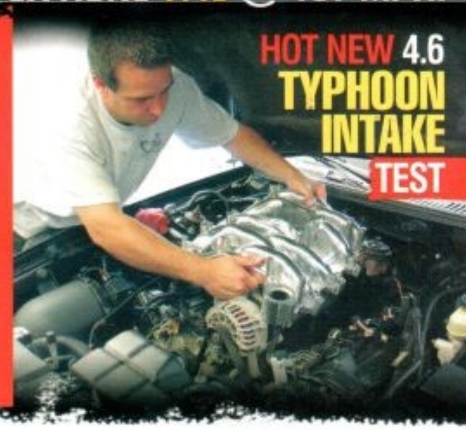

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HERE IS our 370-incher ready to be loaded on the dyno. It's minus the water pump because the pump used is one specifically set up for T&L's dyno.

THE 5.0 TO 6.0 STRETCH

A STROKER 347 USED TO BE THE HOT TICKET FOR YOUR 5.0, BUT WE JACK THIS BABY UP TO **370 INCHES AND MAKE 606 HP** ON PUMP GAS.

BY DAVID VIZARD

OK, THE 5.0 to 6.0 stretch, is, admittedly, a little short of the truth. It makes a catchy title, but the reality is, we are actually looking at a 1.124-liter stretch (1,124 cc) and as we know, more cubes are better than fewer cubes. This makes our supposed 6.0 small-block nearer to 6.1. All this in a block that still sports an 8.2 deck height.

Knowing that cubes are king, and with the ease of extracting extra cubes from the taller 351 Windsor block, you may ask why stick to the shorter deck height? Well, there are several reasons. First, although it's not the big issue it used to be, there's just more room for headers between the suspension towers with the 8.2-deck block. Second, you get a lower center of gravity, which is a plus if fast cornering is of any interest. Third, there is a stealth factor, and fourth, a 351 Windsor weighs about 90 pounds more than the thin-wall cast 5.0 block.

BIG-BORE BEEF

Before we go further, let's visit our goal, which is simply, a quest for cubes. Then to best utilize those extra cubes in terms of cam specs, heads, intake, and so on, and to keep an eye on how much the extra cubes will cost. We have successfully been to 347 inches with a 3.4-inch stroke Scat crank in a stock block. Still working with Busch Engine builder Lloyd McCleary (T&L Engines) for all our machining and assembly, our first move was to make a decision as to what block to use. Here we utilized McCleary's considerable experience building big-inch Fords, and on his recommendation went with a Dart 302 Iron Eagle block for this step up in cubes.

The first thing you notice as the Dart block comes out of the crate is the casting quality. Because it is intended to hold out reliably against power figures well into the four-digit region, it is, at 178 pounds after boring, heavier than the stock 302 block equipped with a steel main girdle by a margin of some 46 pounds. But the considerable extra strength of this block is not just from extra material in strategic places alone. The cast iron used is a denser, high-nickel, high-strength alloy that contributes considerably to the overall integrity.

As you can see from the nearby block section, Dart has put a lot of extra material into the bore wall thickness. The intent here is to withstand big boost and/or a ton of nitrous. With walls this thick, it would be a crime not to make use of them by making a big-bore motor.

The cylinder walls are typically 0.225 inch thick. That's about 10 percent thicker than a Mexican block with a stock bore size. Add to this the stronger material and a Dart block at ¼-inch oversize is probably still better than 20 percent stronger in the bore department than even Ford's best stock offering.

Although a 0.250-inch block looks feasible, we elected to go no more than 0.165 inch over. With the intended 3.4-inch stroke Scat forged crank, this would produce 370 inches. For the record, at Dart's biggest recommended bore, this would have delivered 377 inches and, had we gone out on our own and bored to 4.250 inches, the cubes would have amounted to 385.

So much for big bores to make inches, but let's not forget that this is just half the equation. The other half is the Scat stroker crank and its associated longer rods. For the power level we were shooting for (550-plus horsepower), it was deemed that we were on the cusp as far as the choice between Scat's cast steel crank and the basic and cost-effective forging. At the end of the day, the forging won out by just a small margin.

A PROMINENT feature of this sectioned Dart 302 iron Eagle block is its massive cylinder-wall thickness. Even with a 4.25-inch bore, the walls are still 10 percent thicker than a stock bore. Also worth noting are the blind head-bolt holes. That means no more rusty head bolts on teardown.

HERE IS our Dart Iron Eagle after having been bored and honed to 4.165-inch bore diameter. You can get a bare block, but a ready-to-assemble enameled block as seen here from T&L sells for $2,700.

Even though it was Scat's least expensive crank, it still featured many of the performance assets of the more expensive NEXTEL Cup–style cranks. This included aero counterbalance weights and hollow big-end journals. Any time the stroke goes up, the amount of counterweight mass necessary to internally balance the rotating assembly goes up. In spite of this, the way Scat had done the counterweights there was enough counterbalance mass to allow for the assembly to be internally balanced.

Pistons for our big-bore engine were from Ross. These semi-custom pistons are not quite off the shelf but, as Ross claims as part of its service, the order was turned around in three weeks. These flat-top pistons feature 1/16-inch, 1/16-inch, and 3/16-inch rings. Because of the stroke and the need to cram in as long a rod as possible, the pin intrudes into the oil-ring groove necessitating a support rail–style ring and groove design. As for the rods, these were Scat's light race H-beam items. Their relatively low weight plus the light weight of the Ross piston contributed toward being able to balance the rotating assembly internally.

CAM AND VALVETRAIN

The cam profiles McCleary used to operate our 370's valvetrain were from Comp Cams. The custom T&L-spec roller profile had reasonably high acceleration rates and lift values, but required only a moderate spring, thus producing a valve train with good street/strip reliability. The advertised and 0.050 duration figures were 296/260 for the intake and 304/268 for the exhaust. With a 1.6:1 rocker ratio, gross lift was 0.672 inch. This was ground on a 108-degree LCA with 4 degrees advance. To get the cam timed right, a Comp Cams multi-keyway double-roller timing chain assembly was used. This allows the cam to be adjusted in 2-degree increments. Ours went in at the required 104-degree intake centerline. Had the actual adjustment from the multi-keyway sprocket given an option of 103 or 105, it would have been better to go slightly more advanced than retarded as this has less negative effect on power. With the cam timing buttoned up, the timing cover and crank damper were installed, and our attention

NOTE THE massive angle bolt, four-bolt mains on the Dart Iron Eagle block and the aero counter weights of sufficient size to internally balance the entire deal despite the 3.4-inch stroke used.

turned to the Edelbrock Victor Jr. heads (see sidebar for details) and rocker shaft assembly.

The head gaskets were Fel-Pro's high-performance items, and the T&L-ported Victor Jr. heads were held down by ARP's lower cost six-point shouldered bolts. For rockers, we elected to use a Jesel Sportsman shaft setup. These are well-known and trusted race rockers that Jesel produces with the frills removed. What's left is a respectable shaft-rocker setup at an equally respectable price. After the heads were torqued to 85 ft-lb, the pedestal base for the rockers was bolted into place. At this point, a pair of adjustable pushrods were installed, and one pair of the shaft-mounted 1.6 rockers was bolted down to the pedestal. Adjustment of the pushrod length was then made until the desired sweep pattern on the valve tips was achieved. With that the pushrods were removed and the length checked. This length was then ordered from Comp Cams. They were then installed, and the Jesel rocker shaft assemblies positioned and bolted down. The rockers were then lashed at 0.016 inch/0.018 inch for the intake and exhaust, respectively, and with that the valvetrain was about complete.

PAN AND PUMP

It was about this time that the Moroso oil pan came in, so attention was returned to the bottom end. The oil pump used was a Melling high-volume design driven by an upgraded Melling driveshaft. The decision-making process for the Moroso pan was based on the need to have something that was good for both the dragstrip and road course. The fact the car would be lower at the front than would be the case for a drag race–only deal meant the pan would have to be shallower than normal. This makes the whole process of keeping the oil out of the way of a crank zipping around at 7,500 rpm that much more critical. It meant more attention had to be paid to keeping the pump pickup immersed in oil.

PART OF the credit for internal balance capability must go to the less-than-average weight of the Ross pistons and Scat H-beam race rods.

IF, AS in our case, the cam was well matched to the rest of the engines spec, timing it in correctly becomes more important. In this case, the intake centerline was set at 104 degrees.

HEAD GAMES

A SET of Edelbrock Victor Jr. heads were chosen because of the intrinsically sound port and chamber design. CNC-ported Victor Jr.'s would have been a simpler choice, but with a 225cc port runner, McCleary considered they may have a small but nonetheless noticeable impact at low speed.

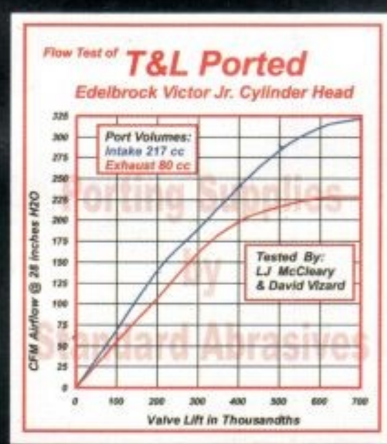
This engine is after all a street/strip deal, and that means not overlooking the street part of such. What was done instead was to take a set of as-cast Victor Jr. heads and port them. Edelbrock rates the ports of the CNC version of this head at 320 (intake) and 220 (exhaust) cfm at 0.700 inch lift. What we wanted to see was whether these numbers on the intake side at least, could be achieved with a smaller port. The good news is McCleary made a pair of these heads go 321 cfm on the intake with a 217 cc port and 227 cfm on the exhaust of only 80 cc volume.

THIS IS what the Victor Jr. looked like after getting T&L's pro porting treatment. The ports featured a brushed-like finish, not the high polish so often put on heads to impress an uninformed buyer.

AFTER CALIBRATING T&L's computer-supported Superflow bench, our project engine's heads were flow tested. The 321/227 cfm for intake and exhaust were actually up on ports with a significantly bigger volume.

But peak numbers are not the real issue unless the valve is going to be lifted into that range. Our cam and valvetrain combination would, after lash, lift the valves to a little over 0.650 inch. If the port goes on flowing significantly bigger cfm numbers after peak lift, it is a sure sign the port is too big.

What really presents a truer picture of the situation is to look and see how fat the flow curves are rather than how tall. Take a look at our flow graph. This is what T&L's Superflow measured, and that is after we used the same calibration procedure as used for UNCC's flow bench. At 0.250 inch, the intake was close to 165 cfm, which is better than 90 percent of the heads out there with 2.1-inch valves and a conventional valve job. Notice how the flow tipped over just before the full amount of used valve lift was reached. This indicates that as far as valve lift is concerned, the port is almost perfectly matched to the lift used. This leads to minimal redundant port volume, which in turn means nearer optimal port velocity for the job at hand.



FLOW BENCH results indicate that the T&L-ported Edelbrock Victor Jr. heads had fat flow curves. They also had excellent top-end flow while still having ports of less volume than usual. This was the sort of combination that could be expected to give a wide and torquey powerband while still delivering good top-end power.

COMPLETE WITH Manley Pro Flow valves and Isky springs is a finished head. With the flow capability, they would do well on any high-output Windsor up to about 420 inches.

To this end, a triangulated trap-door system allowed oil to flow easily into the pump pickup area, but resists it leaving by any route other than out through the pump.

INDUCTION

We chose two intakes for our 370—the Edelbrock Victor Jr. and a larger Super Victor. It was decided to test with both of these as the engine was at the cross-over point where the bigger Super Victor might pay off. These were ported by T&L's ace porter, McCleary. If you've ever tried it, you know the physical job of porting an intake manifold is a lot more difficult than porting heads. The porting and matching job done on these manifolds was nothing short of top-notch. It was more than just a cosmetic clean-up job, as attention had been paid to progressively profiling port areas from the plenum out. The goal was to make the port area get smaller from plenum to head at a rate equal to about 1½ degrees. In addition to this, attention has to be paid to the way air enters the runners.

For its cubes and rpm band, a carb of about 825-850 cfm was deemed necessary. The easiest way to fit this bill would have been to use an off-the-shelf 850 Holley. But McCleary wanted a carb that would produce best low-rpm results for street driving, yet flow well enough to make good top-end output. His choice, based on dyno results, was an AED-modified 750 Holley.

When Holley built the 750, it came up with about the most versatile platform within the configuration limitations of a four-barrel carb for small-block V-8s. AED builds on that with its street/strip 750. Without impairing the low-speed characteristics, AED reworked the carb and picked up about 65 cfm. This is done without increasing the size of the main venturi. The result is a carb that has the low-speed characteristics of a 750 but the power capability of one that flows about 825 cfm.

COMP CAMS multi keyway sprocket allowed the cam timing to be altered in 2-degree increments. In our case, the accuracy of the crank, cam, and gear set meant that the 'zero' slot got the timing spot on.

WE HAVE IGNITION

For ignition, we went with something a little different. Here a Crane distributor, with built-in electronically generated advance curves, was used. An internally housed chip has, programmed into it, nine different curves that advance with respect to rpm. That is what we would have called mechanical advance on a conventional distributor—except there is no mechanical device present to carry out the routine.

For our terminology to be correct with a Crane distributor, we will have to refer to it as rpm advance. To allow for the characteristics of various cams from mild to wild, one of three different built-in vacuum curves can be selected. Accessing either rpm or vacuum related curves is as simple as turning a selector to the appropriate number (how much easier can it get?).

DYNO TIME

Our Victor Jr.–equipped 370 went from engine stand to purring on the dyno with about 30 minutes work, and, equipped with regular long-tube Mustang headers, was ready for the first round of testing. Since T&L has done a number of similar engines in the past, it didn't take long to set up the motor once it had been given a full two-hour break-in. The distributor advance curve was already a known factor, so it was set, as was the vacuum. This left some minor jetting work on the AED-modified Holley carb and the job was done.

The first series of tests showed the headers were not really up to the job of dealing with an engine of this power level. If you really want to make the most of an engine like this, you can forget those 1⅝-inch long-tube headers. McCleary went to a 1¾-inch stepped header with more appropriate lengths and collector design (see sidebar for results).

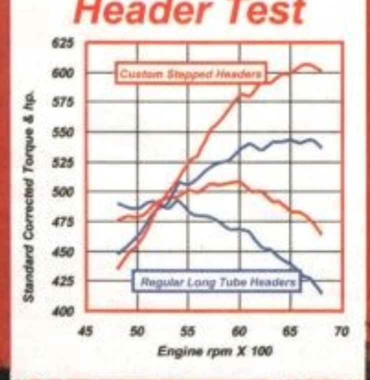
Figure 1 shows the results with the Victor Jr. after the new headers were installed. The first point to note is that this was not a top-end-only engine. It would run smooth and pull like a stock 302 down in the 2,000-rpm range, but by the time it hit the 2,700-rpm mark, it started to show all the signs of being a big-cube torque monster. For a pump-gas-burning motor of nominally 10.5:1 compression ratio, the torque output of 490 lb-ft is stout. Any time the pound-feet per cube goes over the 1.3 mark, you can reckon the engine builder has done his homework.

When constraints are put on the compression ratio, it becomes more difficult to get big torque numbers. A good torque number for a 10.5:1 Two-Valve pushrod engine is 1.25 per cube. With 370 cubes, 462 lb-ft would have been an acceptably good number, so 490 was more than such. As for the horsepower, it checked in at 593 at 7,200 rpm.

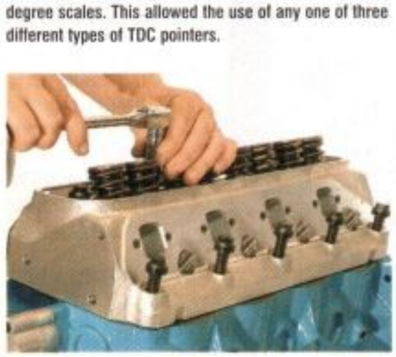
At this point, the Victor Jr. intake was replaced by the Super Victor and, as we were to find, the deep-breathing, T&L-ported Victor Jr. heads loved it. The bigger manifold lost 10-12 lb-ft

TRICK EXHAUST—WHAT'S IT WORTH?

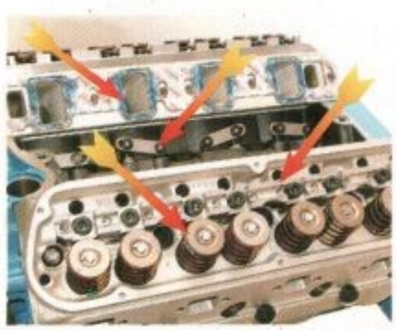
ONE ASPECT about building competitive NASCAR engines is that with rules restricting output for various classes and track to levels between 430 hp and over 800, is that you get to have a good handle on what a near optimal exhaust should be for any given power level. This was just the case here. McCleary reckoned a typical Mustang long-tube header was more suited to engines in the 350-450hp range. This prompted him to use a system having dimensions more appropriate to a 600hp engine. The 1¾-inch stepped design paid off, as the graph here shows. Gains started at 5,200 rpm, with peak torque and power climbing by no less than 15 lb-ft and 48 hp.



THE CRANK damper used was from Professional Products, and was conveniently marked with several degree scales. This allowed the use of any one of three different types of TDC pointers.



AFTER LOCATING the Fel-Pro head gaskets, the T&L ported Edelbrock Victor Jr. heads were bolted down using ARP's more friendly priced six-point bolts.



THERE ARE several points to note from this shot. First the manifold gaskets are preglued to the heads so they do not move when the manifold is installed. Second is that the lifters must be installed before the heads. Third, the arrow shows the pedestal for the Jesel rockers bolted in place. Lastly, note the titanium retainers, which hold the Isky "tool room" springs in place.

OUR JESEL Sportsman rockers looked more pro than sportsman, but the cost was definitely sportsman. Here, lash is being set at 0.016/0.018 for intake and exhaust, respectively.

ALWAYS PAY special attention to minimize potential windage losses by selecting an appropriate performance pan.

below 5,000 rpm, but both peak torque and horsepower above this point took a worthwhile jump. What our pump-gas burner finally delivered was a whopping 505 lb-ft of torque along with a best pull of 606 hp.

CONCLUSION

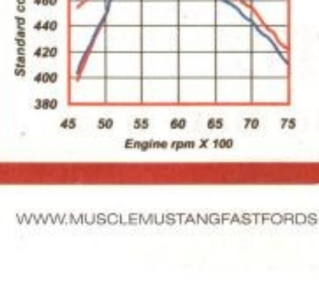
Because everything was done in a sound engineering fashion, the extra cubes afforded by the Dart block/Scat crank/Ross piston combination paid off big time. Remember, we started with the 302 configuration at the beginning of our big-cubes buildup. At this point, adding much more stroke to an 8.2 deck height block would mean dealing with a very short rod/stroke ratio combination. Although we are pushing the boundaries of diminishing returns, it would seem like we are not quite at the limit of positive returns for added stroke if torque and power output below 6,500 rpm is the goal.

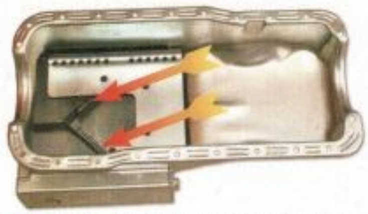
If we wanted to get more cubes at this point we could still go up a tick on both stroke and bore. That, for our hydraulic cammed, street driver is where we will go for the next big-inch 8.2-inch block build. This will stretch our 370 to 382 inches, so watch this space to see how we fair.

So what did all this cost? Certainly the Dart block was the biggest investment factor here. But having said that, a block of this obvious quality, strength, and bore-diameter capability was still a great buy. From T&L, as an upgrade over a stock block, it was $2,200. As for overall cost, a copy of this engine from T&L would set you back $9,800.

BROTHER VS. BROTHER

ANY CARBURETED small-block Ford hovering around the 580hp mark is a candidate for testing a Victor Jr. against its bigger sibling, the Super Victor. Under 5,000 rpm, the Victor Jr. (blue curves) was best with up to 10-12 lb-ft more torque. When rpm passed 5,000, the Super Victor (red curves) came on strong, bumping both peak torque and horsepower by 15 numbers.





HERE IS the Moroso pan used on our project, which could find itself on either a dragstrip or road course. The arrows indicate the two one-way trap doors in the oil pump well of the pan.

THE WORKMANSHIP on this T&L ported intake had to be seen in the flesh to be appreciated. The porting was not just cosmetic, but sought to achieve the best port tapers for the job.

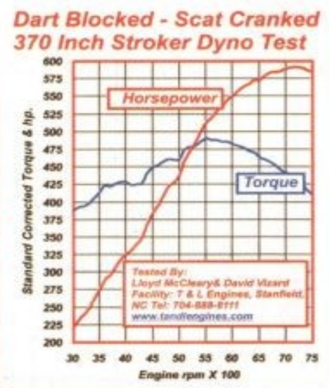
WE CHECKED out T&L's port-matching job and it proved to be right on the money both width-wise and top to bottom. The manifold was secured with stainless washers and 12-point bolts.

CRANE'S ALL-ELECTRONIC distributor has a combined total of 36 rpm and vacuum advance curves built in. These are selected by turning the two indicated screwdriver slots to a number corresponding to the curve required.

SEEN HERE is the AED-modified 750 Holley carb, which after modifications flowed nearer 825 cfm. Check out the plug wire harness. Examples like this can be had from Moroso or Mr. Gasket.

OUR 370 went from the shop floor to the dyno in a hurry. T&L's Lloyd McCleary is seen here at the back of the dyno adjusting the absorber to take the higher torque output expected of this big-inch engine.

WITH THE Victor Jr. intake, our 370-inch stroker cranked out a respectable 593 hp and 490 lb-ft of torque. It did this and still produced more low-speed torque than a stock 302, so driveability will be more than acceptable. All this was done on 93-octane pump fuel.



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