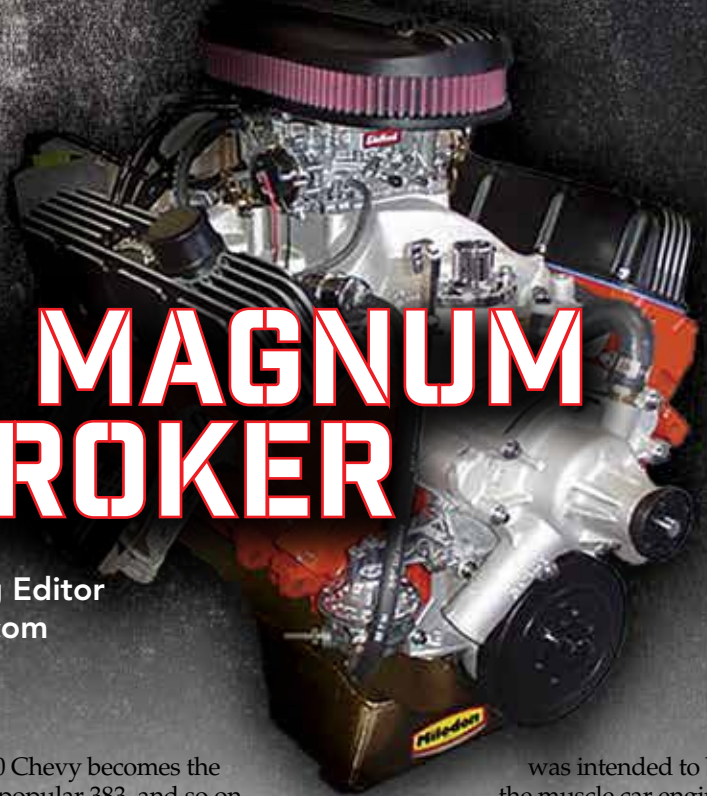


MOPAR MAGNUM 392 STROKER

By Dave Sutton, Contributing Editor
dsutton@enginebuildermag.com



For many engine builders, the idea of building something special, a less than everyday stroker combination, can be a great business advantage. We took a look at the potential of turning a small displacement, non-performance V8 into a bored and stroked tire blazer.

Instead of searching out a rebuildable muscle motor to swap in its place, use the money you save your customer by not getting a



How do you get from this tired 1977 Chrysler 318 to the awesome 392 stroker pictured at the top of the page? Creativity and hard work. Your customers will thank you for both.

second engine, and all that it might take to put it in their vehicle. Instead, purchase a stroker crank, a more expensive set of pistons (possibly custom) and a good set of heads.

It's done everyday, I know. A 302 Ford becomes a 347 cid stroker.

A 350 Chevy becomes the ever popular 383, and so on. Nothing new here. But what if you aren't starting out with an engine that has multiple stroker kits waiting to be purchased right off the shelf?

There's something about your first love, and your first car that you never forget. For me, that car was a 1963 Plymouth Savoy that had spent most of its life on the drag strip. Maybe your customer has something similar: a 70s-something Dart, Demon, Challenger or any one of many midsize Mopars.

Their plan is to remove the tired old 318 and find one of the more popular muscle car V8s — like a 340, 383 or 440 to fit in its place. Maybe he or someone else has played with the motor a little over the years and it's now running an aluminum manifold and a 4bbl carb. But it's tired and he wants more power.

With the help of our good friends at Grawmonbeck's Machine, in Mason City, IA, their dynamometer and a mix of stock and performance parts we decided to build a 6.4L, 392 cubic inch Dodge Magnum. It

was intended to be the muscle car engine Chrysler never did. With a 4" stroke, a medium length rod and the Magnum heads this motor will make good torque numbers and enough horsepower to thrill a former 318 owner and should have a fairly flat torque curve.

The Parts

A stroker motor needs a stroker crankshaft. Ours comes to us from Scat Enterprises in the form of their 4340 steel, standard weight 4.00" stroke 340 main journal crankshaft. Since our 318 shares the same journal sizes as the higher demand 340, this choice was easy.

To connect our stroker crank to the appropriate compression height pistons we used a set of Scat Pro Comp series 4340 I-beam connecting rods. For the horsepower and torque we are shooting for, these will be perfect. And the truth is, a set of stock rods could be prepped with a good set of rod bolts and reconditioning to meet the need of a customer with a smaller budget, but we planned to ring this motor out on the dyno and part of the goal was to upgrade for a more durable motor than a stocker. These are also bushed for a full floating wrist pin, just like the 340 factory muscle motor.

Since we went for a steel crank with large radius fillets, we used MAHLE Aftermarket's "H" series

REBUILDING TECHNICAL GUIDE



When a few of the bearings were installed the crank was laid and a rod and piston were installed to check for clearance. There is very little that needed to be removed from the bottom of the cylinders to clear the connecting rods. There is plenty of clearance around the cam, the pan rails and the bottom of the cylinders for our 4.000" stroke crank.

performance bearing.

Our performance mains feature a grooved upper shell and non-grooved lower. The rod bearings are chamfered and narrowed to fit the rod journals. All journals are standard Chrysler dimension. No small block Chevy rods or journals here — it's an all Mopar design.

At the business end of the connecting rods we'll hang our shelf stock stroker piston. A set of ICON dished pistons specifically for this application, in a .040" oversize provided us our 392 cubic inches with the 4.000" stroke crank.

Again, our premise was to shop the books for



The Scat Industries I-beam connecting rods added significantly to our diet plan, while adding strength and durability. Our new rods came in at a flyweight 574 grams. A full 179 grams lighter than the factory rods.

parts you might otherwise overlook to net a performance engine from our original grocery getter. Adding 74 cubic inches to our little V8 should really wake things up. But adding

that many inches, 9.25 ci per cylinder, will certainly raise the compression ratio to something beyond pump-gas if we stick with a flat top design. That is why we've chosen a more streetable dished head designed for something around 9.5:1 static compression ratio. These beautiful forgings are made from a very durable 2618 alloy, feature a .120" wall pin that is standard .984" Chrysler diameter to work with a stock or aftermarket connecting rod.

Our IC847 ICON pistons are machined for a 1/16" x 1/16" x 3/16" ring pack. This might be a little narrower than Chrysler would have

used in the day, but with current piston ring technology we determined we would have no problems. Factory motors today often come with a thinner ring pack, and we all know how long today's engines can last.

Our Dare-To-Be-Different bore size called for a set of nodular iron plasma moly standard tension rings from Engine Pro to seal up our fresh .040" oversize cylinders.

To round out our rotating assembly, we used a standard Chrysler style flex plate and a street performance,

fully degreed harmonic balancer from Engine Pro. The whole assembly was balanced by Grawmondbeck's who will also clean and machine our 318 block to spec.

The shortblock build was handled with Durabond cam bearings and a brass plug kit from Melling Tool. We also replaced all the block hardware with a Finish Kit, also from Durabond. Again, using typical parts used in your shops everyday we built a strong and dependable shortblock worthy of a Muscle Car installation.

The machining procedures were

fairly straightforward. Before we put the block in the Rottler hone, we set up the BHJ block fixture and then the decks were milled. It didn't take much to clean up the surface and zero deck our block. The hone finished the cylinders the last .005" to give us our 3.950" bore size. Next, our block was bored .035" over on the Rottler. It had one rusty hole we were a little worried about, but every cylinder cleaned up nice.

The block required a small amount of clearancing and the balance required some work. In this case we did not have to add expensive heavy metal, but we had a whole new machining operation that may not have been planned for. Don't get yourself boxed in on a performance build over a cheap price. Make sure to leave yourself some wiggle room, a buffer to cover any unexpected parts or labor expense.

You have two choices, either pad your estimate, and when your final cost comes in less than what you have quoted you will have a very happy customer, or set it up from the start that this is a quote based on what we know now, and there will most likely be some additions as you get under way. Remember, these are not your typical bread-and-butter builds. For those who "dare-to-be-different," problems will surely arise. Be prepared to cover it.

We chose Engine Quest replacement cylinder heads for the Chrysler 318 and 360 Magnum engines, ordering their alternate "B" head that is drilled on the intake side for the earlier "LA" style early small block.

This allowed us to open up our options for intake manifolds. In addition, you may have a customer who may have started playing with their 318 and has already changed the manifold to an aftermarket aluminum piece that you wish to continue using.

Another option would have been to use the "Magnum" style intake pattern and possibly some late model fuel injection. This did not fit the model for our project but could always be an option for your customer.

The Engine Quest heads are beautiful right out of the box, and are

REBUILDING TECHNICAL GUIDE

a “power improved” piece designed to not only replace a cracked factory head, but they will also out flow and out perform the originals.

It’s no news that the camshaft and cylinder heads must work together to maximize performance. Right out of the box our heads flow enough air to support the kind of horsepower I’d like to see us obtain, but they must also accommodate the upgraded valve train. So we started with a Lunati Voodoo Hydraulic Flat Tappet cam and lifter kit and then we’ll work up to the valve springs and adjustable rocker arm components to support our cam choice.

Our cam specs look strong for a 340-360 cubic inch motor, but should be quite streetable with 392 cubic inches. The advertised duration is 276/284 (int/exh), with 234/242 @ .050” lift. The cam has a lobe separation angle of 110 degrees, with a 106 intake lobe centerline. Here is where you need to be careful when upgrading to the Magnum heads. Early small block Chryslers used a shaft style rocker arm with a 1.5 ratio rocker.

Our Magnum heads use a stud-mounted rocker with a 1.6 ratio. The book specs on our cam state .513/.533” lift (int/exh). Our motor will have a higher theoretical lift .547/.569” lift (int/exh). I use the word theoretical for a reason. Anyone familiar with the pushrod angle in the small block Chrysler knows that some cam lift is lost on its way to the rocker arms. But, we’ll use these figures to make sure we have enough valve spring, enough valve-to-piston clearance, enough

We CC’d our combustion chambers and found them to be 64cc with our new valves. This should put us right about 9.4:1 compression ratio.

retainer to valve guide clearance and spring travel so we don’t coil bind. The added lift will be perfect to expand the RPM range and feed our bigger motor, while keeping it very streetable.

Moving back to making our heads work with our cam and rocker choices, we needed to modify our heads a little. Before choosing a spring, I had to determine an installed height. Since we planned on using shelf parts, we turned to Comp Cams to get an Adjustable Rocker Arm Conversion Kit for the Magnum cylinder heads.

Because there aren’t a lot of choices for valves to fit the Magnum heads, some experience searching the manufacturer’s valve specs and comparing them to the O.E.M. specs will net you some options. Because we planned to work with the Comp rocker kit right out of the box, we chose to keep our valve length as close to stock as possible. Our choices looked something like this: stock replacement valves for a 318-360 Magnum; bore the guides for the tried and true 11/32” stem small block Chevy valves; or GM LS or Gen III type valves. At this point I had more than basic valve dimensions to worry about. Stock valves will work fine for some builds. They are a very modern design. They have a 5/16” stem diameter and the exhaust valves are quite large at 1.625” head diameter. Since we are running a substantial amount of valve lift and plan on



an engine that will be able to see at least 6,500 RPM, this did not seem prudent. Stock LS valves are close dimensionally, but have too small a head on the exhaust valves. There are however, great choices to be had in aftermarket LS valves.

A set of Ferrea Racing Valves were just what we needed to adapt a larger one-piece performance stainless steel valve to our street performance heads. We increased the size of our intake valves from 1.920” to an even 2.00” while our already substantial exhausts went up slightly from 1.625” to 1.650”. We could have gone larger on the intakes, but since we are working with a slightly smaller bore of 3.950” and did not wish to open up for any shrouding in the combustion chamber, we’ll hold the intakes at 2.00”. Minor work was required – We had to hone the valve guides slightly to fit the 8mm LS stems. .002” clearance was given to both intakes and exhausts stems.

To finish our heads we choose a set of dual valve springs out of the Engine Pro Performance catalog. The people at EPG helped us with parts for both our short block and rotating assembly, and parts for our heads. The springs are perfect for the cam selection and meet the fairly short installed height of the Chrysler heads. We used a set of Comp spring retainers that were designed for a GM LS motor and a set of Engine Pro 8mm 7-degree machined valve locks. Look at the specs in the



Our bobweight was significantly lower than the Scat target weight. After we almost launched our crank out of the CWT balancer, a portion of the crank counterweights were removed on the crank grinder.

REBUILDING TECHNICAL GUIDE



Both rod and piston sets were within a gram of each other within the set and with a quick matching of the lightest rod to the heaviest piston, our parts required no additional balance work to give us our 1731 gram bobweight.

books. The parts are there for many combinations. We'll also use an EPG steel clad viton valve seal that will fit the stock valve guide.

We did need to hone the valve guides slightly to fit our LS valves and we did cut the step out of the guide boss to make room for the dual spring. A great alternative to the dual spring would be a set of conical springs designed for a small block engine, but the decision to use a dual spring came back to my design of a factory style muscle engine and a readily available performance spring for the small block Chrysler engine.

Once I was able to track down the info I needed from Engine Quest on how much we could remove from our spring pads, we still came up short. They suggested that the heads could be cut as much as .080" deeper. This still left us short from the .100" we needed. We were very close to an even 1.600" installed height with our

Our ICON pistons (left) all weighed in at a paltry 597 grams, with pins. This is 142 grams less than their factory counterparts.



head/valve/retainer combination. We needed to get to 1.700" We choose to stay on the safe side and cut the spring pads .050" and used a set of .050" offset valve locks to get us to a perfect 1.700" valve spring installed height.

The cam bearings were installed and the cam fit perfect. This actually was no surprise, because we mic'd the cam bores before we attempted to install the bearings. That would have been the time to correct a housing bore, not after destroying a bearing or two.

We installed the new distributor tower bushing that was included in the DuraBond finish kit.

These kits are really the way to go. It's nice to have all the new hardware right there in one place as you do your assembly.

Our EQ heads are sealed to the block with head gaskets from Fel Pro and clamped with bolts from ARP. We used an adjustable rocker arm kit from Comp Cams, but did have to turn to Engine Pro for an emergency shipment of custom length pushrods once Joe was able to use an adjustable one and check the geometry. We ended up with a length of 7.550" when used with our flat tappet lifters. The kit comes with short pushrods for use with a roller lifter cam.

I also previously reported we were having troubles with our main stud length. The people at ARP came up with 4-bulk studs that bailed us out. The stud length was not the only problem we were having with fitting our Milodon windage tray.

Once a position

was established that cleared the stroker crank and rods, it interfered with the oil pickup. So we cut a slot in the tray that would allow the pickup to pass through. This is time-consuming work that adds to sticker shock. Many believe all these parts just fall together. Rarely is that the case.

The last small laborious job was adding some additional oil holes in our filter mount. Early plates had four holes, while later ones have six. Joe added four additional holes to our plate.

The Bling

Though it should run well, your customers also expect a stroker engine to look great too.

A Holley fuel pump is driven by the original factory eccentric and feeds fuel to one of its chrome fuel filters



All our bearings were treated to a coat of Driven assembly lube.

in route to our Edelbrock 800 cfm carburetor.

The outside of the engine was given a couple coats of Chrysler Hemi orange. This gives a great backdrop to the satin finished Edelbrock Performer RPM manifold, 800 cfm carb and water pump. We also left the new Engine Quest aluminum timing cover raw. This was then topped with a very nostalgic looking set of Edelbrock Classic Series valve covers and air cleaner in a black finish with polished fins. The gold irradiated finish on the Milodon oil pan adds to the classic "Muscle Motor" look. A small amount of "bling" comes from the chromed Holley fuel pump and filter, chromed dipstick and tube and the polished

REBUILDING TECHNICAL GUIDE



Our assembled shortblock, still missing freeze plugs at this point.

stainless fasteners from ARP. The light brown cap on the ACCEL distributor and the finned coil also add to the period look. Design Engineering Inc. provided the plug wire protection. We had to debate the use of this, as the yellow ACCEL plug wires would have fit in with the look. We did run into a last minute problem when we discovered we had a set with 90-degree plug boots. We probably needed a set of 135 degree to come over the top for the Chrysler heads. So we routed things from the bottom, which cleans things up visually and gave us a chance to use the protective products from DEI.

Dyno Pulls

Stacey Redmond and Joe Degraw of Grawmondbecks Competition Engines got the jump on me when they decided to blow off a workday and get our motor hooked up and plugged in to their Super Flow dynamometer. Once it was bolted into the dyno engine stand and wired up like a patient in the intensive care unit, there was nothing to stop them from pushing the button and bringing

On 91 octane, we cranked out an impressive 477 hp at 5800 rpm. Max torque came at 4400 and was a stump pulling 481 ft.-lbs.



our monster to life. Since our Edelbrock carb was new in the box, Stacey elected to bolt on "His Carb," a tried-and-true unit he knew would be dialed-in enough to get the motor started and bring to a fast idle right away. We're running a flat tappet cam and we're using Driven BR30 and their assembly lube, but he did not want to take any chances breaking it in, so the decision was made.

By the time I showed up, the Edelbrock carb was reinstalled and the timing was set at 36 total. It fired right up and ran extremely well. The engine ran crisp and clean and had unbelievable throttle response. Once the engine was warmed up, we made a few pulls and were pleasantly surprised. The rings seated in with each pull and both horsepower and torque numbers stabilized. We tried a few changes, but things ended up pretty good right from the start. A few more degrees of timing made no difference. We did change the metering rods one step down, as per the excellent tuning instructions that come with the carb. It could not have been any easier. This made no change to the power, but should help economy a little.

Stacey and Joe had a little trick

they used during the E85 build off. They pulled out a couple 3" pipes that were about 40" long. They are flanged to slip over the headers and they slip inside the 6" diameter collectors. The pipes provide a little backpressure. Immediately, the torque curve smoothed out in the lower RPM and we picked up 2 horsepower.

We decided to try a 2" spacer under the carb to see how that affected the performance. No improvement or change, but none was necessary. With 91 Octane from the local station we cranked out an impressive 477 hp at 5800 rpm. Max torque came at 4400 and was a stump pulling 481 ft./lbs. We were making 421 ft./lbs. at 2800 and as you can see, the torque curve is a gentle arc, right up to our self imposed redline of six grand. At this rpm it was still making 410 ft./lbs.

As I said before, this combo could be done on a lot smaller budget and with similar results. We followed the rules set down at the beginning by using shelf stock parts. We followed the advice of our suppliers and the descriptions in their catalogs. We matched the parts to work perfectly together and to meet the expectations we set for ourselves – the same way you do when you start working with your customer and their project, I hope. ■

