CHEVY SMALL-BLOCK
POWER BUDGET 406CI BUILDUP

By Jeff Smith
Photography: Ed Taylor
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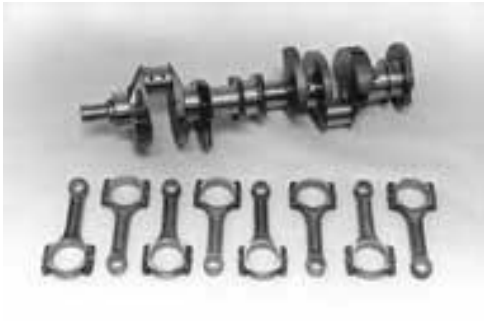
An observer of high performance once proclaimed: “Look stock and carry a big arm” Everyone wants more power, and Bow Tie hot rodders are famous for always pushing the horsepower and torque envelopes. But horsepower costs money, and unless your name is Bill Gates or Donald Trump, few of us have as many of those greenbacks as we’d like. So the ultimate engine story is where we show you how to make more power for less money. If that's your Holy Grail, then you’ve come to the right place.

The reference to the big arm is a direct endorsement of displacement. You want a stronger Mouse trap? Build it with cubic inches. So while it is possible to build a 350 less expensively than a 400 small-block, those extra inches make it all worthwhile. This story is all about pumping steroids into what once was perceived as a weak-kneed small-block. But we like to think of our version as Muscle Mouse, for obvious reasons. If you think that 500 lb-ft of torque and 450 hp from a pump-gas small-block is talkin’ your kind of small-block, then pay real close attention to the details.

Most of the engines we deal with in this magazine are intended for street performance and mild competition use. Therefore, it’s the combination of torque and horsepower that makes an engine powerful. Peaky engines are no fun on the street. Our goal with this 406 was to make serious torque with iron cylinder heads and a dual-plane intake manifold-in other words, a working man’s motor that could embarrass those Mustang 5.0 guys as well as those young studs with their turbocharged front-driver imports.

The only assumption that we made in this story is that you can dig up a suitable two-bolt main 400 block. These blocks are becoming increasingly harder to find than an alibi your wife/girlfriend hasn’t already heard. Given this difficult situation, the alternative is to drop back on the displacement curve slightly by substituting a 350 for the 400 block and build a 383. The Scat crank and rods we used will work equally well in either of these applications. Scat also sells an internally balanced crank that doesn’t require an externally balanced damper and flexplate like the 400. This reduced-fat displacement option will cost some power, however. Everything else being the same, a 383 version will cost you roughly 40 lb-ft of torque and 25 hp. These are rough numbers but certainly realistic.

One key to this buildup is the Scat cast crank and rod package. The crank sells for $299 while the strong 4130 steel I-beam rods go for a mere $249. Together that's only $550. Combine that with a set of Speed-Pro forged pistons for roughly $400 and for under $1,000 you have a rotating assembly that's as strong as it is inexpensive. There are certainly other ways to go, but we think this is one of the best for the money. We've combined this with a set of budget-based Dart Iron Eagle 215cc cylinder heads and a Comp Cams valve-train, and as the dyno test reveals, this is one kick-ass package. Let’s see how it all goes together.



The 400 small-block is rapidly becoming a scarce commodity on the Bow Tie performance scene. So many 383s have been built that stock 3.75-inch stroke 400 cranks are more difficult to locate than 400 blocks. Scat has come to our rescue with a cast-iron, 3.75-inch stroke crankshaft that's a direct replacement for the 400 crank with stock bearing journal diameters. The matching Scat 4130 steel 5.7-inch I-beam rods come with ARP Wave-Lok bolts.

The Scat forged 4130 rod uses an internal dowel pin to locate the caps. A small amount of grinding is necessary (arrow) on three rods to clear the cam. This is true for any 400 or 383 small-block using a 5.7-inch connecting rod.

We installed new ARP main studs and had the mains align-honed at Jim Grubbs Motorsports (JGM) to ensure the proper bearing clearance. JGM also performed the boring and torque plate honing to ensure all the clearances were dead-on. Ironically, the 400 two-bolt main blocks are preferred since they offer superior strength in the main webbing area compared to four-bolt main 400 blocks.

Speed-Pro now offers 16cc, dished forged pistons for a 5.7-inch rod 400, but at the time we did this story, the pistons were not quite ready for production. Dutweiler's machine shop milled an 11cc dish in the 2517 flat-tops to lower our compression for the iron heads. What look like ribs in the perfectly flat dish are actually tool marks left by the CNC machine.

We also used an ARP oil pump stud. With the 400's larger main journal diameter, make sure the stud does not protrude into the main cap and strike the back of the main bearing. This would quickly destroy the lower main bearing shell.

Engine builder Ed Taylor of Ventura Motorsports carefully set the ring endgap for both the top and second Speed-Pro single moly rings. He set the second rings at a wider 0.022-inch based on information we received from Speed-Pro that shows that relieving pressure between the top and second rings aids top ring seal, thereby reducing cylinder pressure loss and blow-by.

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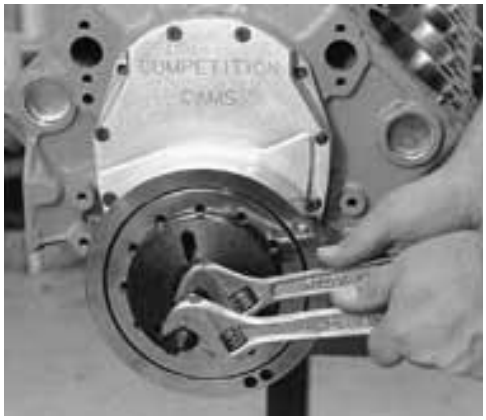
After all the clearances were carefully checked, Taylor dropped in the Scat crank and torqued everything in place. He also checked crank endplay to ensure sufficient clearance for the thrust bearing.

ARP offers these nifty aluminum pins that screw over the rod bolts to both guide the rod directly onto the rod journal and prevent scratching the crank journal.

The only correct way to torque rod bolts is to use a rod-bolt stretch gauge like this one from ARP. This establishes the proper bolt stretch to ensure that the clamping loads will keep everything together without failing the bolt.

Ed had previously test-fitted the engine to determine which rods would need to be trimmed so they would clear the cam. With this done, installing the Comp Cams Xtreme Energy 272 cam after the rotating assembly was installed was a breeze. The cam specs are included in the dyno-test story.

Taylor degreed the cam using a Comp Cams dual roller chain and gears along with a set of 12-point ARP cam bolts. We used a Comp Cams two-piece timing-chain cover to make the cam swap easier. To keep the expenses down, you could substitute a less expensive standard timing-chain cover.



Taylor installed a new externally balanced, 8-inch damper from TD Performance to complete the rotating assembly. It's always best to use the proper installation tool. Avoid beating the damper on with a hammer and a block of wood.

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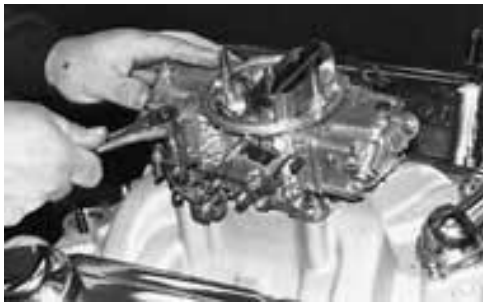
Up top, Taylor added a pair of Fel-Pro 0.049-inch-thick head gaskets, again in search of a little less squeeze. Combining the gasket, the 0.005-inch deck height, the 72cc Dart chambers, and the dished pistons, compression ended up at 9.7:1, which should keep the engine out of detonation on 92-octane pump gas.

Wrapping up the bottom end is a Moroso deep sump oil pan and a matching Moroso pump and welded pickup. This matched system ensures a strong oiling system and the proper clearance for the pickup to the bottom of the pan. Note the built-in windage tray.

Next came the Dart 215cc Iron Eagle heads. These heads are a budget alternative to aluminum heads and have shown that they can make excellent power. The heads come with 2.05-/1.60-inch stainless valves.

We exchanged the stock springs that came on the Dart Iron Eagle heads (right) with larger 1.437-inch-diameter Comp Cams springs (120 pounds on the seat and 290 pounds at 0.550-inch lift) to handle the larger 284 Xtreme Energy cam.

Before Taylor installed the intake with the Fel-Pro gaskets, he dropped in the valvetrain and set the lash. It's much easier to do before the intake is installed. We used a set of Comp Cams Magnum roller-tipped rockers with a set of trick ARP locks.



Taylor installed the Edelbrock Performer RPM intake, Holley 750-cfm double-pumper carburetor, and the TD Performance chrome valve covers to complete the assembly. With everything in place, it was time to bolt this muscular Mouse to the dyno and run the snot out of it.