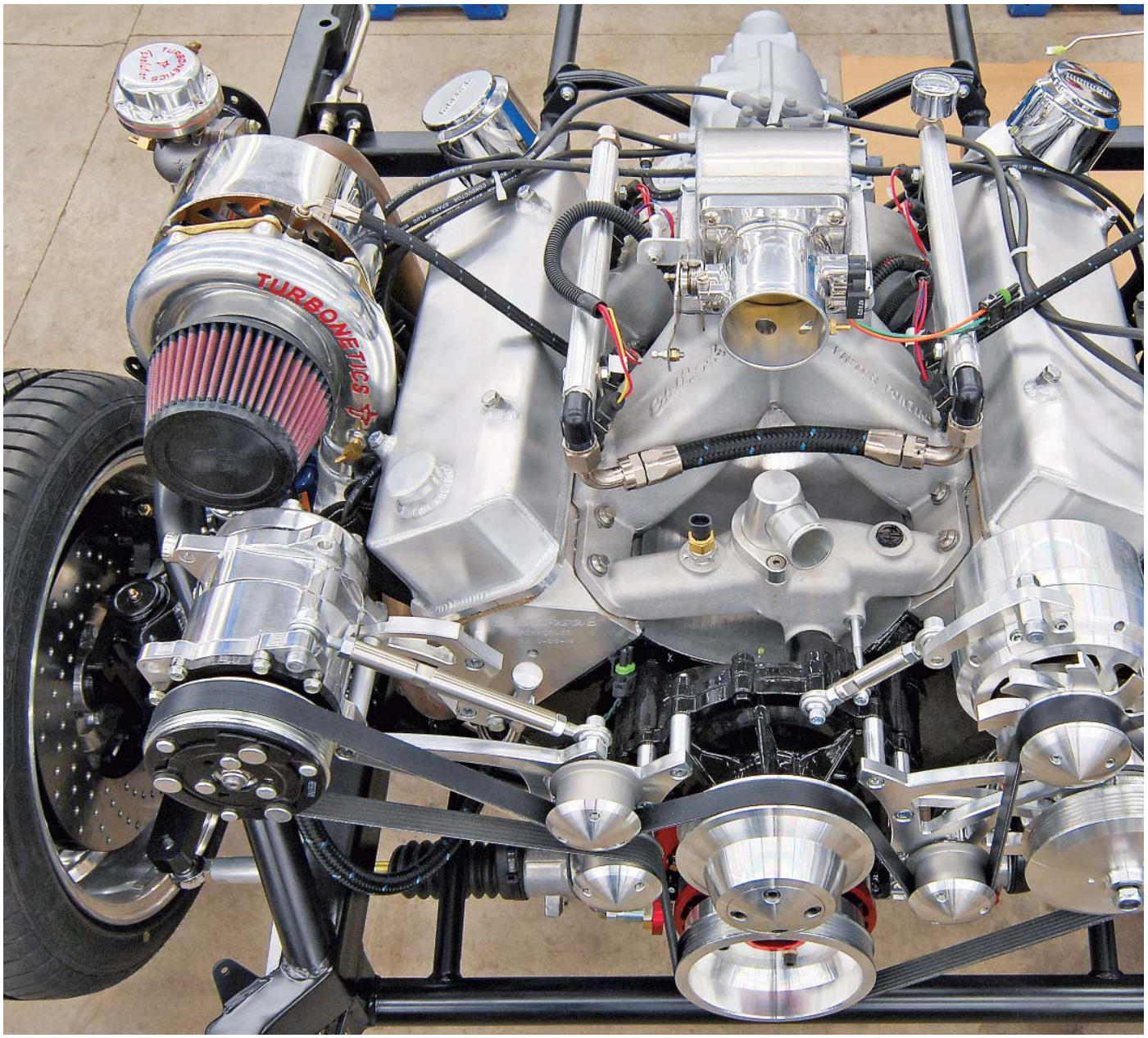


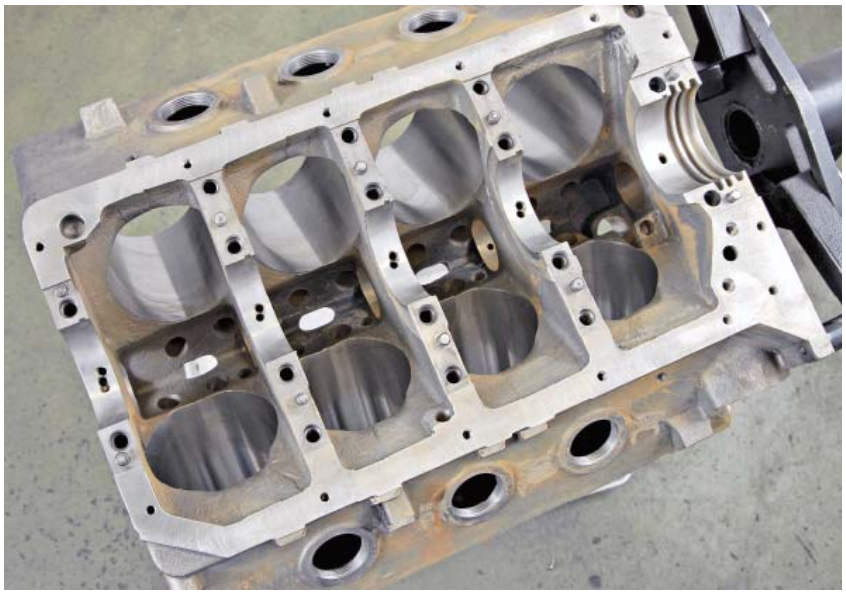
TWIN TURBO TAIL TWISTER

Building a 505ci Twin Turbo Pontiac Engine for the Street and the Track

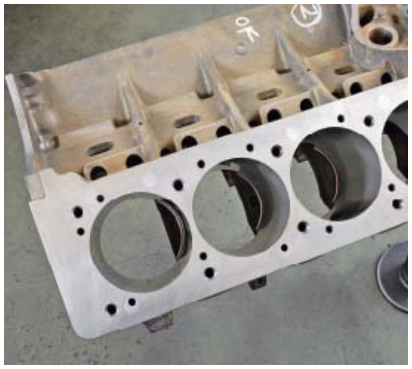
BY MARK ELAN
PHOTOGRAPHY BY THE AUTHOR

Some people are never satisfied. Ordinary just won't do. For most, simply owning a nice '67 GTO would be great. Getting to drive around in a fully restored one would be a dream come true. Not so for Jeff Hutchens of Springfield. MO. If it looks fast, it had better be fast.

Following a lead from a previous MCR customer, Jeff looked up the guys at Muscle Car Restorations in Chippewa Falls, WI. MCR is known for restoration work, but is also no stranger to building ground up racecars. Jeff owned a '67 in high school and he didn't



The IA II block is very beefy and is claimed to be good for up to 3,000 HP. This 3.00-inch main block is made from ASTM class cast iron, has Siamesed cylinder bores, 4-bolt mains, thicker main webs and deck surfaces, and wider pan rails than a stock Pontiac block. It also has threaded freeze plugs, a redesigned cooling system and improved oiling. With a 5-bolt motor mount pattern, it will fit in any Pontiac and it has bellhousing bolt patterns to accept BOP and Chevy transmissions.



It comes with a dry deck, so Jeff Fiala of Wheeler Dyno Service drilled holes for the water passages using the head gasket as a template.

This is critical. Unless you plan to externally feed the cam oil galley, you must join the main bearing passages to the cam bearing oil passages or your cam will be oil starved. Jeff ground a notch in each to connect the two passages.

want to mess with that classic GTO look, but he also had to have state of the art performance to run with the high dollar exotics.

We'll begin here with the powerplant and then get into the chassis in later issues. How much performance does Jeff desire? How about a twin-turbo pump-gas IA II engine in excess of 500 cubic inches? Sure this combo will produce lots of power, but it has to be smooth controllable power that uses real pump gas from any corner station. It also has to be new-car-with-a-warranty reliable.

To those ends, MCR told Butler Performance what the customers desired and Butler scienced out the combination and supplied many of the parts to build it. Wheeler Dyno Service performed the assembly and MCR fabricated the turbo exhaust.

An IA II iron block provides a solid foundation. This one received a 4.350-inch bore and will run a 4.250-inch stroke forged crank. It certainly could have been built bigger, 4.400 x 4.75 is the absolute max, but by leaving a few cubes on the table and building the engine a little "under square" it will rev quicker than a "maximum-inch" beast. Besides, 505 cubic inches under boost will be more than enough to test Jeff's nerve.

The forged 4.250-inch stroke crank will be spun by a set of Ross custom forged pistons via Scat 6.700-inch forged rods and Ferrea pins. The bearings are Sealed Power and Jeff Fiala at Wheeler custom filed the Total Seal classic rings. ARP bolts hold it all together._

A mild street hydraulic roller from Comp Cams with 258/248-degrees of duration at .050, .541/.541 lift, and a 111-degree centerline was chosen for this engine. Yes, bigger would make more total power, but at the sacrifice of the bottom of the power band. The last thing Jeff wants is a peaky power curve. Besides, a smaller cam will improve exhaust gas velocity, which will help the turbos to spool up more quickly. And since there are two turbos, they'll still be able to push the top end into the too-much category. An added benefit is a relatively smooth idle that will allow easy around-town cruising, and just hint at what's inside.

The heads on the other hand, are fully-ported closed-chambered Edelbrocks with 2.110 and 1.660 valves. In this case, low intake port velocity, which affects the low-end power is

eliminated with the early onset of boost, and Jeff will definitely feel the extra rush on the top side. The intakes flowed 304cfm and the exhaust managed 232 cfm (both at .600 inches valve lift). Static compression ratio works out to be a boost friendly 7.96:1.

Here's were things start to get really fun. MCR did an absolutely masterful job of building a pair of stainless steel 2-inch turbo headers that mount 70mm Turbonetics units with an Evolution 35mm mechanical waste gate keeping each of them under control. And they, along with a 2.5-inch Bell Intercooler and 3-inch exhaust, fit beautifully inside the stock '67 GTO profile. A 70mm Accufab throttle body will give Jeff total control of the entire operation via his right foot.

Ignition is a fairly straightforward; an MSD crank trigger distributor that's been modified for a cam sync sensor, so a FAST computer can sequentially control the 83 lb-hr injectors. We'll go into more detail about the FAST box and how it makes this project possible when we get to the dyno session in Part II.

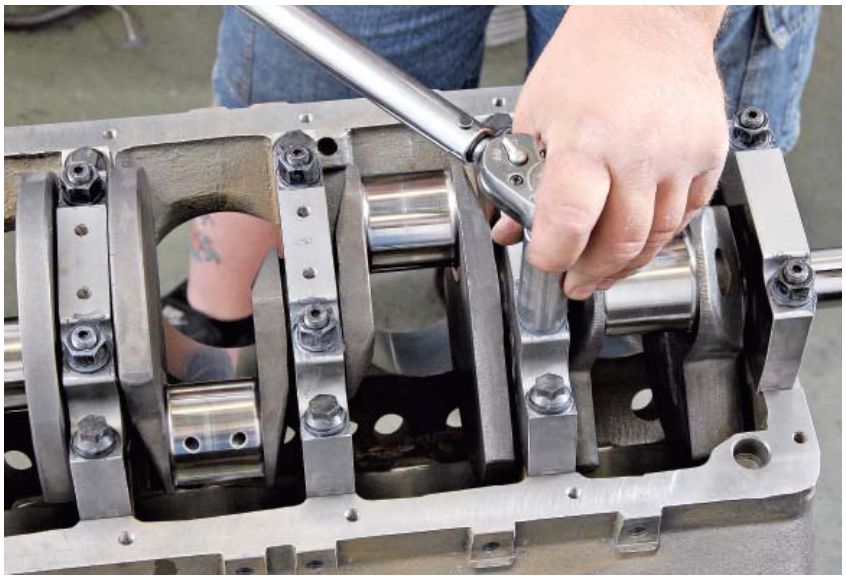
Assembling something like this is mostly typical, but there are a few things you need to know so you don't ending up making the kind of history you don't want to be known for. Since we want provide all the information we can on the combination and how the parts work together, we will not detail all the clearances and torque specs that are normally contained in an engine build up article. They do not vary significantly from a stock buildup.

Next month, we'll bolt this monster to the Wheeler's dyno to see how much power it makes.

Jeff drilled oil drain holes in the lifter valley, as this block comes prepped to run a dry sump oiling system. The Comp Cams hydraulic roller lifters will drop in with no modifications needed to the block.

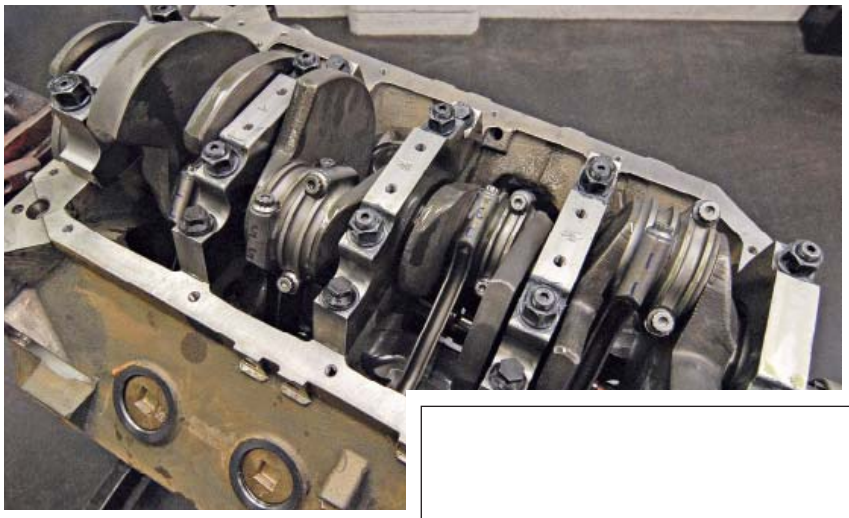
During preassembly, Jeff installed the Comp hydraulic roller cam to ensure that it rotated freely in its bearings.

For final assembly, Jeff prefers to use 60W motor oil for pre-lube and uses the Viton rear main seal from JPW. He staggered the block and cap halves, as shown, to help prevent leaks.



The main caps are steel, they are registered, and the center three have a splayed four-bolt pattern for extra rigidity. ARP studs are used, except for the outboard holes for the splayed caps. Jeff used moly lube on the threads and under the nut/bolt face as well, to insure accurate torque. The rear main gets 120 ft-lbs while the centers receive 100 and the outer bolts get 85.

Full-floating .990-inch Ferrea pins connect the custom Ross forged pistons to the Scat 6.700-inch high-tensile 4340 forged H-beam rods featuring 2.20-inch diameter big end to fit the big-block Chevy-sized crank journal. For this 0-deck engine, the compression ratio of 7.96:1 will result from the 49cc dish in the pistons, 90cc chamber E-heads, and the volume of the head gasket.



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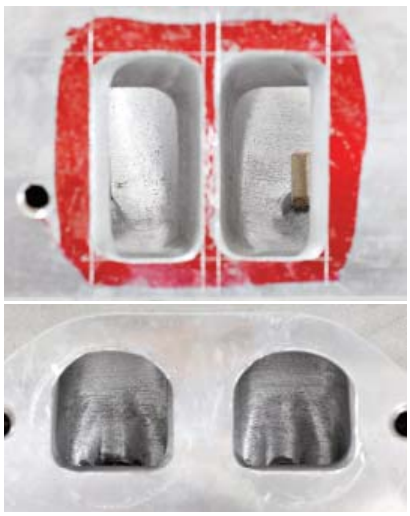
Here is the bottom end prior to installation of the Milodon windage tray and Melling high-volume oil pump.

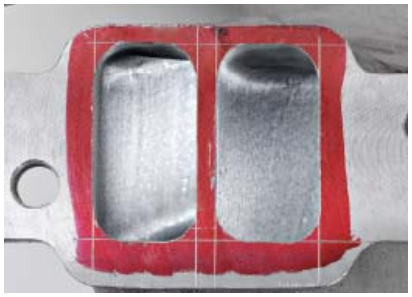
Jeff installed the cam straight up and verified it with the degree wheel.



The heads got the full porting treatment on the intake and exhaust sides. Wheeler was after maximum flow possible here.

Here you can see the bowl work. The chambers were opened up to 90ccs from an advertised 87 ccs. A three-angle valve job (30-45-75-degrees) was performed on the valve seats.

The valves that came with heads were retained. They are stainless steel and measure 2.11/1.66-in.

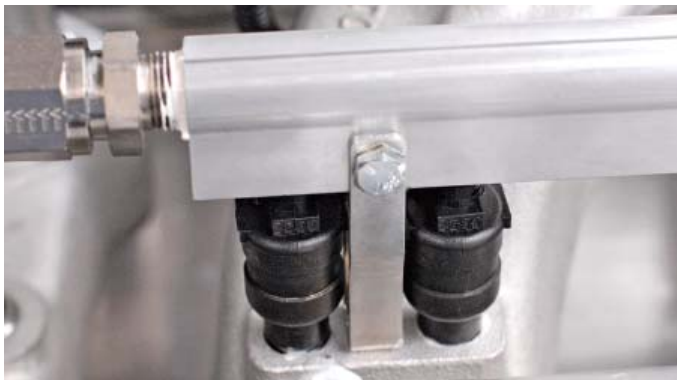


The intake didn't escape the grinder as its ports were matched to the heads.

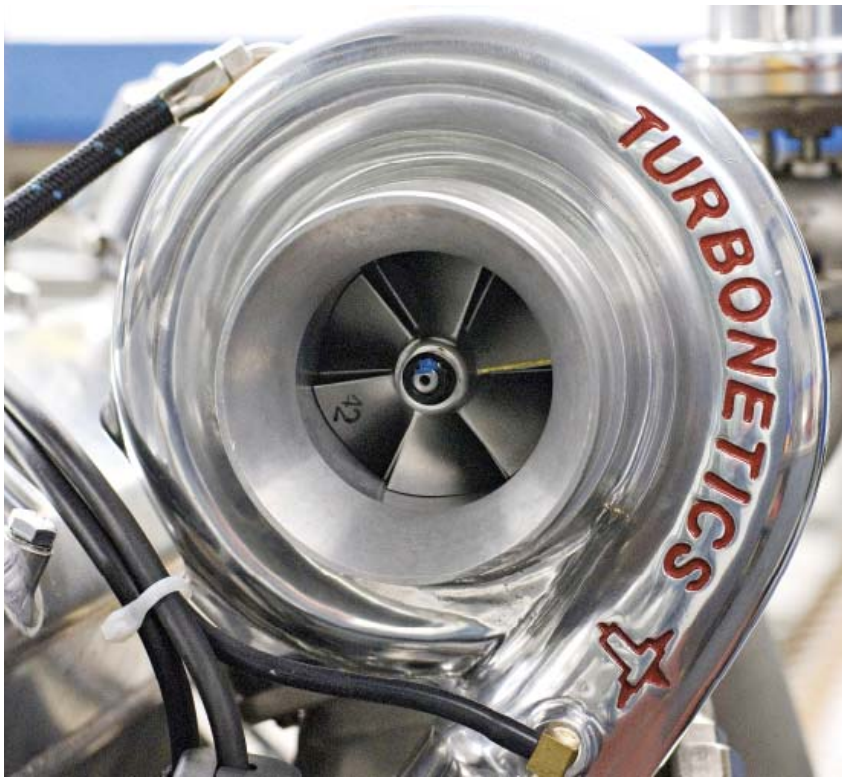
▼ The Edelbrock valvesprings feature a seat pressure of 140 lbs and an open pressure of 360 lbs. Since this engine will rarely, if ever, see the other side of 6,000 rpm, a set of Comp Cams 1.5:1 ratio aluminum rocker arms are all that is needed to keep valve timing in order. Smith Brothers 3/8-inch diameter, restricted pushrods with .040-inch holes were used, so that full oil flow could be maintained for the lifters yet be still restricted to the rockers.

Since Jeff will be pushing things just a little with pump gas under boost, a rock steady MSD crank trigger ensures consistent timing.

MSD also supplied a cam sync distributor so the injectors can be run sequentially. That way the tuner has control over each injector separately should the engine have a cylinder with a special need. Timing can also be controlled per the individual cylinder.



These 83 lb-hr injectors came from FAST.



There's a 70mm Turbonetics unit perched on each side of the engine. The obvious advantage of twin turbos is that you can run two smaller ones so that they will spool up quicker and can make more boost at lower engine rpm, and still not run out of room on the top end.

Especially with pump fuel, the boost needs to be tightly controlled so each side also has a Turbonetics Evolution 35mm mechanical waste gate. Boost can be controlled with these units by changing an internal spring and/or by sending some of the boost to the lower side of the diaphragm.

SOURCES

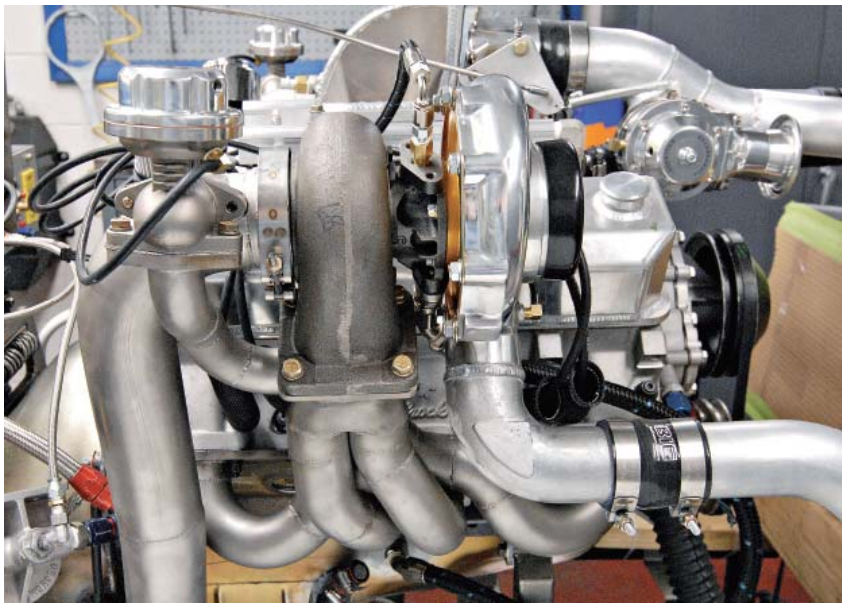
Butler Performance
931-762-4596
www.butlerperformance.com

Muscle Car Restorations
715-834-2223
www.musclecarrestorations.com

Wheeler Dyno Service
763-785-0700

On the receiving end of the turbos, and by way of a 2.5-inch Bell Intercooler (that you will see in Part II), is a 70mm Accufab throttle body and plenum.

Because turbo boost in not directly controlled by throttle position and engine rpm like with a pulley driven blower, some provision must be made to bleed off excess boost when the throttle is closed quickly. Turbonetics calls its blow-off valve "Godzilla" because it can sound somewhat like the scream of that classic beast.



Notice how cleanly everything is tucked in alongside the block. MCR did a brilliant job of fabricating all of the plumbing. In the next issue we will dyno the engine to reveal the performance figures.