

**600HP UPGRADE!** EDELBROCK'S NEW SUPERCHARGER

# 5.0



# MUSTANG & SUPER FORDS BOSS

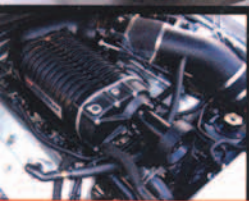
# 302

**TEARING UP THE  
STREET AND  
TRACK IN FORD'S  
HIGH-REVVING  
HANDLER**



**408CI  
TRICK FLOW  
CLEVOR**

A SOURCE INTERLINK MEDIA PUBLICATION U.S.A. \$5.99 CANADA \$6.99 JULY 2011



**700HP  
COBRA  
BOLT-ONS!**

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# Hot In Cleveland

BUILDING TRICK FLOW CLEVELAND HEAT ATOP A COAST HIGH 408 WINDSOR

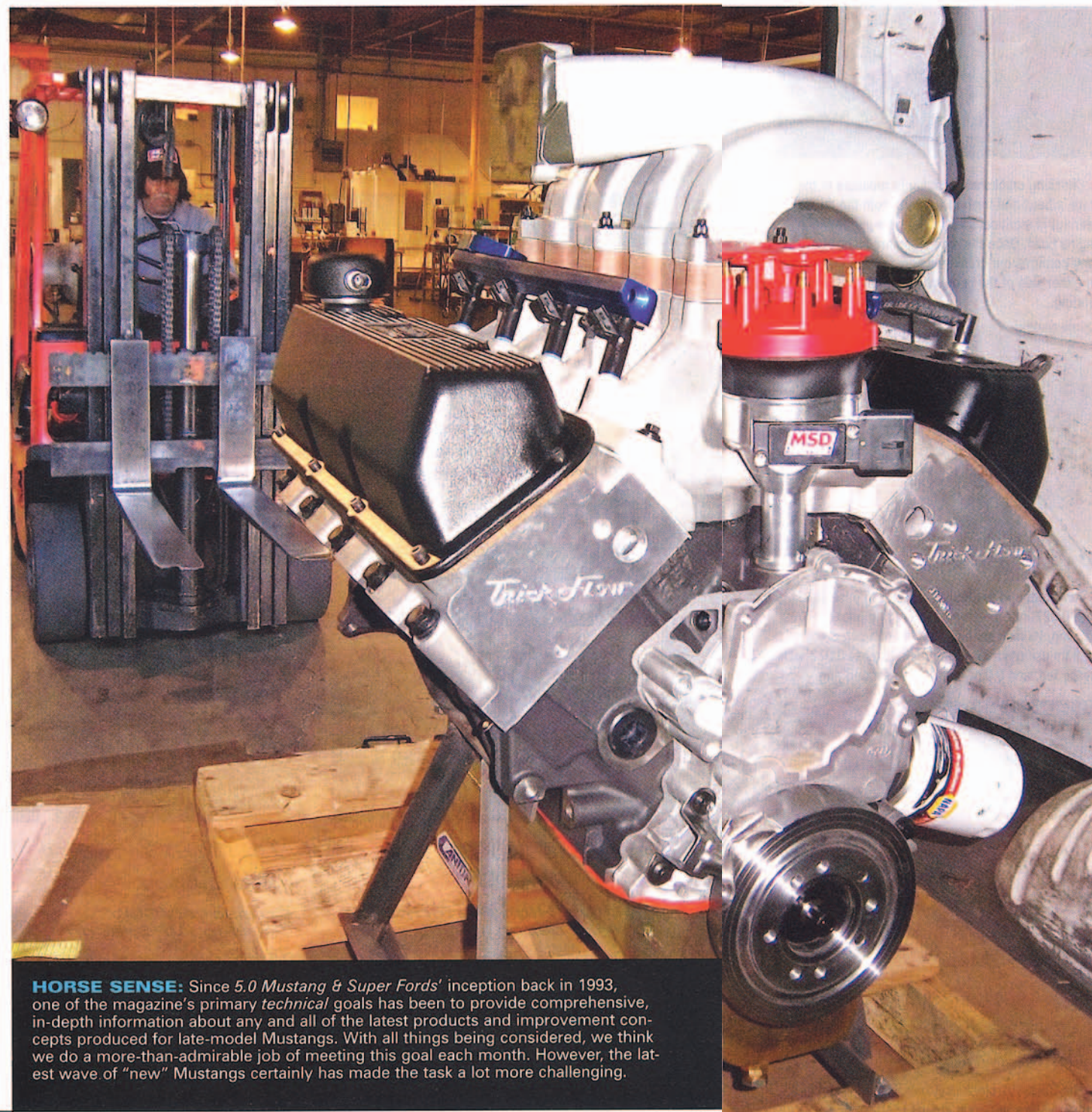
Text and Photos by KJ Jones

Exploring the performance avenues for the latest 5.0 and hopefully assembling a killer Coyote to slide between the fenders of a future project 'Stang, definitely is one of our long-term goals. However, on the pushrod (remember those?) side of Mustang engines, we continue to experiment with different combos. We like to try everything from bolting budget-minded H/C/I top-halves on stockers to building radical small-block Fords. From the blown, 353ci monster that powers our '86 T-top coupe to the nitrous-injected, Cleveland-headed 342-cubed bullet that powers Boss 340, we love a hot Ford small-block.

Most of our advanced coverage of pushrod-5.0-based engines focuses primarily on the popular 347 stroker. Over the years these have become a standard upgrade engine for enthusiasts who want more horsepower and torque for their naturally aspirated or power-adder street/strip Ponies. In an 8.2-inch-deck block the 347 is a tried-and-true setup that's capable of surpassing 470 hp and 430 lb-ft of torque at the crank. As we've learned in past builds, a bigger bore gets you more power, as today's aftermarket blocks can easily exceed the standard displacement of 9.5-deck Windsor powerplants (351 ci).

Because of the popularity of the 8.2-deck 347, building 9.5-deck engines for '86-'93 'Stangs has not been overwhelmingly popular, even though exchanging a first-gen 5.0 with the larger bullet is relatively easy. Swap kits that include headers, oil pans, and accessories brackets are available, and such pieces as the OEM engine mounts, timing cover, water pump, and accessories (power steering; air conditioning) are all reuseable. One thing that has been a drawback to the fuel-injected 302-351 swap becoming more popular is the limited number of direct-replacement, bolt-on, EFI intake manifolds that are available for street/strip, Windsor-based engines.

While we can't say Trick Flow's R-Series 5.8-liter intake (PN TFS-51500006) is the



**HORSE SENSE:** Since 5.0 Mustang & Super Fords' inception back in 1993, one of the magazine's primary *technical* goals has been to provide comprehensive, in-depth information about any and all of the latest products and improvement concepts produced for late-model Mustangs. With all things being considered, we think we do a more-than-admirable job of meeting this goal each month. However, the latest wave of "new" Mustangs certainly has made the task a lot more challenging.

▼OK, by a show of hands, how many of you honestly did a double-take after glancing at this engine, and asked yourself, Is it a 302? Is it a 351W? What heads are those? Better yet, what intake manifold is that? Read on for those answers and all other details on this exciting new bullet.

# SAY WHAT?

# ?



2005 - 2012 MUSTANG V6 AND V8 PERFORMANCE EXHAUST SYSTEMS

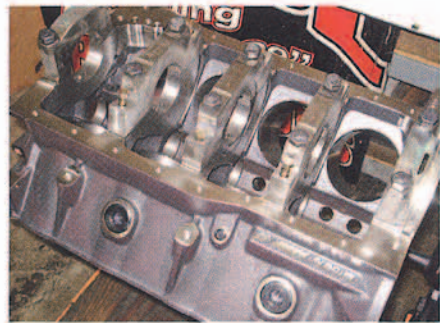
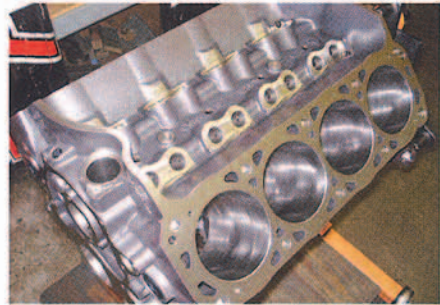


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only player in the injected-Windsor-manifold game, we do know that the upper/lower package definitely ranks as being one of the best, especially when paired with Trick Flow's Twisted Wedge cylinder heads.

For all intents and purposes, this effort is a redux of a Trick Flow-topped 408. However, we're assembling this big-cube screamer with something special—Trick Flow's PowerPort 225 351 Cleveland



▲ While we've written quite a bit about Ford Racing Performance Parts' Boss 351 engine block (M-6010-BOSS351BB; \$2,132.99), this is only our second build effort with the 9.5-deck block. Like its 302 predecessor, the bigger Boss casting features nodular-iron, four-bolt main caps (with 2.75-inch main-bearing journal) and screw-in freeze plugs, and can be bored as big as 4.125 inches for large-displacement engines. A shout of props goes to Derek Raney and L&R Automotive ([www.lnrengine.com](http://www.lnrengine.com)) for their help with preparing the Boss 351 for this project. L&R opened the cylinders to 4.030 inches, squared the deck, and cleared the block where necessary to accept the 4.000-inch-stroke crankshaft and 6.200-inch rods that comprise our 408.



▲ Our 408 Clevor's internal makeup is a derivative of Probe Industries' Dominator engine assembly (PN 10674-DM-F408W; \$1,919.99). All of the components in this kit (crankshaft, lightweight I-beam rods, and reverse-dome pistons) are off-the-shelf. However, it's important to note that we're using -11cc 351 Cleveland pistons, as opposed to the -22cc slugs for inline-valve heads that are used for conventional 408 Windsors.

cylinder heads (PN TFS-5160T005-C01; \$2,749.95), and a new EFI intake manifold that takes all the drama out of installing the canted-valve castings on 9.5-deck Windsor blocks.

In this venture into the land of bigger cubes, we're finally taking a big step outside the proverbial box for Fox-body street strokers (of 331 and 347ci displacements). This is an effort that we blame fully on the Coyote 5.0. It's now time for



▲ This Probe stroker crankshaft is chiseled from 4340 steel. The arm is internally balanced, and has a 2.100 rod-journal diameter and 2.750 Cleveland main-journal diameter.



▲ Here is a closer look at our engine's reverse-dome, 351C piston (PN 14617-030), from Probe's Sportsman Race Series. The slugs are forged from 2618-T61 aluminum, and feature 1.250-inch compression height and 0.927-inch pin bore. An -11cc inverted dome makes these pieces work well for naturally aspirated and nitrous/forced-induction performance, as compression falls at 10:1 with the 60cc Trick Flow Cleveland heads.



▲ Antonio "Tony" Garcia is one half of the Coast High team that's responsible for building our 408 Clevor. Tony handled the lower end's assembly, while our buddy Gary Guerrero took care of the all-important topside. After setting the main bearings and crankshaft in place, Tony torques the ARP main-cap bolts to 45 lb-ft (¾-inch bolts) and 105 lb-ft (½-inch bolts).

making bold moves with first-gen Mustang engines, and this build demonstrates how easy creating a 351 Clevor for your Fox 'Stang has become, thanks to the folks at Trick Flow, Ford Racing Performance Parts, and Coast High Performance



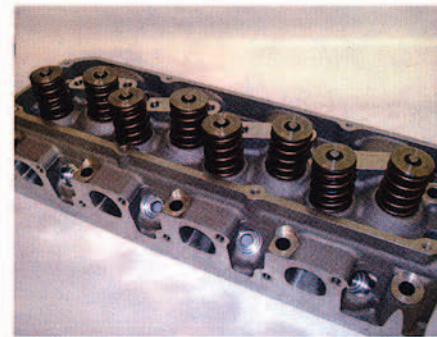
▲ Checking crankshaft endplay (a measure of the crank's back-and-forth movement from the thrust bearing) is a critical step in any high-performance engine build. Once the main caps are locked down, Tony confirms our crank will only move 0.009-inch on either side of the center bearing when it is rotating.



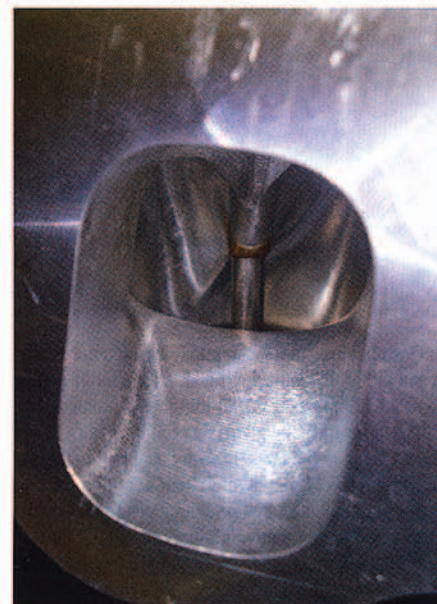
▲ Tony sets up the Clevor's piston/rod assemblies with 0.927-inch pins, and a "moly" ring package (⅛-inch top, ⅛-inch second, and ⅛-inch oil). Since we'll be using nitrous, Tony gaps rings at 0.022-inch on the top, and 0.024-inch for the second ring.



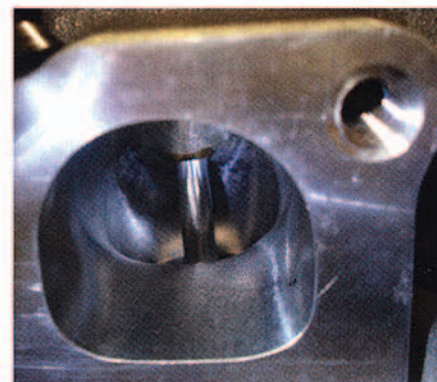
▲ The Boss 351 block gets one final wipe-down before pistons and rods are installed.



▲ Here is a look at the canted-style valve layout that makes Cleveland-style heads so famous. Positioning valves in this angled fashion promotes superior fresh-air intake and expulsion of burned exhaust gasses. The Trick Flow castings are based on the small-port, 2V design. However, the castings also feature some qualities of the DEM 4V Cleveland heads, which should promote excellent high-rpm performance from our 408.



▲ Intake ports on the 225cc (that's the port volume, by the way) Cleveland heads are located in the stock position and measure 1.500x2.100-inch.



▲ Conversely, the PowerPort heads' exhaust ports are raised 0.100-inch above the factory position, and their 115cc runners are 1.380x1.670-inch. We already anticipate experiencing a challenge acquiring headers for this Clevor application. Right now, it appears using custom-fabricated tubes is the only option. However, before going that route, we're going to try Hedman Hedders' 351C tubes (PN 85619). We're also told Trick Flow is working with another major header manufacturer, who may mass-produce long-tubes for Fox-bound Clevor engines.

# MORE POWER!



2005 - 2012 MUSTANG V8 SUPERCHARGER SYSTEMS

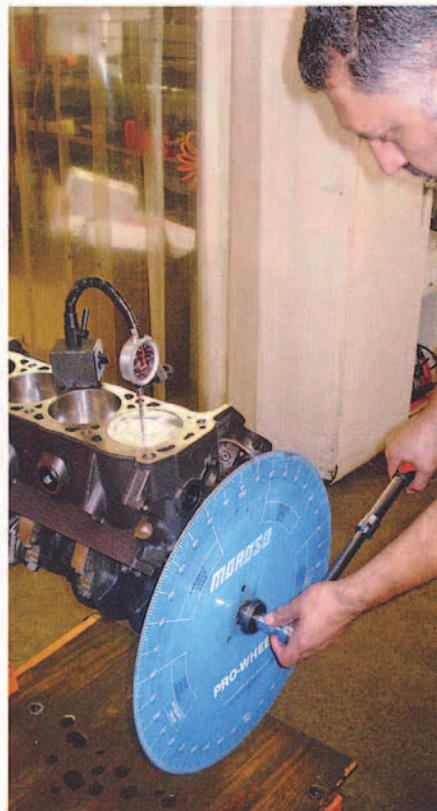


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▲ The 351W's oiling system is much better than that of its Cleveland counterpart, which is one of the reasons a Clevor is a best-of-both-worlds engine package. Naturally, our intent is to keep oil flowing smoothly throughout the engine, so Melling's high-volume pump (PN 10833; \$55.95) was chosen for the task. The stock-style pump features a larger inlet bore and hardened-steel gears, which help supply 25 percent additional oil flow. The pump's drive and idler shafts also have been extended into the cover to provide extra support.



▲ Tony uses a degree wheel to calibrate the camshaft's lobe centerline at 108, which is in accordance with the manufacturer's spec for this bumpstick. The cam's 112-degree lobe separation angle makes it a good choice for an occasionally nitrous-influenced bullet.



▲ There's a bit of trickery happening with the Clevor's cam. While we're using a Trick Flow Stage III hydraulic-roller piece (0.574-inch-intake/0.595-inch-exhaust lift and 236/248 degrees duration at 0.050-inch) for this engine, a rocker-arm change (from 1.6 ratio) changes the cam's lift measurements dramatically. Details on that change are a few photos away.



▲ The engine's valvetrain harmonics and total amount of deflection will be minimal thanks to this billet-steel roller timing set from Comp Cams (PN 7138; \$89). The cam gear operates smoothly thanks to a Torrington bearing, and the set features a nine-position crank sprocket for 2-degree-increment adjustability and 8-degree-maximum advance/retard.



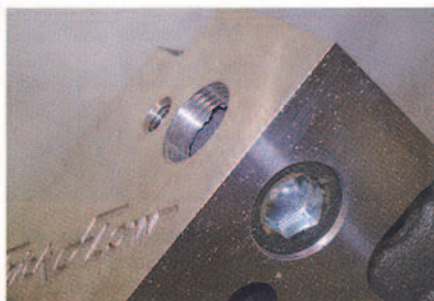
▲ Once his work is completed, Tony logs all of our Clevor's critical data (clearances, torque values, etc) into a program that produces a Coast High Performance buildsheet, which is provided with every engine the company assembles.



▲ Prior to installing cylinder heads, our engine's top-half assembler, Gary Guerrero, checks the valve seal on the new Trick Flow heads. Gary uses a vacuum tester for this procedure, which pulls 28 inches of vacuum at each port.



▲ Check the deck of Trick Flow's PowerPort Cleveland 225 aluminum cylinder head (PN TFS-5160T005-C01; \$2,749.95). The fully assembled, CNC-ported heads feature 60cc combustion chambers, and stainless-steel 2.08-inch (intake)/1.60-inch (exhaust) valves. Notice the plug in the water passage on the head's deck surface and a new, threaded hole in the face of the cylinder head. These modifications are necessary for installing any 351 Cleveland heads on a Windsor-style block.



▲ Here is a closer look at the plugged original and new water passages. We're using AN-12 fittings in the face of each head. However, the heads can also be bored to accept AN-16 fittings, for increased water volume out of the engine.



▲ Side clearance for each connecting rod is another internal-engine spec that should be checked (and oftentimes isn't). Only 0.025-inch separates the big ends of each rod in our bullet. The ARP rod bolts receive 65 lb-ft of torque.



▲ We certainly don't want to experience any conflict between the pistons and the valves in our Clevor's Trick Flow PowerPort 225 cylinder heads. To ensure there is sufficient clearance, Tony uses a dial indicator to check piston deck height, which measures 0.008-inch from the top of the piston to the deck surface.



▲ As Trick Flow and Summit Racing Equipment are family members, all of this 408's necessary finishing pieces can be acquired directly through Summit's extensive catalog. Such parts as the oil pump, oil pan, ARP fasteners, cam and valvetrain, timing cover, balancer, gaskets, MSD distributor and more arrived in two big boxes. Acquiring engine parts in this manner is much better than running all over the place trying to find the right stuff.

# WE ARE PERFORMANCE

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▲ Gary sets Fel-Pro's PermaTorque multi-layered-steel head gasket (PN 1133) down on the block surface. The 0.041-inch-thick MLS gaskets are stronger and more forgiving than standard gaskets, and will maintain a solid head-to-block seal under the extreme cylinder pressure that will be brought about by nitrous.



▲ Cylinder heads are secured with an inside-out pattern for torquing each ARP bolt (PN 154-3604). Gary uses a step procedure for each fastener; starting at 45 lb-ft, then 75 lb-ft, and finishing the process with 100 lb-ft of torque.



▲ Gary installs a Ford Racing Performance Parts SFI-rated damper (PN M-6316-C351; \$249.95) on the Cleavor's crank, and secures the balancer's ARP bolt with 70 lb-ft of torque.

## SOURCES

### ARP

(800) 826-3045  
www.arp-bolts.com

### BBK PERFORMANCE

www.bbkperformance.com

### COAST HIGH PERFORMANCE

(866) 249-9143  
www.coasthigh.com

### COMP CAMS

(901) 795-2400  
www.compcams.com

### FEL-PRO

(248) 354-7700  
www.federalmogul.com

### FORD RACING PERFORMANCE PARTS

(800) FORD-788  
www.fordracingparts.com

### MSD IGNITION

(915) 857-5200  
www.msdition.com

### PROBE INDUSTRIES

(866) 718-6267  
www.probeindustries.com

### SUMMIT RACING EQUIPMENT

(800) 230-3030  
www.summitracing.com

### TRICK FLOW

(330) 630-1555  
www.trickflow.com



▲ As we mentioned earlier in this report, we elected to forego 1.6-ratio rocker arms and use Probe's 1.8 ratio, aluminum, 1/8-inch stud-mount arms. With the hydraulic-roller cams, the rockers are zero-lash; no adjustment is necessary once the rollers are centered on the valve tips, and the 8.500-inch-long, 3/8-inch pushrods can barely be twisted between the thumb and index fingers. A set of Comp's hydraulic-roller lifters (PN 8931-16; \$529.95) actuate the pushrods. This move to 1.8 rockers was made in an effort to extend the engine's rev range, and maximize its power potential, with and without a nitrous shot. With the 1.8s, the cam's lift jumps to .646-inch on the intake side and a generous 0.670-inch at the exhaust.



▲ This lower intake manifold is the key to building a Fox Mustang-style, EFI, 351-based Cleavor engine. The new, Trick Flow R-Series intake manifold bolts directly onto 9.5-deck 351W engine blocks (a 9.2-deck version also is available), without requiring any mods to manifold or block (all of the ports match perfectly to the heads, and water is properly routed), and handily supports Windsor-based, Cleveland-headed engines that operate in the 2,500- to 7,000-rpm range.



▲ This upper plenum looks totally Fox Mustang, doesn't it? Well, technically, it is, as it's the R-Series upper (PN 515U0005; \$300) that many enthusiasts turned to for their traditional Fox/EFI-Windsor swaps, back in the day. This top piece mates perfectly with the Cleavor lower (a spacer or nitrous plate may be necessary for fuel-rail clearance), and features a 90mm (approx 3.5-inch) throttle-body bore that is a must when making really big steam is your intention.



▲ After adding final touches from our cache of parts from Summit—pieces such as MSD's 351W TFI distributor (PN 8452; 269.95), a set of Ford Racing Performance Parts 80-lb/hr fuel injectors (PN M-9593-LU80; \$461.95), FRPP valve covers (PN M-6582-A341R; \$153.75), and BBK's billet fuel rails (PN 5010; \$179.95)—the Coast High Performance-built 408 Cleavor sits on a stand and ready for installation. We'll be bringing you highlights of that install process in future issues, as well as the all-important dyno and, with any luck, dragstrip testing that are all part of our Cleavor plan. **5.0**