

# EVO 8 ENGINE BUILD

Heavy Duty Internals for Big, Streetable Power

By Martin Musial of AMS ([www.automotosports.com](http://www.automotosports.com))

**Our last** Lancer Evolution technical article left off with the EVO 8 laying down 550whp. Good numbers indeed, but when you realize that we're cranking that out with a stock bottom end, it makes you think twice about how long everything is going to hold up. To put our worries to rest we chose some Eagle rods and had Ross Racing Pistons make us some custom pistons. Along with stronger internals, we use stronger hardware and a few tricks to keep everything together and give us the best performance. In this article, we'll learn a little about the EVO



8 engine and how it works, follow it through a complete buildup, and finally test the finished product.

## SOURCEBOX

**ARP**  
T: 805-339-2200  
W: [www.arp-bolts.com](http://www.arp-bolts.com)

**Eagle Specialty Products**  
T: 662-796-7373  
W: [www.eaglerod.com](http://www.eaglerod.com)

**Exedy Clutches**  
T: 800-346-6091  
W: [www.daikin-clutch.com](http://www.daikin-clutch.com)

**Ross Racing Pistons**  
T: 800-392-7677 (orders)  
T: 310-536-0100 (tech)  
W: [www.rosspistons.com](http://www.rosspistons.com)

**Supertech Racing Valves**  
T: 408-448-2001  
W: [www.supertechperformance.com](http://www.supertechperformance.com)

# Introducing the Lokar Motorsports G-Bar System



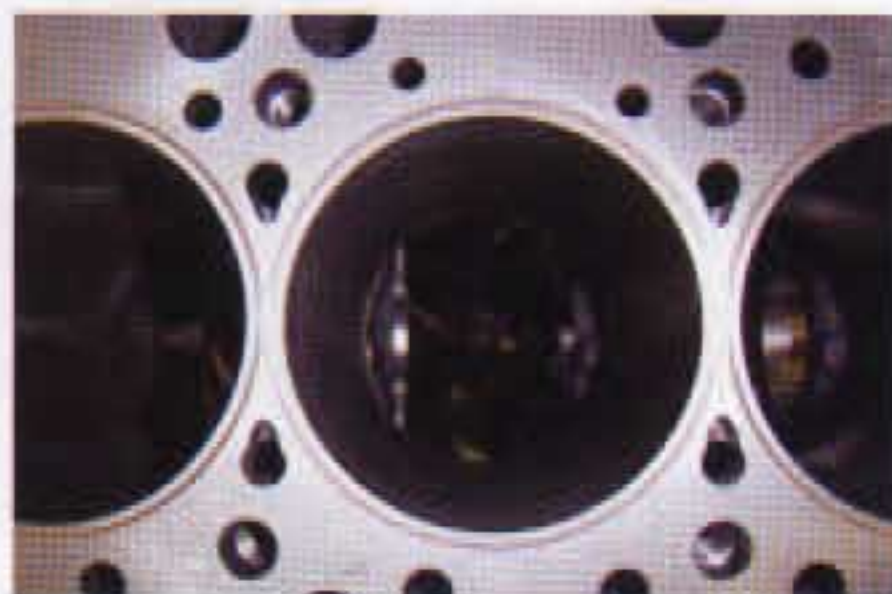
The Lokar Motorsports G-BAR System increases rigidity in the upper portion of the vehicle. The G-BAR System is a bolt in application that requires no welding or drilling. The system incorporates a series of adjustable

aluminum bars that tie together the upper and lower half of the car. The installation of Lokar Motorsports' G-BAR System virtually eliminates body flex. The result is better handling and increased cornering G capabilities. The G-BAR System is modular, allowing the Pillar Cross Bar and the X-BAR to be purchased separately. The Pillar Cross Bar can be used independently from the X-BAR or in conjunction with it. The Lokar Motorsports G-BAR System is compatible with the Lokar Motorsports Harness Bar.



10924 Murdock Drive • Knoxville, TN 37932  
865-966-2269 • fax 865-966-1999  
info@lokarmotorsports.com  
www.lokarmotorsports.com

## ABOUT THE EVO 8 MOTOR



The Evolution 8 motor comes to us as the most refined form of the venerable Mitsubishi 4G63T engine. The 4G63 has always been robust, taking almost any abuse owners threw at it. We proved this point by taking the stock EVO 8 engine to over 600hp, accumulating almost 500 dyno pulls in various states of tune, and many trips down the track.

Torque is the motor killer and, with 440 lb-ft at 28psi of boost, we decided we've pushed the limit far enough. It was time make it strong and crank the boost up. The factory rods in the EVO 8 are almost identical to the 7-bolt rods that came out of the DSM engine. They look rather thin, but surprisingly they take the punishment with a well-tuned engine.

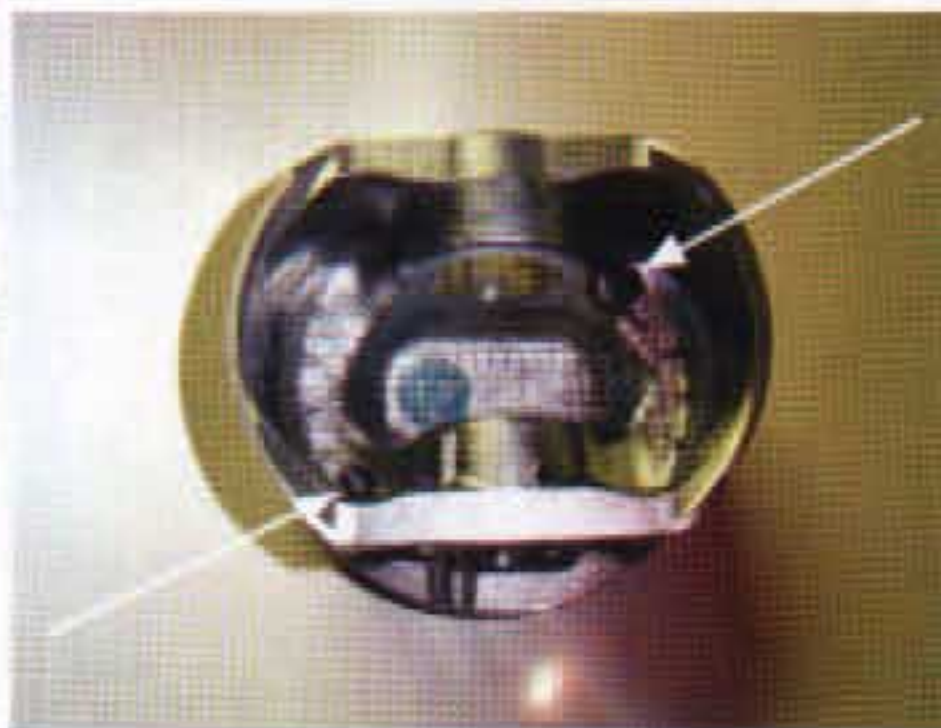
The pistons are worth taking a closer look at. Mitsubishi uses a dry film moly-based coating on the piston skirt to reduce piston and cylinder wall scuffing – not something you see in many OEM engines. Mitsubishi also used thinner rings to reduce friction losses and thus

increase horsepower. Underneath the piston you'll notice two small openings that allow oil to travel through the piston. From below, oil squirters shoot oil up toward the pistons and through the hole. The oil travels through the piston and out the other side, cooling the piston and helping it live longer.

The crank is standard issue 4G63, which has proven to be very reliable even in 1,000hp applications. The block is rigid cast iron, giving the engine a solid foundation on which to build some crazy power. The five main caps are connected together as a girdle with the center cap containing the thrust bearings. Gone are the concerns of crankwalk that plagued some second generation (1995-97) DSM owners.

Two balance shafts spin at twice the speed of the motor helping to alleviate some of the vibrations inherent with the inline 4-cylinder engine. Removal of these shafts nets around 5-10hp. Due to the nature of this buildup, we chose to leave these shafts in the engine. Mitsubishi uses a multi-layer steel (MLS) head gasket, which seals very well but requires a very smooth surface finish on the head and block, on the EVO 8. Head bolt/stud diameter is 11mm just like the 7-bolt DSM applications. We'd rather see the 12mm hardware used, but we'll work around this and make sure the head gasket gets a good seal.

Since our EVO 8 and most others out there will have low mileage, we can use stock bore



# #1 IN PLUMBING!



pistons and just use a glaze breaker on the cylinder walls to prep them. Without having to machine the block we can remove the head and do the component swaps with the engine still in the car. This makes the job much easier and doesn't require the complete disassembly of the engine.

First, we remove the timing components and head to reveal the block surface. We will be spinning the crank over so it's necessary to have the timing belt removed completely. After the oil pan is dropped we have access to the bottom end components. The rod caps can then be loosened and removed and the piston popped up through the block. The best way to do this is to get a wooden dowel or rod and put it under the dome of the piston, then bump it up with a mallet until the piston comes out of the block. It will tend to stick at the very top because the rings get caught up on a ridge near the top. The rings wear this ridge in as the piston crosses over top dead center during

engine operation.

It's important to wrap the exposed parts of the crank with towels or rags because during our glaze breaking procedure it will be exposed to metal particles and abrasives. The glaze breaker is run up and down the bore using a very light oil as lubricant. Be careful as the oil squirters are near the bottom of the bore and can be hit by the arms of the glaze breaker. The cylinder walls must be cleaned thoroughly to remove any abrasive or metal particles that tend to stick to the walls. A light coating of oil will prevent the walls from developing surface rust during our assembly. The rags can be removed from the crank; and, the bottom surface of the motor should be cleaned with brake cleaner or similar solvent to remove any other residue from the glaze breaking procedure. Again all exposed metal surfaces should be lightly oiled — you'd be surprised how quickly they can develop surface rust if left dry. Now we're ready to assemble the pistons and rods.

Ross racing pistons makes some ultra-trick pistons and we've always had success using their products. We turned to them for these custom pistons and spec'd them out to retain the stock bore and compression (8.8:1). The Ross pistons weigh in at 338 grams compared to the stock pistons at 341 grams.

Comparing the two pistons side-by-side shows how much stronger the Ross are. Besides being made from a forged billet,



Ross 8.8:1 piston on left versus stock piston on the right.



*Modified sport compacts need modified plumbing, coolers & brake lines - look no further than Earl's!*

- Over 30 Years as the plumbing leader!
- The winningest plumbing system in racing history!
- The most complete line to plumb any situation!

## HIGH FLOW ALUMINUM HOSE ENDS & ADAPTERS

- Available in straight to reverse 180° to plumb nearly any situation
- Complete line of adapters let you go from pipe thread to A.N., metric to A.N., pipe to pipe or A.N. to A.N.

## HIGH PRESSURE HOSES

- **Auto-Flex™** stainless steel braided line - the perfect hose for sport compacts!
- **NEW! Pro-Lite 350™** - black woven nylon braid makes it easier to cut and work with plus it weighs 50% less than stainless!

## TEMP-A-CURE™ COOLERS

- 2 to 3 times more efficient than typical tube & fin type coolers.
- Perfect for extreme engine and transmission temperatures found on turbo & race applications

## HYPERFIRM™ BRAKE LINES

- Teflon lined stainless steel lines for improved pedal firmness & improved stopping
- Testing found an 18 foot shorter stopping distance on a 1996 Toyota Supra @ 80mph!
- Meet all D.O.T., T.U.V. & J.W.A. standards.

For nearest dealer, call

**1-800-HOLLEY-1**

then punch ext. 6234

[www.earlsplumbing.com](http://www.earlsplumbing.com)

# EVOLUTION IS DESTINY



## EVO

[MachEVO.com](http://MachEVO.com)

The mighty Mitsubishi Lancer Evolution takes to performance modifications like a duck to water. Take your Lancer Evolution to the next evolutionary level with parts from Mach V Motorsports. We offer a huge selection of EVO tuning parts, including intake, exhaust, fuel, suspension & exterior mods.

*After all...*

*there's no stopping EVOLution!*



Check out our easy-to-use web sites for technical info, complete upgrade guidelines, install tips and comprehensive parts catalogs for your WRX, DSM and Lancer Evolution.

Get the looks, performance and handling you want. **Log on now!**

**NEW EXPANDED FACILITY**

45064-B Underwood Lane  
Sterling, VA 20166

**MACH V**  
MOTORSPORTS

**(703) 435-5000**

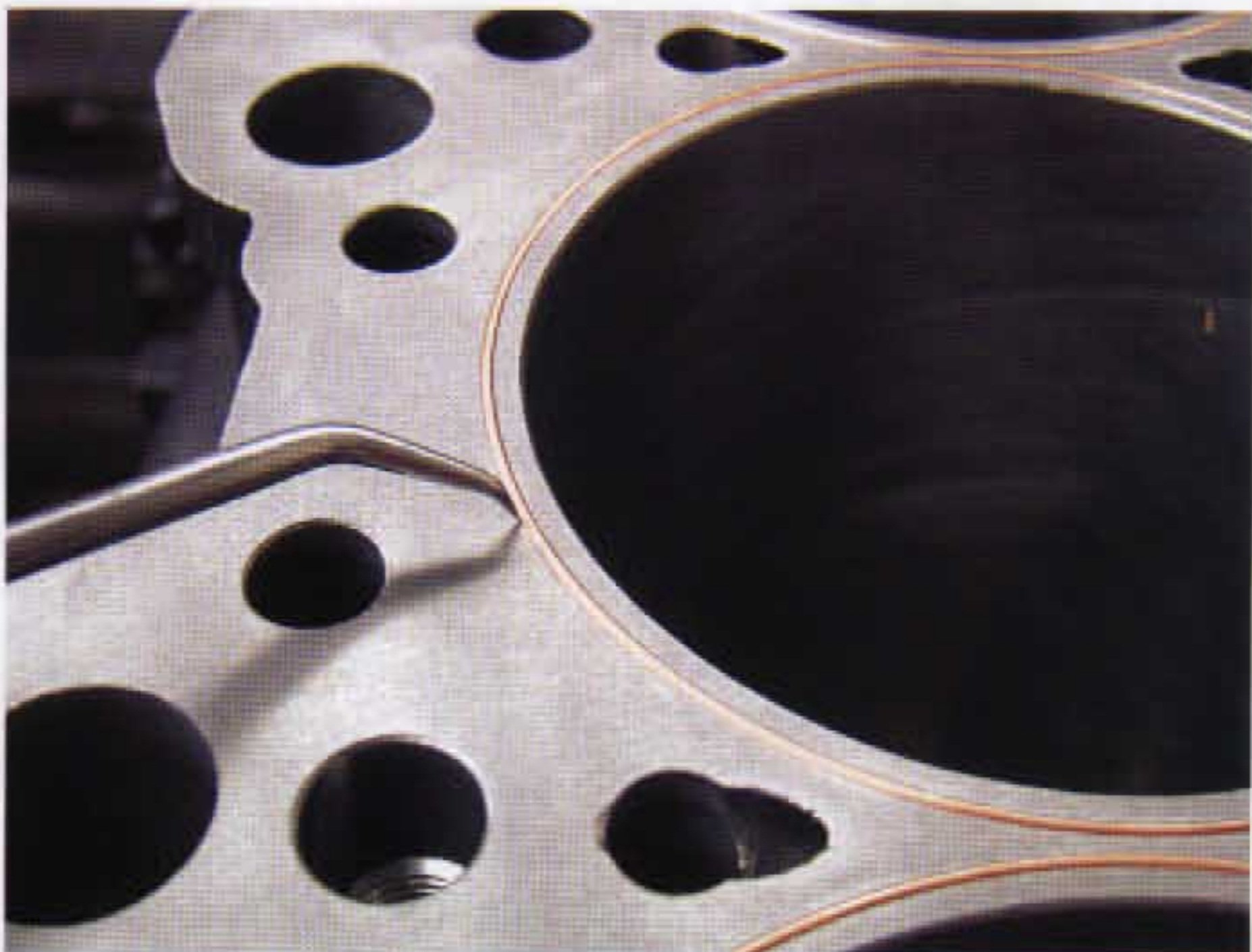


the thickness of the stressed areas is much beefier over the stock pistons. The rings are also thicker than the stock counterparts to handle the extreme pressure we'll be throwing at them.

The top ring land is further down the piston to keep heat away from the top ring. With the Ross racing pistons, we run tighter piston-to-wall clearances than other aftermarket forged pistons and with great success. The engines run quietly with no piston slap or noise. We have had no skirt scuffing issues even under high boost and when nitrous is thrown into the mix.

For the rods, we chose the reliable and economical Eagle 4G63T rods. We've pushed these rods to over 800hp with nitrous and have had no problems. The rods are lightweight and come with ARP hardware out of the box. The small end of the rods comes under-sized and needs to be pin-fit to the pistons before assembly. After the piston-to-wall clearance is checked on each piston and the rings are file fit, they are ready to be dropped in for final assembly.

After installation, each rod cap should be plasti-gauged for proper bearing clearances. These steps are critical and will keep your



**GOODRIDGE**  
www.goodridge.net



HIGH PERFORMANCE HOSES & FITTINGS

RACE PROVEN BRAKELINES

- ELIMINATES SPONGINESS UNDER HEAVY BRAKING
- INCREASES BRAKING EFFICIENCY
- ABRASION AND CORROSION RESISTANT

FOR IMPROVED PERFORMANCE AND RELIABILITY

529 VAN NESS AVENUE, TORRANCE, CA 90501  
Tel: (310) 533 1924 Fax: (310) 618 0909

155 ROLLING HILL ROAD, MOORESVILLE, NC 28117  
Tel: (704) 662 9095 Fax: (704) 662 9094

109 GASOLINE ALLEY, SUITE B, INDIANAPOLIS, IN 46222  
Tel: (317) 244 1000 Fax: (317) 244 1011

**BE SURE IT'S GOODRIDGE**

HOSE AND FITTINGS  
**GUARANTEED FOREVER**



engine alive during high horsepower runs. Before we install the main-girdle/main caps, we install the ARP main studs. The main studs provide a higher clamp load on the main caps and keep everything together under high cylinder pressures.

With the bottom end zipped up, we turn to putting the head back on. Before we slap it back on, we freshened up the valves with some 1mm oversized units from Supertech Performance Valves. The intake valves are a stainless steel high temperature alloy and the exhaust valves are inconel to endure the high heat without distortion. A set of high performance valve springs and titanium retainers from Supertech will let us spin the motor to over 9,000rpm without the worry of floating a valve. We measured the seat pressure of the valves and compared it to other aftermarket single valve setups and the results proved that these were the springs to use.

When running high boost and making big horsepower, we found that the head gasket needs a little help in sealing. Up to about 500-550whp and 450+ lb-ft of torque you can get away with a stock MLS head gasket and good head studs, but after that it really helps to O-ring the block or head. Since we're leaving the block in the engine bay, we chose to O-ring the head.

Grooves are cut around each chamber and a soft copper ring is installed, which protrudes about .007"-.008" from the surface. Upon installation and tightening, the soft copper compresses and provides extra sealing around each cylinder. The head torque procedure should be done in three stages to compress the head and O-ring evenly. After bolting on all the accessories, the engine is primed with conventional oil and fired up. A few hours of run-time under various loads is all that's needed before letting the boost rip!

## TESTING

On the dyno, we can now turn up the wick and see what it will do at higher boost levels. We progressively stepped up the boost to 38psi and turned in 667whp and 536 lb-ft of torque.

With this power we had trouble with the clutch and Exedy came to the rescue. A twin disc carbon-carbon unit with its heavy-duty pressure plate solved all the problems. Not only is the carbon-carbon unit a dream to drive on the street, but it holds more power the hotter it gets! With conventional organic or metallic clutches, the coefficient of friction drops as the temperature rises. Heat the clutch up and glaze it, and it won't hold power until it cools down. The carbon-carbon unit, however, grabs less when cold and holds tight when hot. That's the beauty of this ultra-modern material! It drives great off the line when cold and as you slip it on a drag launch, it grabs harder and puts the power to the wheels.

For track use, we decided to run a conservative 33-34psi of boost. With limited seat time and a full-weight car, I pulled a 10.63 at 132 mph. A month later, we put down a 10.68 at 135.5 mph at 35psi of boost. The motor has been run for the past few months at this big power level and everything is holding up perfectly!

Where to go from here? Nitrous, of course! Besides nitrous, we just finished up a stroker kit for the EVO 8 4G63T to bring up the displacement from 2.0L to 2.3L. Initial testing has showed over 10 percent gains in torque and more horsepower. Along with more displacement, we'll be upping the ante with a larger turbo.

We'll also be experimenting with the larger GT series turbos from Garrett and trying to wring out 850-900 all boost streetable horsepower. A 1,000hp EVO 8 doesn't seem out of reach anymore. Stay tuned! **///**

