

# 2005 Shelby GR-1 CONCEPT Powertrain

## 10 CYLINDERS, 605 HORSEPOWER

The heart of any supercar is its engine, and the Ford Shelby GR-1 concept is no exception.

Inspired by the biggest, baddest engine of them all – the renowned 427 – Ford engineers created a new aluminum-block V-10 to power last year's Ford Shelby Cobra concept. This 6.4-liter engine – reprised for service in the GR-1 – is adapted from Ford's MOD engine family. It delivers the rush of raw power – with 605 horsepower and 501 foot-pounds of torque – associated with that big 1960s V-8 powerplant without the aid of supercharging or turbocharging.

This combination of brute force and thorough engineering has created a rarity in the world of auto shows – a concept car that can actually do, rather than merely promise, 0-60 in under four seconds, and would easily exceed 200 mph if not electronically limited.

"After I drove last year's Cobra concept, I knew we had a winner in the 6.4-liter V-10," says Carroll Shelby, renowned race driver and consultant on the Ford Shelby GR-1 concept. "We decided to transplant that engine directly into the GR-1 with practically no changes, right down to the rear-mounted transmission, which really helps the weight distribution."

For approximately three years, the Ford powertrain team has been working on an all-aluminum V-10 targeted at ultimate, naturally aspirated performance. When they bolted this modern-day Boss into a Mustang chassis for evaluation, it only took one drive to confirm its potential.

"When we found out there was yet another concept car with the Shelby name on it, we knew it begged for this engine," says Graham Hoare, director, Ford Research and Advanced Engineering. "Although it's not yet ready for production, we've reached a credible engineering level for such a serious concept car – and it has a modern soul that matches the Shelby mission."

## PROVEN TRANSMISSION

While the Ford Shelby GR-1 concept shares a significant amount of technology with the Ford GT and the Shelby Cobra concept, there were several unique engineering challenges met head on by the team.

First, the six-speed manual transmission had to be packaged in a way that would not compromise the occupant foot wells. "One of the unique solutions we delivered for the GR-1 was the design, engineering and development of a torque-tube driveline, which allows placement of the transmission in the rear of the car behind the occupant zones," says Manfred Rumpel, manager, Ford Advanced Product Creation.

The rear-mounted six-speed transaxle is identical to the high-performance unit in the Ford GT, with an integral limited-slip differential to drive the rear wheels. Based on the engine's 7,500-rpm redline and the wide drive ratios, this Ford Shelby GR-1 concept has a theoretical top speed of more than 200 mph.

The transaxle application was necessitated by the desire to fit such a large engine into a compact coupe while leaving enough room for the driver's legs and feet. With a conventional transmission

mated to the back of the engine, the tradeoff between hood length and passenger room often makes for a cramped footwell and dramatically offset pedals.

Mounting the transmission in the rear helped to more evenly distribute the vehicle's weight and increased the foot well area from 16.5 inches to 21.7 inches and resulted in almost 3.0-inches more legroom than in similar performance vehicles.

The legroom-saving torque tube driveshaft runs at engine speed, considerably faster than typical driveshafts mounted to the rear of a transmission. The spinning inner shaft is supported within a stationary outer tube that stabilizes the engine and transmission in bending motions and in torsion. The inner shaft taps crankshaft torque via a twin-disc, small-diameter clutch mounted at the rear of the engine.

Computer-aided design was essential in helping the first prototype come together smoothly.

"Because they spin so much faster than driveshafts, these torque tubes can be a challenge to execute properly in terms of vibration," says Rumpel. "Using our electronic tools, we optimized the location of the driveshaft support bearings, and it ran smoothly on the very first try. This type of modern engineering tool gives us a development advantage that pioneers like Carroll Shelby could only dream about."

## **UNIQUE SOLUTIONS**

Additional improvements from the Ford Shelby Cobra concept include new, twin fuel-fillers exiting the bodywork just aft of each sideview window and mid-way up the rear quarter panel bodywork. These racing-inspired devices feed two individual 10-gallon capacity fuel tanks that reside inside the structural chassis directly behind the passenger compartment.

The battery was also relocated to the rear of the vehicle, deep inside the luggage compartment, further aiding vehicle weight distribution and better shielding the cabin from the intense heat of the engine compartment.

A new cooling system, revised from the Shelby Cobra concept, includes a unique hood with twin portals to feed air into the massive powertrain.