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FEATURE ARTICLE

Cadillac's Brute Finesse

Stuffing an oversize engine into a small, light platform may be an American hot rodder's dream, but it takes skill to be a player in the sport sedan market.

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By Christopher A. Sawyer, Executive Editor

The Cadillac CTS-V must compete against some very capable vehicles from Europe, all of which sport technical exotica like overhead cam engines with four valves per cylinder and variable valve timing. By comparison, the Cadillac's 16 overhead valves and pushrods sound trite at best. But when the valves are spread out over eight cylinders displacing 5.7 liters, produce 400 hp @ 6,000 rpm and 395 lb-ft of torque at 4,800 rpm, and pull around 3,847 lb, the comparison takes on a decided "America vs. The World" tone.

Like the Corvette, the heart of the CTS-V is the LS6 V8. The 5.7-liter V8 produces 400 hp and 395 lb-ft of torque, numbers that are more genuine than the carbon fiber-like nylon engine cover.

Design and engineering work on the CTS-V was carried out by GM Performance Div. (GMPD) personnel working with John Heinricy's High Performance Vehicle Operations. Kip Wasenko, designer of the mainstream CTS during his days at Cadillac, shaped the CTS-V from his new perch as GMPD's director of Design. But creating a credible performance version of the CTS took more than just a shoehorn and a body kit.

Under the Skin

The hydroformed front and rear cradles are larger than stock, and made of thicker gauge steel. High-stress areas in the front suspension receive welded-in steel gussets, the aluminum control arms are fitted with elastomeric bushings, and a hollow steel cross-car brace supports the shock towers. Front spring rates are up 27%, a 26.6-mm hollow anti-roll bar replaces the standard 23-mm hollow bar, and the monotube front shocks are 10-mm larger (at 46 mm) and have unique valving. Plus, a nine-land (valve element) steering gear replaces the standard six-land unit. In back, the solid anti-roll bar increases 3 mm to 21 mm, spring rates rise by 27%, and Sachs Nivomat dampers replace the standard units. The brakes also have been upgraded, with Brembo calipers and discs at all four wheels (355 mm x 32 mm, front and 365 mm x 28 mm, rear), and sit inside 18-in. wheels shod with 245/45WR-18 Goodyear run-flat performance tires.

The CTS-V's LS6 V8 has a new induction system that draws air from three front inlets, and exhales through a 2.5-in. stainless steel dual-exhaust system. It also has a deeper oil pan, a lighter and more compact water pump, accessory drives that are 37-mm closer to the block, and a redesigned exhaust manifold. These are the only real changes–other than the carbon fiber-effect (it's actually nylon) intake/valve cover shroud–from the Corvette's version of the LS6.

(V is the suffix for all future high-performance Cadillacs)

A dual-mass flywheel is used to eliminate gear rattle and pedal "buzz," especially at low speeds. To ease shifting and enhance reliability, the Tremec T56 six-speed manual has double-cone synchronizers on third and fourth gears, triple-cone units on second gear, and fifth and sixth gears (0.84:1 and 0.56:1 overdrive, respectively) are located on a countershaft separate from the first four gears. Upgraded constant-velocity joints take power through a GKN-supplied 70-mm steel tube driveshaft to a revised rear differential with a thicker input flange. The 3.73:1 limited-slip differential's aluminum housing incorporates deep cooling fins on its lower surface, and a cast-in-place top grate for greater cooling and rigidity.

Plastic Surgery

In order to differentiate the CTS-V from its more plebeian brothers, Cadillac added unique front and rear fascias made of thin-wall TPO, with the front sporting a thermoformed polyethylene aerodynamic tray and a stainless steel mesh lower intake piece that matches the grille. Rocker panel covers are made of 3-mm thick TPO, and extend 40 mm lower than the rockers on the standard car. And–finally!–the large rear license plate holder is body color, not dark gray. Inside, the changes are more subtle. Satin chrome trim rings surround each gauge, the center armrest is 4-in. lower and shorter, all wood accents are banished, the seats have suede-like inserts to hold the driver and passengers in place, and the driver information center includes displays for peak and momentary lateral acceleration.

The lessons learned from the CTS-V will be used on its STS-V and SRX-V brothers in the near future. All are based on GM's Sigma platform, which will make their modification relatively simple. An XLR-V also is under consideration. However, Cadillac general manager Mark LaNeve assures us one Cadillac won't be receiving the hot rod treatment: "There is no DTS-V."

Improving The Breed

When automakers talk of their performance offerings, the phrase "a race car for the road" often finds its way into the marketing-speak, and not always appropriately. The CTS-V race car–the CTS-V R–is heavily based on the road car: 73% by weight, according to the program manager for the sedan's race program. "The upright that holds the front suspension together," says Dave Spitzer, "starts out as a production piece, though we trim and move things around a bit. The hubs come right off the production car and go into the race car, as do the differential and halfshafts." The list is long enough to suggest the marketing spin for this car more accurately might be stated as: "A road car for the race track."

The CTS-V R started as a production CTS that failed the paint quality test. But CAD/CAM work, time in the wind tunnel, and more than 500 hp have a way of turning an ugly duckling into a swan with an attitude.

Work was well underway on the CTS-V when the racing program reached the planning stages in September 2002. A test vehicle was ready by the following April, and spent the year testing at many of the tracks on which it will compete in the 2004 Speed TV World Challenge series. "In developing the race car," says Spitzer, "we used a lot of the facilities normally used by the production teams to develop their vehicles." These included GM's wind tunnel and seven-post shaker rig in Warren, MI, the Vehicle Handling Facility at the Milford Proving Grounds, and a rig that swings the car like a pendulum so engineers can analyze the height of its center of gravity and moments of inertia. "We just lined up in the queue like anybody else," says Spitzer. And the race team–run in conjunction with Pratt and Miller in Wixom, MI–brought information back to the production engineers.

Early in the development process, the race car's Gen 4 V8 was hit by a failure of the production intake valve. The team developed a fix with the valve's supplier, Eaton, and continued the test program with no further problems, never expecting the same thing would happen to the production item outside the race track. But it did. "About three months later," says Spitzer, "our fellow from GM Powertrain, Tony Roma, was sitting in a

meeting with the production teams when one of them holds up a valve that had failed in the same manner." Instead of a lengthy post-mortem and redesign, the production team members were given a copy of the race team's fix. "We saved them three months in development time," says Spitzer proudly.

Despite all this sharing, one thing Spitzer is reluctant to share is the pain that came with Cadillac's abortive three-year effort to win Le Mans. "We simply didn't know what we were getting ourselves into, and that's hard to admit," he says. "But I think it's pretty clear we didn't know how much Audi was bringing to the table." Or how much money (rumored to be $165 million in the first year alone) the Germans were willing to spend. "All you can do in that situation is to start digging," says Spitzer. "We learned a ton, and our checklist is much longer and more robust than before." It's a statement that's no doubt comforting to Spitzer, but discomforting to those who must compete against him.—CAS