TECHNOLOGY TRANSFER INFUSES CORVETTE Z06 and C6.R WITH THE RACING SPIRIT

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The Corvette Z06 and C6.R are the products of a two-way exchange of technology between the realms of production and racing.

A great car is more than the sum of its specifications. Hardware is important, of course; stunning design and state-of-the-art components give the 2006 Corvette Z06 supercar and the Corvette C6.R race car immense capabilities. But the "software" is also crucial – the people, the processes and the philosophy that are evident in the soul of these two remarkable machines. While created for distinctly different environments, the Z06 and C6.R are the products of a two-way exchange of knowledge, personnel and experience between the realms of production and racing. These brothers-in-arms are infused with the racing spirit.

Technology transfer is a two-way street. Lessons learned on the track have benefited the Z06, just as GM's vast resources have enriched the C6.R race car. Moreover, the rules and regulations of the American Le Mans Series require that the production-based C6.R retain strong links with its production counterpart.

"There can be no doubt that the people who created these cars have learned from each other," said Corvette chief engineer Tom Wallace. "The race car looks like the production car, and our customers know that the car that won the 24 Hours of Le Mans is based on the cars in their driveways."

Examples of the synergy between Z06 and C6.R abound:

Powertrain

Both are powered by 7-liter GM small-block V-8 engines with dry-sump lubrication systems, CNC-ported cylinder heads, titanium valves and connecting rods, forged steel crankshafts, and plate-honed cylinder bores. While the components and specifications of the street and competition engines are tailored to their specific environments, the thought process behind them is identical.

"The racing experience enabled us to visualize how we could get more power out of the production engine," said Dave Muscaro, GM Powertrain assistant chief engineer for small-block engines. "How much you get depends on where the bar is set, and racing helped us set realistic goals. A street engine has the constraints of emissions, noise and durability standards, but the race engine really challenged us to produce maximum power from a given package.

"When we started to look at upgrading the LS6, the first thing we did was sit down with the race group and talk about what they had done to build a 7-liter small-block. What did they do to the block to make the cylinder bores bigger, what did they do to the heads to increase the airflow? That was the key to creating the LS7."

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American Le Mans Series rules require that the production-based C6.R race car retain strong links with its production counterpart. The street version's flush headlights, central air intake and sleek body shape enhance the performance of the racing version.

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Technology developed by GM Racing for the Corvette race car's 7-liter LS7.R small-block V-8 (top) was incorporated in the 505-horsepower LS7 that powers the Z06 Corvette – GM's most powerful production engine. The 7-liter racing and production engines both feature dry-sump lubrication systems, CNC-ported cylinder heads, titanium valves and connecting rods, forged steel crankshafts, and plate-honed cylinder bores.

Aerodynamics

The C6 Corvette's supple form is more than just a pretty face. The body design was sculpted in the wind tunnel to perform as well on the highway as it does on the Mulsanne Straight at Le Mans.

"Aerodynamic lessons learned in the race car were applied to the C6 Corvette to improve its performance under real-world conditions," Wallace explained. "The flush headlamps are an example – this lightweight, aerodynamic system gives fantastic performance. The C6 has a central air intake because it provides more airflow with less aerodynamic lift than the bottom breather that was used previously. The C6.R needs to breathe a lot of air without pressure buildup under the front end. That's what we did on the C6, and for the same reasons."

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Race-inspired technology is evident in the Z06's body design, including a downforce-producing splitter on the front fascia, a wicker bill on the rear deck, and aerodynamic wheel openings that reduce drag.

The Z06 adds even more racing-inspired aerodynamic technology to the Corvette body design, including a downforce-producing splitter on the front fascia, a wicker bill on the rear deck, and lips on the leading edges of the wheel openings with rounded edges at the rear to reduce drag.

"The sixth-generation Corvette has better aero numbers than the preceding version, and a lot of that is due to the testing we did at 200 mph with the race cars," said Doug Fehan, program manager for Corvette Racing. "Production cars are seldom tested at that speed, so there isn't an extensive library of data. But if you're going to build America's sports car, a car that can be a global leader in the sports car business, you need to know what happens at high speeds. That's what racing did for the C6."

Interior

Ergonomics is another area that expresses Corvette's racing heritage.

"The emphasis we place on driver control in the street car helps Corvette be a good race car," Wallace explained. "We think about racing when we make decisions on the car – what would the race car want to have? The result is a better car for our customer, a more vibrant car that can be driven with confidence. Hop in and you feel like Ron Fellows because the car is so good. We take that racing attitude and apply it to the production design, and that makes the street car better."

Personnel

One of the goals of GM's racing programs is to accelerate the career development of GM personnel. The race track is a classroom that rewards fast thinking.

"We use the technology exchange to make the car better, and we use the personnel exchange to make the people better," said Wallace. "I often cite racing as an example of teamwork, about doing whatever it takes to solve a problem, to fix a design, to take care of something that broke in a durability test. I always remind people to bring the racing spirit to every task."

Many team members switch from racing to production and vice versa, strengthening their skills and bringing experience and insight to each program. Corvette engineers played a key role in the C5-R program, including the design of the race car's aluminum engine cradle and suspension system. In one such example, a Corvette racing engineer transferred to the production group and his racing-inspired expertise in composite materials enabled a limited production run of composite carbon fiber hoods for the Commemorative Edition Corvette. That program provided the real-world experience that validated the decision to produce lightweight carbon fiber front fenders, wheelhouses and floor panels for the 2006 Z06.

GM engineer Steve Wesoloski joined the Corvette Racing team and experienced firsthand the rewards of racing. He was subsequently named GM Racing road racing group manager in June 2005.

"Coming into this environment and being put in the position of lead chassis engineer, I had to get up to speed quickly on aerodynamics, chassis setup and tires," Wesoloski said. "That accelerated learning process is something I couldn't have received anywhere else."

Chassis

The underlying structures of the production car and the race car are very similar, according to Wesoloski.

"We started with the production framerails and the concept of the center tunnel as the backbone of the car, and then designed a roll cage on that structure," he said. "We evolved the structure from the production car with a cored composite floor that spans the full width of the race car. The analytical process that was used in production carried over to how we analyzed the race car."

Safety

Safety is the No. 1 priority at GM Racing. Since the inception of the GM Racing Safety research and development program in June 1992, the program has expanded from its initial focus on Indy cars to encompass stock car racing, sports car racing, drag racing and off-road racing. The racing safety program is built on the foundation of GM's world-class safety research and testing programs for passenger vehicles.

"Safety is always of paramount importance," said Fehan. "Shortly after we built the first C5-R race car, we went to GM's Milford Proving Grounds and did a barrier crash test to full federal standards – we ran a brand-new race car into a solid wall at 29 mph. The car came through remarkably well. The FIA (Federation Internationale de l'Automobile) designated the Milford Proving Grounds as an approved test facility, and we raced that same car for two full years.

"That test dramatically demonstrated how we were able to take the engineering capabilities that GM has in production car safety and apply them to improve the safety of the race car."

A similar process of cross-pollination between racing and production is taking place in the C6.R program. GM Racing engineer Tom Gideon, who heads the racing safety project, developed energy-absorbing honeycomb aluminum attenuators to protect the driver during a side impact. Crash test data from the production C6 is also being used to improve driver safety in the racing version.

"A passenger car and a race car operate in very different environments, with very different safety requirements," said Gideon. "The goal for the C6.R is to optimize the driver's safety by matching the crash data from the race car and the production car with the best race car driver restraint technology."

Summary

Technology transfer can be difficult to see, but in the case of the Z06 and C6.R, it is readily apparent.

"When you see the Z06 and the C6.R side by side, you see the culmination of all the work we've done," said Fehan. "It is abundantly clear that racing has had a profound effect on production, and the engineering moves both ways."

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