Tech Center News™

WARREN, MICHIGAN

VOL. 38 NO. 13 | *Covers the Hub of Macomb County's Auto Industry* | DECEMBER 2, 2013

Aerodynamics Increase High-Speed Stability on 2014 Camaro Z/28

The 2014 Camaro Z/28 goes through the paces in the wind tunnel at the GM Tech Center in Warren.

The Camaro Z/28 is more than just a simple muscle car.

GM engineers have used sophisticated designs on the 2014 Camaro Z/28 to manage airflow in a way that few other production vehicles use, said GM spokesman Monte Doran.

This engineering technique generates downforce like a race car to press the tires against the track for high-speed stability and greater cornering capability.

Numerous modifications were made to the exterior, compared to the Camaro SS, with new and revised content developed to improve aerodynamics, powertrain cooling and brake-system cooling, Doran said. They help the Z/28 produce 440 pounds more downforce at 150 mph, relative to the SS, which generates slight lift at that speed.

Computational fluid dynamics, reduced-scale rolling wind-tunnel testing, full-scale clay models and full-size prototypes were tested in several wind tunnels, including General Motors' wind tunnel in Warren, Doran said, resulting in five primary contributors to the Z/28's aero supremacy:

• Front splitter – The Z/28's front splitter is a large aero panel that provides downforce at the front of the car, enhancing cornering capability and high-speed stability. It's designed to withstand 250 pounds of downforce at its tip and is matched with an aero closeout panel under the front of the engine compartment that also enhances aero characteristics – along with molded-in aero features forward of the front wheels;

• Rear spoiler with "wickerbill" – At the outset of development, the aerodynamic coefficient of drag goal was achieved with original Camaro SS content and an accessory rear spoiler, but to meet the downforce requirements for Z/28, the rear spoiler was modified with a "wickerbill" – a small, vertical tab at the edge of the spoiler. Although an aesthetically minor change, it adds approximately 28 counts of drag, improving rear lift performance by 70 counts. That allows the Z/28 to handle turns at higher speeds and deliver greater overall high-speed stability;

• Hood extractor vent – A functional carbon fiber hood extractor provides increased engine cooling by allowing hot air an exit route, but also plays an important role in the car's aero performance. It provides a path for air channeled through the grille to exit out the hood and over the car. Without the vent, the air would be pushed out the bottom of the engine compartment, which could generate lift. The design is similar to the extractor featured on the Camaro ZL1;

• Rockers, wheelhouse extensions and front tire deflectors – Specific rocker moldings provide aggressive styling and improved aerodynamic performance, while unique wheelhouse extensions cover the Z/28's wide tires to push air past the tires. Deflectors at the bottom-front corners of the front wheel flares also contribute to the car's downforce-producing aerodynamics, taking the place of a conventional air dam;

• Belly pan – The Z/28 underbody incorporates a belly pan that helps reduce front lift. It was developed using computational fluid dynamics and wind-tunnel testing. Along with the aero benefit, it also contributes to drivetrain cooling, with modified NACA duct profiles designed to draw air into the underbody tunnel area, where the highly energized air provides extra cooling for underbody components affected by the exhaust thermal energy of the LS7 engine. Unique wheelhouse liners with closeouts work with the vehicle underbody for optimal airflow, too.

Additionally, the Z/28's special front fascia plays an important

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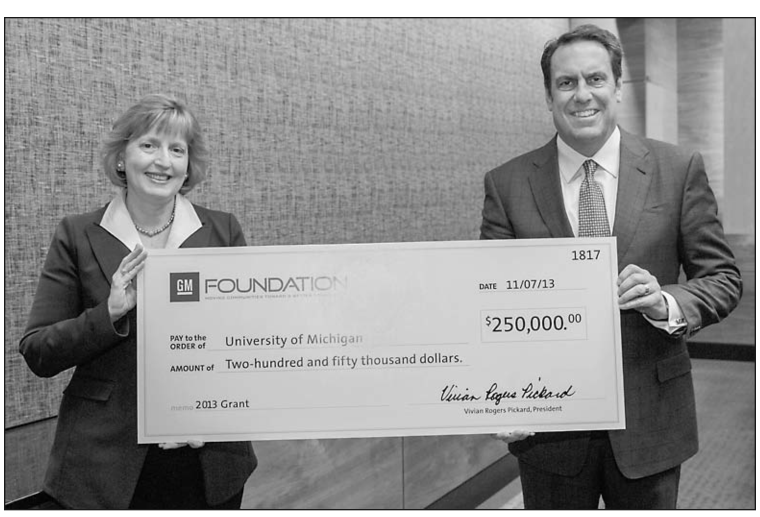

Alison Davis-Blake and Mark Reuss

'By Supporting Higher Education, We Ensure the Next Generation Receives Knowledge, Skills to Compete' – Pickard

The General Motors Foundation has just issued grants totaling $2.9 million to support 26 leading universities and partnering organizations across the country this year through its University/Organization Partner Program, said Foundation spokesperson Maria Mainville. The announcement was made on Nov. 26.

The initiative provides funding to advance secondary education curricula in science, technology, engineering and mathematics, also known as STEM, information technology and other fields important to the automotive industry, Mainville said.

"Working with leaders in education to strengthen curricula, foster a diverse learning environment and challenge young minds is a top priority for us," said GM Foundation President Vivian Pickard.

"By supporting higher education programs, we are ensuring that the next generation of leaders and innovators receive the necessary knowledge and skills to compete in a global marketplace."

On the University of Michigan campus Nov. 7, GM North America President Mark Reuss presented a $250,000 check to Alison Davis-Blake, Edward J. Frey Dean of U-M's Stephen M. Ross School of Business.

Over the last decade, the GM Foundation has awarded nearly $31.3 million in grants through the University/Organization Partner Program, Mainville said. Through this annual program, the GM Foundation helps prepare more students to graduate with STEM-related degrees. The funds also support design and manufacturing degree programs, diversity initiatives, student or-

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Silverado, Sierra Reworked for Improved Fuel Economy, Ride, Handling, Safety

by Jim Stickford

The designers and the engineers of the 2014 Silverado and Sierra had the chance to show off their work at the SAE Detroit Dinner at the San Marino restaurant in Troy Nov. 19.

Jordan Lee, chief engineer and program manager for the small block engine family at GM, said the 2014 Sierra/Silverado uses the "Gen 5" small block engine.

"The small block engine is venerable and has been around in one form or another since 1955," Lee said. "As the name indicates, this is the fifth-generation version of the small block engine. We had to redesign every part for the new Silverado/Sierra."

One of the main goals of redesign, Lee said, was to get substantial improvements in fuel economy. They were able to achieve the desired improvements through a combination of three different technologies – direct injection, cylinder deactivation and variable camshaft timing.

"Cylinder deactivation is done when the truck is 'light loading,'" Lee said. "That means it isn't hauling anything heavy and might even be in cruise control. On our V8, four of the truck's eight cylinders will be turned off. With the V6, two cylinders are deactivated."

By combining these three different technologies in a "synergistic" way, GM was able to achieve much better fuel efficiency, Lee said. "I know the word synergistic sounds like a lot of popular jargon, but what it means in this case is that by combining these three technologies we are able to get results that are greater than the sum of the parts."

And they were able to design the Gen 5 small block engine in a new way as well through the use of computational analysis. By designing the engine using a computer, GM was able to create "virtual engines" whose components could be tested in the computer, Lee said.

This saved the designers and engineers a lot of time, Lee said. In the old days, engineers would have to build a working prototype to test their ideas. That took a lot of time, money and effort. Once they got results, they would then make refinements to the engine design, build another one and then test that engine. During a redesign process, Lee said, it might have been possible to create three or four prototype engines.

Now, using sophisticated software, they've been able to test more than 100 iterations of the Gen 5 small block engine before deciding on the optimal design.

"My biggest surprise on this project was our ability to achieve real-world fuel economy gains," Lee said. "We did this by combining three technologies that have

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