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How the Scuderi Engine Came to Be

By NEAL E. BOUDETTE

The unusual engine design unveiled on Monday by the Scuderi Group, a family-run start-up based in West Springfield, Mass., is the product of a uniquely American story—it came from a lone inventor, a first-generation American and a D-Day veteran, who struck on an unorthodox idea and was at first ignored.

Early on, the Scuderi Group had so little success in approaching auto engineers that it contacted Ford Motor Co. through a man who had been a prep-school advisor of William C. Ford, great-grandson of Henry Ford.

The engine was conceived by Carmelo Scuderi, the son of Italian immigrants. Born in 1925, he got a job on a farm during the Depression and learned to tinker with engines. In 1943, he joined the Navy, wore his uniform to his high school graduation, and was put in charge of the giant engines powering a ship designed to land tanks and trucks on a beach. In the days after the Normandy invasion, it became a hospital ship and he helped tend the many wounded brought aboard.

After the war, he married, started a family, studied engineering on the G.I. Bill and landed at a defense contractor. Later he started his own engineering firm and developed test equipment and military fire trucks.

At home he pushed his children. He once offered his oldest son, Steven, a dollar if he could learn to stand on his hands. Later he paid out more dollars when Steven and his siblings learned to walk up the stairs on their hands. Eventually Mr. Scuderi set up used gymnastics equipment in their tiny backyard. Steven, Salvatore and Cindy Scuderi—who all now work at the Scuderi Group—and another son, Angelo, all eventually went to college on gymnastics scholarships.

After Mr. Scuderi retired in 1994, he began spending hours in his office at home, sometimes working through the night, scribbling calculations in pencil in spiral notebooks. Most simply had to do with energy and heat.

Some were accompanied by careful drawings of pistons and cylinders.

On Easter in 2001, he announced he was finally comfortable telling the family what he had been doing. "I've redesigned the internal combustion engine," Salvatore Scuderi recalled his father saying.

Mr. Scuderi's father then walked his son Steven through all his thermodynamics math, looking at pressures and temperatures and the pistons going up and down. By his calculations this split-cycle design he created allowed the fuel to be compressed to a much higher pressure and fostered faster and more complete burning of the fuel.

His children weren't immediately convinced. "I rolled my eyes and thought, 'What, are you kidding me?'" said Nick Scuderi, who is in charge of the company's marketing.

Nevertheless, Steven Scuderi helped his father patent the design. The Scuderi Group then joined with Southwest Research Institute in San Antonio to turn the concept into a real engine. In the fall of 2002, Mr. Scuderi had a car accident and checked into a hospital a few days later with seemingly minor pain in his arm. Days later he suffered a fatal heart attack.

His family decided to continue the work with Southwest to see if the design really had potential. One important simulation Southwest was doing looked at the flame speed in the design—a key determinant of an engine's efficiency. In 2002, Sal got a voice mail message while driving. It was from Steven with the results—the speed was far better than they had hoped. "I couldn't believe it," Sal Scuderi recalled. "I pulled over, and thought, 'The old man did it.'"

As Southwest ran more simulations and refined the design, the family firm started courting investors. In the first round, they raised about \$500,000, mainly from friends and family members. They also started sending letters to auto makers, and collecting a stack of rejections.

Then, a family friend offered to use a contact of his at the Hotchkiss School who

had served as an adviser to Bill Ford, the car maker's executive chairman. Through this channel they got a letter to Mr. Ford. A polite replay eventually came from the company, saying Ford didn't find a fuel-economy advantage to the design. "Good luck in your development of advanced engine technologies!" the letter concluded.

The first sign of interest came in 2006, when the Scuderi Group showed its engine at an automotive conference and some Honda engineers asked for more information.

In 2007, Daimler AG, wary of rising oil prices, was starting a research effort to identify future technologies that could improve fuel efficiency and asked the Scuderi group to make a visit to its offices in Stuttgart, Germany, people familiar with the matter said. In 2008, they went back for follow-up meetings, and Daimler asked for more detailed data on the engine, these people said.

Last summer, a group of Honda Motor Co. engineers from Japan traveled to Texas with meet with the Scuderis and Southwest Research, according to a consultant familiar with the meeting. At first the visitors appeared reserved, with jackets on, but by the afternoon the jackets were gone and they engineers were smiling and asking detailed questions as they examined the prototype engine parts the Scuderis had on hand, this person said.

A Honda spokesman declined to comment, saying the company doesn't discuss future projects.

Whether any of these auto makers ever license the engine design depends heavily on the prototype the Scuderi Group showed on Monday in Detroit. Next month the Scuderi Group and Southwest Research expect to fire up the prototype for the first time. That will enable them to get real-world data on how the design performs.

"There's a big difference between simulations and a working engine," a Daimler researcher familiar with the engine said. "It all seems interesting, if they can get it to work."

