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# Crawford's Innovative PaddleShift

By BRUCE MARTIN

One of the leading innovators in carbon-fiber composite construction is located in the heart of NASCAR country but it has created the latest in paddle-shifting technology in sports car racing.

Max Crawford is the man behind Crawford Composites. His impressive racing career began during the 1960s when he was in San Diego, Calif. He built his first car in 1964 for hill climbs and served as a crew chief for Jonathan Patrick Racing for five years before eventually moving to North Carolina to work with famed sports car driver Elliott Forbes-Robinson.

"Elliott brought me here to do the Trans-Am Series and I've been here ever since," Crawford recalled.

The innovative Crawford began devising new ways to build parts when he wanted more strength and less weight.

"We took delivery of an item for a 956 Porsche and the car was overweight, so we started experimenting with carbon fiber because of its strength and its light weight. We started experimenting with the aerospace industry in the early 1980s," Crawford recalled. "Through trials and tribulations we ended up making quite a bit of bodywork and then I got involved with Elliot in the 944 program for Porsche for Trans-Am. The original car was a 924 and we turned it into a 944 turbo. When that program came to an end, I did a lot of wind tunnel work on the Buick GT program and for Dyson."

Crawford Composites was formed in 1989 and began working on various projects for the GTO program and later GTP projects for Mazda, including the first privately built composite chassis. He also worked on some McLaren projects before getting involved in wind tunnel model construction for Ford and General Motors in NASCAR. He's also worked with the Pro Mazda Championship and Ferrari.

The company also sells around 300 wings a year to Honda, Toyota and TRD in sports car and other forms of racing.

Crawford Composites home base is 48,000 square-feet with 47 employees on staff. Its customers include teams



CRAWFORD COMPOSITES PHOTO

**PULL THE LEVER:** A unique steering wheel is the anchor of the new Crawford Composites PaddleShift system. (Below) The Pro Mazda Championship utilizes this paddle-shift method on its race cars.

from the NASCAR Sprint Cup Series, TUDOR United SportsCar Championship, NASCAR Nationwide Series, IndyCar, SCCA, World of Outlaws, vintage racing and the World Endurance Championship.

Crawford pioneered the introduction of autoclaved composite laminates for the U.S. race car industry and his company was the first privately owned American, non-aerospace company to build a complete carbon fiber composite car in 1990, the Mazda RX7-92P, for IMSA competition.

The company now also builds a PaddleShift system that is used in various levels of racing.

"There were paddle-shift systems here that you could buy as kits but a lot of them came from Europe, so I worked at it diligently for a while and decided it was time for us to make our own systems with the electronics back in 2012," Crawford said. "Our paddle-shift systems are used in Pirelli World Challenge, Pro Mazda

and various forms of club racing. I have a Pro Mazda car driven by a young man, Michael Johnson, who is a paraplegic and he uses our system on his car.

"The market I have is geared more toward the club racer because that is a much bigger market than going up to the Indy Lights cars or something like that," he continued. "They have their own system right now but our products are also used in Australia and New Zealand, so we are getting a foothold in that market."

It may be unique that one of the top sports car innovators and parts suppliers is based in the Lake Norman area of North Carolina, which is right in the middle of NASCAR territory.

"This is a fantastic area," Crawford said. "I was one of the first composite shops in the area and now there are quite a few. The pond for the composite market is very small because many of the teams now have their own composite shops. So we have

diversified into military and aerospace projects."

Crawford Composites is also exploring the possibility of working on items for paraplegic drivers who can be more independent by driving cars with hand controls. While that project is in the early stages of development, the company is focused on diversifying into non-racing areas.

"We made Daytona Prototypes for many years and had a lot of success with that," Crawford said. "Now we are heavily involved in the aircraft industry."

Crawford Composites' PaddleShift System is a fully configurable pneumatic sequential paddle-shift system. Designed for various sequential gearboxes, the system can be tailored to the customers' specifications.

"The CCPS is a combination of our composite experience and motor-sports prowess, and we are thrilled with the results," Crawford said. "Our decision to involve drivers and end users in the engineering process has produced a very clever, yet user-friendly system."

One constant of Crawford's company is the man who brought him to North Carolina in the first place, Forbes-Robinson, who enjoyed an outstanding career as a sports car racer and continues to work with Crawford on the development of the PaddleShift system.

"The CCPS shifts so seamlessly that you can make a late downshift change on a corner without upsetting the car, and shifting is so much faster than with a sequential gearbox with a traditional flat shift," Forbes-Robinson said. "Crawford's commitment to their customer is outstanding and goes way beyond production of this innovative system. Their team will manage all facets of the installation, including trackside setup and testing."

The company also works with GEMS Ltd. to provide a reliable and powerful closed-loop controller that is packaged in a compact and lightweight carbon-fiber composite unit.

This gearbox control unit features a high-speed processor, configurable analogue and digital inputs, CAN communications onboard logging, ratio learning and over-rev protection.

It can function with a wide range of components because the system is tailored to each installation. Actuator mounts, AN lines, CAN templates for the ECU and data logger and custom wiring using AS connectors are all produced in-house. ■



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