

# College students reinvent the Camaro

Improving fuel economy and reducing emissions, while maintaining safety and performance

By Jan Wagner

For the past 30 years, the US Department of Energy (DOE) Advanced Vehicle Technology Competitions have exemplified co-operation among the auto industry, academia and government to provide real-world, hands-on skills specifically applicable to the auto industry. EcoCAR 3, co-sponsored by the DOE and General Motors, was the

most recent of these premier collegiate automotive engineering competitions in North America. Over four years, and managed by Argonne National Laboratory, EcoCAR 3 challenged 16 universities to take a 2016 Chevrolet Camaro and re-engineer it into a hybrid-electric vehicle in order to further improve fuel economy and reduce emissions, all while maintaining the safety and performance expected from this iconic American car.

All the Camaros were required to be hybrids, with plug-in hybrids being an option that 15 of the 16 teams chose. Innovation is a key component of the competition.

Team members are typically chosen from a variety of educational disciplines, including mechanical and electrical engineering, computer science, communications and business. Some teams were considerably larger than others. Beyond the funding provided to each team, they may reach out to their individual communities for additional support to further fund their project. Each team had a faculty advisor from their university, a GM mentor and

access to many sponsors for expert advice.

The process included determining a target market, proposals, concepts and designs—subject to approval and with the understanding that some aspects of their Camaros may not be changed (Year One); taking delivery of the cars, swapping out engines and figuring out their battery configurations (Year Two); full hardware and software integration, and testing (Year Three); and refinement (Year Four). This mirrors General Motors' development process, so students who emerge from this program are better prepared to enter the workforce than are many of their peers. This is about building capabilities that will evolve American engineering. EcoCAR 3 accelerates the development and demonstration of emerging automotive technologies.

Year Four finals began with a week of rigorous safety, technical, drive quality and emissions testing at General Motors' Desert Proving Ground in Yuma, Arizona. For the second leg of competition, teams headed to Southern California for track

(Facing page) Ohio State University's first-place entry in the EcoCAR 3 Camaro competition.

(At right, top to bottom) The EcoCAR 3 Camaro from McMaster University, Ontario, Canada. // The University of Waterloo Camaro's Weber 850cc engine. // The University of West Virginia's second-place entry.

events, including autocross, acceleration and consumer appeal at Auto Club Speedway in Fontana. Teams also spent several days presenting to judges and proving how they have developed into the next generation of engineers and business leaders who are prepared to enter the auto industry and related careers. Industry and government officials judged the presentations.

The teams met in the parking lot of The Magic Castle in Hollywood, California, at the end of their four-year journey, where we joined them and went for rides.

No two Camaros were alike. Since the teams were not compelled to retain their Camaros' existing internal combustion engines, one team chose to swap theirs out for a snowmobile engine. Yet another upgraded to a 5.3 L V8. Several Camaros were outfitted with only one electric motor, whereas others had a pair and two Camaros had three. Likewise, transmission choices varied.

The University of Alabama's team incorporated two electric motors in their Camaro. One was belted to the front of the car's internal combustion engine (known as the P1 location). The second was located between the transmission and the differential (P3). Two other potential locations for the electric motors were in between the internal combustion engine and the transmission (P2) and after the differential—one for each wheel (P4).

Students say that participation in this competition can and does lead to employment with auto manufacturers, related companies and government. The University of Alabama's team says that GM has hired nine of their past tech leads.

While all of the participating students emerged from this competition with valuable experience that will serve them well throughout their careers, the first place overall trophy and an extra \$10,000 to further support their university's advanced vehicle technology program went to Ohio State University. Second place overall went to West Virginia University, followed by the University of Alabama in third place.

Awards were also presented for competition vehicle events, technical presentations, communications, project management and pre-competition technical deliverables. Additionally there were organizer and sponsored awards. ■

For full competition results and much more information visit [www.EcoCAR3.org](http://www.EcoCAR3.org) and [AVTCSeries.org](http://AVTCSeries.org). // For more photos, visit [www.drivetribe.com](http://www.drivetribe.com). search for "AutoMatters & More" and click on TRIBES.

