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## Grease Monkeys Become Tech Junkies; Computerized Cars Require More Than Wrenches to Repair

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Taylor Chamberlin works at a specialty garage in Gaithersburg and recently coaxed so much power out of his own Ford truck that it couldn't run on a rainy street for spinning its wheels. But he's not a mechanic and he seldom gets his hands dirty.

"I'm a computer nerd," Chamberlin said.

Guys who would have been banging under the hood with oily wrenches a generation ago are now more likely to work their magic with lines of software and a serial cable. The goal is the same -- to wring as much speed as possible out of an automobile -- but the computerization of cars has permanently changed what it means to work on your car.

Components that were once purely mechanical -- brakes, steering, suspension -- are now either electronic or controlled by computers. It's still possible to spend a Sunday afternoon tinkering on your Lexus in the driveway, if by tinkering you mean changing the oil. Otherwise, most home mechanics are restricted to cosmetic changes, such as installing a new sound system or putting light-up dragon heads on the wiper fluid nozzles. Almost anything that makes a car perform better is going to involve electronics.

"It has come a long way since the days of using a handful of wrenches and a screwdriver. It's amazing to see what these computer chips can do," said Peter MacGillivray of the Specialty Equipment Market Association, a trade group for companies that make auto accessories.

Car culture, in a sense, has become less democratic, harder for the average person to participate in with just some tools and spare time.

"I think it's going to hurt the hobby eventually," said Jon Bill, archivist for the Auburn Cord Duesenberg Museum in Auburn, Ind., and author of several books on vintage cars. Bill can handle anything on his '53 Ford, but when his late-model Jaguar wouldn't start one morning, he popped the hood and realized he had no idea what to do with the various cables and computer boxes staring back at him.

"I was, 'Gah, I'm helpless!' There was nothing to do other than call a dealer," he said.

Laptops are standard around Atlantic Motorsports, where Chamberlin works when he's not studying at George Mason University. Today's automobiles are packed with about a thousand times as much computing power as was in the Apollo moon landers, according to the Alliance of Automobile Manufacturers. Computer chips run more than 86 percent of the systems in an average vehicle, according to the alliance. Modifying them can ruin a car as quickly as juice it up, but if you know how, you can reprogram controls such as timing and air/fuel ratio to milk more power out of an engine.

The technology may annoy purists, but it hits the sweet spot for a generation of teenagers who learned about cars from video games such as Grand Turismo or Need for Speed. Marry the lust for hotter computer graphics to the classic urge

for faster wheels and the result is a new type of hot rod culture.

It's not called hot rodding anymore, though; it's "tuning." Magazines such as Super Street and Import Tuner are crammed with ads for computer chips and central processors alongside wheel rims and turbochargers. One company even advertises a way of converting a Nintendo Game Boy into a car diagnostic device. Many tuners focus on Asian imports such as the Honda Civic, Mitsubishi Lancer Evolution or Subaru WRX -- which for relatively little investment can produce as much speed with six- or even four-cylinder engines as the hulking V-8 muscle cars of the "Dukes of Hazzard" generation.

"The average commuter car is a much more refined product than it was 10 years ago," said Albert Ennulat, who runs the automotive technology program at the Gudelsky Institute at Montgomery College. "A lot of equipment is required to do appropriate jobs today that the homeowner is not going to have in his garage."

In the old days, he said, boosting performance might mean simply bolting on a turbocharger to make the engine more powerful. Today, that won't help the car without also reprogramming computer code to accommodate the new equipment. All those precision electronic controls have also changed mechanical systems, he said, making them so delicately machined that driveway mechanics shouldn't fool with them.

Some advances have eliminated the need for tinkering. Twenty years ago, a home mechanic might swap out a standard suspension system in favor of something stiffer, to improve handling around corners. Many modern cars have electronically controlled suspensions that can change at the flip of a switch.

"I don't know about all that stuff. That's all fresh and new to me," said Sam Chi, 59, who spent years as an auto mechanic in the 1970s and '80s. He drove a powerful Delta 88 back in those days, and dreamed of owning a Datsun 280Z. Now his son Dan, 17, has a Lancer Evolution with modifications Sam Chi can't begin to understand.

Dan's car was already a monster when he and his parents bought it last November. But while the high school junior insists he is a responsible driver who would never take risks with his beloved car, he wanted more power.

"I think making modifications is kind of like an addiction," Dan Chi said. "When you feel fast, you get used to it. You want that feeling of being even faster, of, like, the G-forces pushing you back in your seat and stuff."

Using his dad's old tools, Dan was able to install a new air intake on his own. But to make the computer and hardware changes that allowed his engine to jump from nearly 300 horsepower to nearly 400, Dan sold a collection of vintage Nike sneakers for cash and paid a professional.

That's because fiddling with the electronic brain is risky. Crash the electronic control unit, or ECU, and it can easily cost more than \$1,000 to replace. Enter the wrong performance instructions and the whole engine could burn up. Even properly readjusted engines will have a shorter life span because they wind up working harder. And modifying the computer system is likely to void parts of the manufacturer's warranty.

Carmakers don't exactly encourage the phenomenon, but some don't discourage it, either. Much of Mitsubishi Motors Corp.'s U.S. reputation rests on the performance possibilities of the Lancer Evolution, known as the Evo. "It kind of works both ways. We want them to be excited about the car, and we know they're going to do some things. But by the same token they have to be aware that modifications will do certain things to part of their warranties," said Janis Little, a Mitsubishi spokeswoman.

She denied a rumor, circulating a few weeks ago on Internet chat groups, that Mitsubishi was trolling online to identify and somehow punish Evo owners who reprogram their cars. In fact, she said, the company has given a handful of Evos to performance shops in California so they can retune them, and it takes the cars around to youth-oriented auto shows.

The trend has caused a shift in the industry for auto performance accessories. While the total performance equipment market has stayed around \$5 billion a year, more of that total is made up of computer-related gear, said MacGillivray of the Specialty Equipment Market Association.

New types of auto suppliers have emerged, such as GIAC of Irvine, Calif., which describes itself as a "software engineering company" that rewrites computer programs for European performance cars. Its slogan: "For people who

need MORE."

Chris Coulter of Curry's Auto Service Inc. in Northern Virginia uses GIAC routinely. On a recent weekday, Coulter, 36, had to reprogram the computer on a client's Volkswagen New Beetle.

First, Coulter plugged his laptop into a computer port under the VW's dashboard and downloaded the car's basic operating information. He e-mailed that to GIAC, which automatically e-mailed back a new software suite for the car, along with a "key" that allowed Coulter to use the file only for that one paying customer. Then Coulter loaded the new file into the VW, which took less than 10 minutes.

Coulter, who has a college degree in economics and management, is vice president for operations for Curry's; such reprogramming -- called "flashing" when it involves swapping software, or "chipping" if it involves replacing a car's computer chip -- is the only service work he performs.

"I wanted to do it personally to make sure everything worked," he said, given that the consequences of making a mistake could cost the shop significant money.

A few hitches marred the Beetle flashing -- the computer mysteriously quit in the middle of the process, but restarted without further trouble -- and when Coulter was done he took the car for a test drive. For a total cost of about \$750, the customer was getting about a 45 horsepower boost from the new software, as well as a device to allow him to switch back and forth between ordinary settings and the juiced-up program.

Coulter, a trained race driver, backed the car out of the Dulles- area garage and pulled onto a nearly deserted road in the rain. He didn't bother to turn on the windshield wipers, and as soon as he punched the accelerator, it was clear he didn't need to: Rain droplets streamed off the glass as the little car seemed to climb straight up, hitting 80 mph in a breathless few seconds before slowing again.

Though he's done it countless times, Coulter smiled and shook his head in disbelief. "And that," he said, "is a little 1.8-liter engine." Flashed in a few minutes, and he didn't even get his hands dirty.