

IS THE NEW TECH BOOM FOR REAL? (PAGE 113)

# WIRED

FEBRUARY 2006 ONE WORD: PLASTIC

## THE LEGO ARMY WANTS YOU

How obsessed fans are helping Lego  
reinvent the world's coolest toy

LIFE ON OTHER WORLDS! (We've Got Pictures)

THE PRIUS KILLERS: Inside GM's Chop Shop

One of Our SPY SATELLITES Is Missing



First, buy the hottest new car on the lot. Then rip it to pieces.

Inside GM's chop shop, they take (apart) the competition very seriously.

# THE TEARDOWN ARTISTS

by Carl Hoffman photographs by Brian Ulrich

Engineers at General Motors dismantle a Toyota Sienta. The "competitive teardowns" are the biggest open secret in Detroit.

**A silver Lexus RX 400h hybrid SUV** is suspended on a lift in a room the size of a soccer field at the General Motors Technical Center in Warren, Michigan. It was purchased off the lot just a few days ago for \$49,000, loaded, which seems a waste, since it's already a carcass. Mechanic John Klucka has removed its tires and engine and doors and seats and dashboard and, well, just about everything but a few wires and the windshield. "This is a complicated vehicle," he says, unbolting the engine from its frame, "and I've got no manual, so I'm taking it apart blind."

Within a few weeks, GM engineers will unravel the Lexus' every secret – down to the weight and production cost of each nut and bolt – just as they've done with every other Toyota hybrid model. The latest Prius lies in on a table in the corner, gutted, tagged, and spread out like a frog in a high school biology lab.

Toyotas aren't the only cars being disemboweled here at GM's Vehicle Assessment and Benchmarking Activity center. A 2006 Mercedes ML350 waits to be carved up with a handheld power saw. A VW Touareg is spread helter-skelter. Chryslers and Hondas and BMWs and Fords lie dismantled, their parts reduced to labels and data points: Cap ASM F/Tank Fil, 1 @ .068 kg. Switch ASM HTR w/ bezel, 1 @ .174 kg. It's all part of the biggest open secret in Detroit: Automakers reverse engineer their opponents' newest and hottest vehicles in what's called a competitive teardown.

"You wouldn't think there'd be any mysteries anymore," says auto industry analyst Lindsay Brooke. "But what used to be a closed club is now a ruthless global business. Suddenly you've got the Koreans undercutting the Japanese, and the Chinese about to undercut everyone. As much as you think you know," he says, "nothing beats picking up the parts, feeling them, weighing them, and knowing the processes that made them. Teardowns are part of a big cat-and-mouse game, and they're more important than ever."

Radios. Seat cushions. Welds. Drive trains. Bumpers. Headliners. Every company wants to know exactly how its competitors' cars are put together and how much they cost to make so it can learn how to

*Contributing editor Carl Hoffman (carlhoffmn@earthlink.net) wrote about Soviet fighter jet collector Don Kirlin in issue 13.10.*

save money on parts, shed weight, and improve its manufacturing methods. Even more important, teardowns help executives make long-term strategic decisions. A teardown of the 2004 Prius two years ago helped sour GM on hybrid technology. The company is slowly rolling out hybrid trucks and buses, but it's focusing its innovation efforts on fuel cells.

**A full teardown** takes about six weeks. First, mechanics measure the vehicle with a device called a 3-D vector arm, taking all of the car's inner and outer dimensions, like the bumper height and the distance from the driver's eyes to the steering wheel. They create a digital blueprint, then they disassemble the car. Each part gets named, weighed, and labeled with a number. Cost estimators gauge the price of every one, not only to determine what competitors spend but also to pressure GM's own suppliers. "We know a certain kind of plastic costs x per kilo," explains staff project engineer Craig Duncan, a round man in standard GM dress of khakis and a polo shirt. "So we know the mass of the part, what the labor rate is, and what the shipping costs are, and we start adding up all the puzzle pieces. It's a scientific way of being much more aggressive with our suppliers to push the cost down." Finally, all the information is entered into a database for GM engineers puzzling out new car designs.

Some insights are big and obvious. Toyota, for instance, installs many of the same parts, from seats to door handles, in models as diverse as the inexpensive Corolla and the luxury Lexus. But details, too, can be revealing. Most body frames have material to quiet vibrations: Chrysler uses glued pads; Ford, rows of a caulk-like substance. "Why did Ford do it that way?" Duncan asks. He points to what was recently a cherry Mustang and is now a bare-metal lower-body shell. "It looks primitive," Duncan says, pointing to the rows of caulk, "but it's not. A robot did it. That means one machine could be programmed for lots of different cars. No parts. No person babysitting the parts. No parts room. Huge savings." Duncan adds that the number and type of welds can show "how many robots they've got. Sometimes your competitors do things better than you; sometimes they don't. But you have to know."

On top of about 40 complete teardowns per year, GM subjects up to 20 vehicles – like the Mercedes ML350 SUV – to a process known as a "full trim-saw cut": 100-mm-wide cross sections are taken from the doors and roof pillars and fenders. "If you want to be competitive in the midsize luxury category, you have to look at the Mercedes," Duncan says. Flatbed scanners turn these slivers into digital blueprints. The diagrams enable the company's engineers to analyze such arcane information as the design of the A-pillar – the slender structure at the side of the windshield – which not only supports 155



**A GUTTED PRIUS. A DISMANTLED VW TOUAREG. CHRYSLERS AND HONDAS, BMWs AND FORDS — IT'S A REVERSE ENGINEERING GRAVEYARD.**