

FINE PRINT

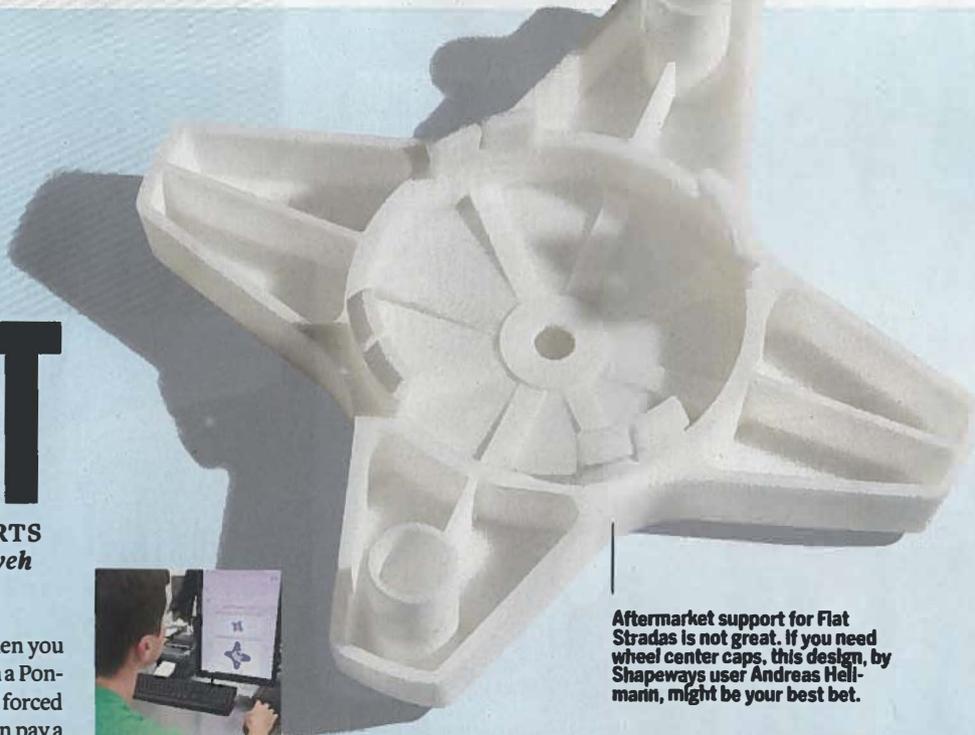
THE NAPSTER OF CAR PARTS IS COMING. by Clifford Atiyeh

IN THE BAD OLD days when you busted one plastic switch on a Pontiac Bonneville, your dealer forced you to buy an entire set. Now you can pay a Russian who builds replica *Star Wars* guns a couple of bucks to ship you a brand-new, OEM-quality part for your old Bonnie. And soon you may want to just make it yourself in your garage.

At this point, an aftermarket car part made by a 3-D printer could save you hours and hundreds of dollars, or it might simply snap in half. But just as computer-aided design rewrote automotive engineering in the 1980s, 3-D printing is looking to revolutionize the replacement-parts business, allowing car owners to create precise copies in their own garages, albeit with varying degrees of success at this early stage.

"There's no physical barrier anymore for people to start mass-producing parts," says Peter Weijmarshausen, CEO of Shapeways. A contract printer based in New York City, Shapeways can make any cosmetic part out of fused-filament plastic, steel, and even platinum. While many of its 1 million users hawk scale models and jewelry, a savvy seller can create a custom car part from scratch once the design work has been done. That includes Weijmarshausen himself, who crafted a pair of headrest brackets for his E36 BMW M3. "Only one person needs to solve a problem, and anybody can benefit from it," he says.

Websites such as Yeggi and Thingiverse host CAD files of everything from Ford F-150 fuel-door hinge pins to Donald Trump shift knobs. At 3D Hubs, you upload these files to receive instant quotes from people with 3-D printers near you who'll fabricate any job, no matter how small. With a copy of Autodesk 123D, you can render your own file from a few dozen photographs of the original part, or input



Aftermarket support for Flat Stradas is not great. If you need wheel center caps, this design, by Shapeways user Andreas Hellmarin, might be your best bet.



A HIGH-SIX-FIGURE PRICE PUTS SHAPEWAYS' PRINTER WELL BEYOND WHAT THE AVERAGE DIY USER WOULD BUY. ITS LASER-SINTERING PROCESS SHOOTS A LASER INTO A TRAY OF PLASTIC POWDER, FUSING IT LAYER BY LAYER. OTHER FORMS OF 3-D PRINTING DEPOSIT NEW MATERIAL, AS IF FROM A BIG TUBE OF GLUE. LASER SINTERING ALLOWS MULTIPLE PARTS TO BE "CAST" FROM A SINGLE TRAY OF POWDER.

numerical measurements into open-source software such as FreeCAD. If you're a true DIYer, you can piece together a \$500 printer or drop \$3000 for a fully assembled unit from Airwolf 3D, which celebrated Mustang tuner Saleen Automotive uses to make shift-knob parts.

But if 3-D printing sounds complex and geeky—not unlike Mercedes diesel owners recycling McDonald's cooking oil—it is. We're not at that point where 3-D printing is turning automakers,

suppliers, or eBay upside down. Even using high-quality plastics such as ABS, polypropylene, and polycarbonate, parts made with layers of melted plastic aren't as strong as those that are injection molded. Printer resolution, which dictates the fineness of the part being created, varies widely with the printer and the chosen material. Even the experts don't recommend building load-bearing parts from a 3-D printer, and without a laser scanner that costs as much as a Ford Focus, you couldn't replicate that broken control arm anyway.

But thanks to amateur support on car forums, you don't need to own any equipment to reproduce basic plastic parts. Anybody need cheap dash trim for a VW Vanagon?

I AM ALUMINUM MAN



When plastic wasn't fantastic enough, Joshua Pearce, a professor of materials science and electrical engineering at Michigan Technological University, built a 3-D metal printer by cobbling MIG weld guns onto a CNC routing table for less than \$4000. Pearce says his finished aluminum products have "remarkably high strength" compared with traditional casting and stamping methods. "There is a learning curve, but anybody who can rebuild a car can handle it," he says.