Popular Mechanics

The Hypermiling Jet Car

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December 8, 2009
http://www.popularmechanics.com/automotive/new_cars/4339212.html?page=2

The Capstone CT-380 hybrid, based on a Factory Five sports car chassis, uses a 30 kw/40 hp turbine engine to provide power to charge its Li-ion battery pack.

One look at the current crop of PHEVs on the horizon and it's easy to spot that we've made huge strides in drivetrain and battery technology in the last few years. In the case of every PHEV and hybrid announced or on the market, there's one commonality: an internal combustion engine that's big enough to give the vehicle its normal performance even when the battery pack has been depleted. The Volt will use a 140-hp four-banger right from GM's parts bin. The Prius and other PHEVS announced also use an IC prime mover in the vicinity of 100 hp.

I often ask the powertrain engineers in charge of these projects why this is. Why not use a smaller, less powerful engine instead? The engine on these vehicles is never used to actually charge the battery, only to provide get-home capability if a driver happens to need to drive further between charging stations than the battery pack can deliver. Why not use a much smaller engine with enough power to propel the vehicle no faster than 70? Forty horses, about 30 kilowatts, should be enough to drive along in traffic, run the air conditioning, and even have some power left over for battery charging. In traffic, there would be regenerative charging, allowing the little sustainer motor to maintain enough battery charge that you would be able to accelerate normally and even attempt a decent passing maneuver on a secondary road. A lighter, more compact IC engine would reduce the mass of the vehicle too, permitting better fuel economy. Usually, these powertrain engineeers say they won't consider such engines because, under some circumstances—like a really cold day and a battery pack that's heavily discharged—the vehicle would not have normal performance right away.

And in some respects they're right. I drove a VW bus with 40 hp for years when I was in college. It could hardly be called a suitable vehicle by modern standards, with so little acceleration that it was downright dangerous on a steep uphill.

Well, somebody has finally answered my queries and developed the little engine just right for an electric car. Better yet, it breaks a lot of other rules.

The answer: A Capstone turbine installed into a Factory Five exotic. Capstone builds standby and emergency generators that use turbines—yes, jet technology—powered by diesel fuel or natural gas. These ultra-small generators have only one moving part, use air bearings for the shaft they spin on, and are remarkably efficient. The main turbine and compressor are derived from automotive turbocharger technology, so the entire 30-kw (40-hp, roughly) powerplant is about the size of a microwave oven. There's no radiator, and the exhaust system is tiny.

Their first vehicle is a series hybrid, with a li-ion battery pack that can drive the vehicle 20 miles or so on a charge. With the turbine running and the battery charged, they claim over 150 mph for top speed. With the battery dead, it will still run 90 mph all day long, delivering 70 mpg. The entire drivetrain and battery-turbine-generator-transmission fits into the engine bay of the waist-high Factory Five sports car. Right now there's only one prototype car, but they've promised PM a chance at a testing session in early 2010.