

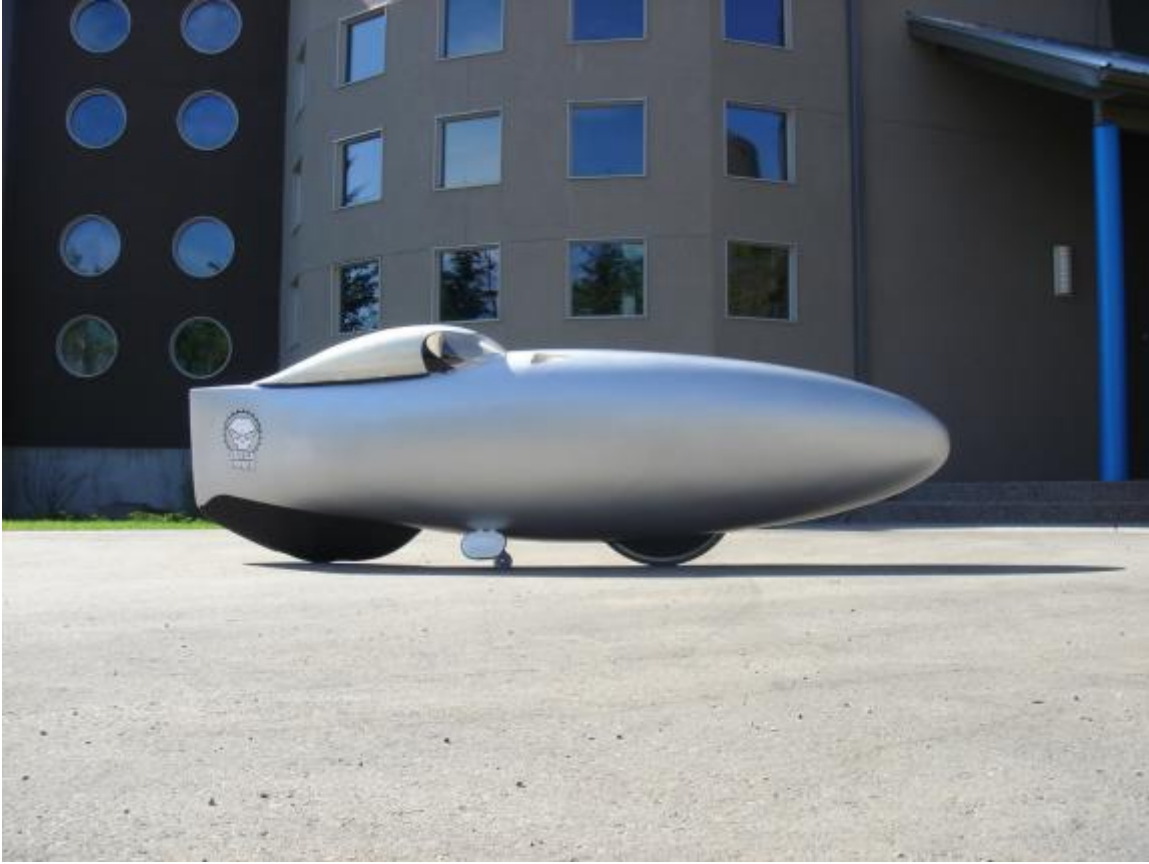
Power to the People

Whether by air, land or sea, eco-minded innovators worldwide are creating alternatives to gas-guzzling planes, boats and cars with human-powered vehicles. Sure, the concept may call to mind Fred Flintstone and his Jurassic contraption, but these inventions, which typically rely on leg propulsion, incorporate the latest in technology to maximize energy efficiency.

Of course, the most popular human-powered vehicle is the almighty bicycle, itself a model of efficiency. In fact, riding a bicycle about 2.5 miles—instead of driving that distance by car—eliminates 1 kg of greenhouse gas (GHC) emissions. [1] That may not seem like a lot, but imagine everyone in your neighborhood rode a bike to work every day—the amount of GHC prevented is staggering. In addition to being eco-friendly, since bicycles and other human-powered vehicles don't rely on traditional fuel, they also save money and are a great form of exercise for the user. That's why many European nations, like the Netherlands, already have strong bicycle cultures, and other countries and cities (including Paris and Minneapolis) are implementing programs to encourage citizens to use bicycles instead of cars or in tandem with public transportation.

That's also the primary motive of these human-powered vehicle builders: to make these machines efficient, affordable and practical enough that they catch on with large populations and reap the aforementioned benefits in high volume. But just what balance of human output and mechanical efficiency makes for the optimal human-powered vehicle? That remains to be seen, but students, scientists, engineers and techie types around the globe are trying to find that ideal formula. Creating and comparing human-powered vehicles has become so popular, in fact, that formal competitions are held in pursuit of the best invention, including the prestigious Human Powered Speed Championships, held by the International Human Powered Vehicle Association. According to its website, the goal is “to combine the best in technology with the best in athletic ability to obtain the fastest and most efficient human powered vehicles in the water, on land, and in the air; and to showcase ongoing technological development for speed and for practical human powered vehicles.” [2]

Still can't quite picture what we're talking about? The following examples illustrate the range of human-powered vehicles being built today—and the potential future of personal transportation as we know it.



CRITICAL POWER

It only makes sense to start with a proven winner, and that's what Greg Kolodziejzyk has in Critical Power. The two-wheeled, carbon-fiber recumbent bicycle was designed with a streamlined body to reach speeds in excess of 100 km per hour and maintain a cruising speed of 50 kph on a flat road. A testament to its energy efficiency, that same amount of effort on a mountain bike would only achieve speeds of 20 kph. After countless hours of training and fine-tuning, Kolodziejzyk and Critical Power set not one but two world records in California in 2006: the 24-hour human-powered distance record and the megameter record, which is the fastest time for 1,000 km. [3]

Photo Source: <http://www.adventuresofgreg.com/HPVMain.html>



HUMANCAR

Taking a more collective approach, designer Charles Samuel Greenwood built the HumanCar FM-4, a hybrid vehicle that can be operated using an embedded electric motor or by the power of four people rowing. Using all of the body's major muscles, the human carriage can reach more than 60 mph. [4] The latest model, the Imagine_PS, improves upon the original, and the Oregon-based Greenwood calls it "the world's first bionic-human hybrid." It comprises two electric motors as well as automotive batteries for power storage. "A single operator can run the Imagine_PS in electric-power-only mode, or any combination of human and electric power," Greenwood said. "It can also operate as a plug-in hybrid electric vehicle, as a mobile power generator, or in vehicle-to-grid (V2G) mode." [5]

Photo Source: <http://www.humancar.com/wp-content/uploads/2010/11/humancar-32.jpg>

<http://www.youtube.com/watch?v=tIXTtShQaSM>

PSU ZEPHYRUS

With their sights set on the Kremer Prize by the Royal Aeronautical Society, students in the Flight Vehicle Design and Fabrication class at Penn State University in Pennsylvania have designed the Zephyrus, which is currently in the construction and testing phase. Following in the footsteps of such human-powered aircrafts as MIT's Daedalus and the Gossamer Albatross, the aircraft, named after the Greek god of the west wind, has its pilot seated in a reclined position in a pod hanging from the main boom; the operator powers a 3-meter-in-diameter tractor propeller to make the vehicle fly. Looking to compete in the Prize's Sport Challenge, the Zephyrus must "traverse an equilateral triangle with 500-meter length sides once in each direction" within seven minutes total flight time. [6]

Video Source: <http://www.youtube.com/watch?v=tIXTtShQaSM>

<http://www.youtube.com/watch?v=fHlhKgFnJ1Y>

TALON 1

Floridians are no strangers to water, so it only makes sense that a group of students from Florida Atlantic University in the Sunshine State created a human-powered vehicle for underwater use. The Talon 1, created as part of the Human Powered Submarine Club, is operated by a single driver lying on his or her stomach while pedaling and steering. This July, the craft competed in the 20-year-old biannual International Submarine Race in Maryland and won the Absolute Speed Award at 6.814 knots, as well as Fastest Speed by Category (one man, propelled), Smooth Operator Award, and second place in Overall Performance. [7]

Video Source: <http://www.youtube.com/watch?v=fHlhKgFnJ1Y>

http://steamboatwilly.org/human_powered_hovercraft/gallery12.html

STEAM BOAT WILLY

Created for traversing over water instead of through it, Steam Boat Willy is another brainchild of ambitious students, this time at the Human Powered Flight Club of the University College London Union. According to its website, “many people of all ages, both genders and emanating from several parts of the globe have become airborne under their own leg power in the craft,” which comprises Styrofoam, spruce, carbon fiber and balloon fabric. A seated, reclined driver operates foot pedals to inflate the raft, which then releases pressurized air to allow the craft to glide across the water. [8]

Photo Source: http://steamboatwilly.org/human_powered_hovercraft/gallery12.html

Sources:

1. <http://velo-city.org/car-free/index.html>
2. <http://www.ihpva.org/about.htm>
3. <http://www.adventuresofgreg.com/HPVMain.html>
4. <http://www.renewable-energy-news.info/green-products-human-powered-hybrid-vehicle/>
5. <http://www.humancar.com/>
6. <http://library.propdesigner.co.uk/404HAIAA.pdf>
7. <http://hps.fau.edu/team>
8. <http://steamboatwilly.org>