Watch a Flying Hoverboard: Will We Soon Be Levitating?

The Hendo uses magnets to move riders on a cushion of air. A faster version debuts in October and skate parks may follow.

By Wendy Koch, National Geographic

PUBLISHED MAY 16, 2015

WASHINGTON, D.C.—With a high-pitched screech, a hoverboard lifts a rider one inch off the ground, floating on a cushion of air across a copper-plated stage.

The scene wasn't as swashbuckling as Marty McFly's spin on a floating skateboard in the 1989 movie "Back to the Future II." But Marty's ride—depicted as occurring in October 2015—was Hollywood fiction.

This one showcased real technology. The Hendo hoverboard, which uses a new kind of magnetic levitation, or maglev, appeared at Smithsonian magazine's "Future is Here 2015" festival that ended April 17 in the nation's capital, along with IBM's Watson and Lockheed Martin's Exoskeleton.

Hendo is certainly not the first thing to hover. Helicopters have long done so. Bullet trains also hover, allowing them to go super fast by avoiding the friction between their wheels and the rails. China's maglev train between Shanghai's downtown and airport travels up to 430 kilometers (260 miles) per hour. Last month in testing, a Japanese maglev train hit a record 603 kilometers per hour.

Yet the Hendo, which Time magazine hailed as one of the 25 best innovations of 2014, offers tantalizing possibilities. Unlike a train, it doesn't follow a track, so it can float freely above any non-ferrous metal surface that creates a magnetic field.

"We have the potential to go faster than anything on wheels," because hovering avoids friction that consumes energy, says Greg Henderson, a former AirBorne Ranger who earned a bachelor's degree in engineering from West Point and a master's degree in architecture from the University of California, Berkeley.

He says the Hendo uses one fourth as much energy (only 40 watts per kilogram) to lift the same weight as a helicopter. In October, he says a new version will debut that's smaller, lighter, and more powerful. Hendo's engines create magnetic fields, which react to a conductive surface to create a secondary magnetic field. The fields repel each other, allowing the board to hover.

What motivated Henderson to build the hoverboard wasn't the popular 1989 movie starring Michael J. Fox but the Loma Prieta earthquake that occurred the same year. He figured if he could make buildings levitate briefly in emergencies, they would withstand earthquakes. So he

decided to start by hovering something smaller—something that would capture the public's imagination.

“We’ve put our entire life’s savings into it,” says Henderson of launching the company Arx Pax (Latin for “citadel of peace”) with his wife Jill to develop the technology they call Magnetic Field Architecture. They started in the living room of their Los Gatos, Calif., home, then spread out to the backyard. Last year, as their team expanded to include newly minted engineers from MIT and Princeton, they opened a warehouse with a special floor and skateboard-style half pipe for testing prototypes.

The Arx Pax hoverboard uses opposing magnetic forces to float above the ground.
The couple raised $510,000 from a popular Kickstarter campaign last fall, bolstered by a video of skateboarding legend Tony Hawk using the board. They sold hundreds of their developer kits, the White Box, and in the first 24 hours, they sold 10 Hendos for $10,000 each. They’ve since raised more money from family and friends and have been approached by people wanting to build hoverboard skate parks.

“It’s our stepping stone to doing much more purposeful things,” says Jill Henderson of the Hendo, noting the couple’s interest in licensing the technology for eventual uses such as moving cargo in warehouses or creating cheaper maglev transit. She says they could easily hover toys, but they don’t want to enter the toy business.

Will they succeed? Others, even Google, have developed hover prototypes but have not commercialized them. The Hendo itself can only be used over conductive surfaces, and riders need lots of practice to stay balanced and not fall off. Maglev trains, which only hover once they reach high speeds, are extremely expensive—costing tens of millions of dollars per kilometer.

We have the potential to go faster than anything on wheels.
—Greg Henderson

Efforts to bring maglev trains to the United States, including one that would take passengers from Washington, D.C., to New York in one hour, have raised money but still face obstacles, primarily upfront costs. “Urban maglev poses a fundamental change in technology that is viewed as being a major risk that is cost-prohibitive,” the Federal Transit Administration says in a 2012 report.

Greg Henderson says his omni-directional technology could cost less than prior types, because it doesn’t need a track, and multiple materials such as graphene can be used to create a conductive surface.

He sees other benefits, too. Instead of using asphalt, he says, roads could become hover lanes embedded with conductive materials but covered in vegetation to absorb heat-trapping carbon emissions: “Freeways can become greenways.”