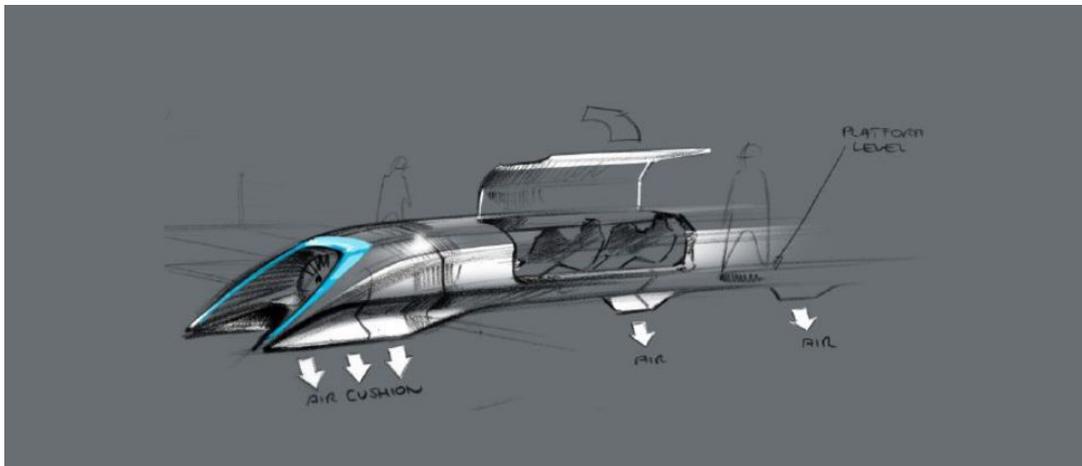


TECHNOLOGY

The Hyperloop: Elon Musk's Transportation Vision

by Elle Mahdavi



Proposed in 2013, the hyperloop is a high-speed vacuum tube transportation system that is twice as fast as air travel, and much more energy efficient. But how viable is this concept in reality?

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Getting to Los Angeles from San Francisco takes about an hour by plane. By vacuum tube, however, that trip could be cut in half. Elon Musk, CEO of SpaceX, proposed constructing a “hyperloop” between LA and SF in 2013, five years after California voters approved a budget to construct a high-speed train. Alongside travel efficiency, a hyperloop would be more environmentally conscious than all other existing modes of transportation.

How it Works

A pod-like vehicle traveling through a vacuum tube would encounter very little air resistance, hypothetically allowing it to reach speeds of up to 800 mph without requiring much energy. Instead of running on a track, the pod would float above one by means of magnetic repulsion, reducing friction and regulating its speed. The hyperloop would also rely on solar energy instead of gas. It could be placed either above or below the ground, depending on the terrain that it covers.

The Costs

Musk argued that taking a trip on a hyperloop would cost as much as a train ticket, as the pod would ideally fit over 800 people. Further, Musk claimed that building this transportation system would cost \$6 billion dollars, far less expensive than the \$68 billion that California has allocated for a high-speed rail—on top of the extra \$647 million that Caltrain has recently requested from the U.S. Department of Transportation. While it is clear that rail transportation isn't incredibly economical or fast, it is also unclear whether the hyperloop could ever be developed as a viable replacement. Critics argue that \$6 billion could not cover the costs of a construction, and SpaceX hasn't adopted the project directly.

Key Players

However, SpaceX is holding competitions for university-level students to create vacuum train pod prototypes. The first phase of Competition I was held in January 2016 where 315 teams competed for best pod design. Twenty-seven teams were then chosen to build pods and compete in the second phase at SpaceX's Hawthorne, CA track in January 2017. Only three teams out of the twenty-seven were eligible to run the track because of quality and time restrictions. Delft University's team came out victorious with the highest overall score, and Technical University of Munich's pod completed the track in the shortest

amount of time. Competition II will be held in June of 2017 for existing as well as new team, and the main focus will be on pod speed. These SpaceX-sponsored competitions are fueling incredibly valuable private and public research for vacetrain systems.

There are also some private companies attempting to construct vacetrain systems based on the hyperloop model, such as *Arrivo*, **Hyperloop One**, and **Hyperloop Transportation Technologies**. Arrivo was started in early February 2017 by the ex-CEO of Hyperloop One. The company hasn't yet outlined its upcoming projects or collaborations. Hyperloop One wants to create a hyperloop route between Helsinki, Finland and Stockholm, Sweden, although it currently doesn't have approval for such a plan. A Swiss logistics company, Cargo Sous Terrain, recently partnered with Hyperloop One to establish a specific vacetrain system for cargo transportation. Hyperloop Transportation Technologies operates out of Toulouse, France and has agreed to a deal with the Czech Republic and Slovakia to construct a hyperloop between the cities of Brno and Bratislava. As well, Hyperloop TT claims to have a deal in the United Arab Emirates for a route between Abu Dhabi and Dubai. Musk further enlivened the transportation industry by creating "The Boring Company" in December 2016, dedicated to creating new underground tunnel-boring technologies. Although this isn't a direct step towards constructing a hyperloop, it's headed in a direction that will eventually include some sort of encapsulated high-speed travel.

These companies are finding more success in cities and countries without major legislative restrictions. In the United States, and specifically in California, where Musk suggested a hyperloop be constructed, land rights and regulations pose huge obstacles. Developing an underground tunnel, or overground tube, that travels in a straight line for 500 miles will necessarily infringe on private property. A major land deal would have to be figured out, for neither a hyperloop startup nor the government would be able to financially compensate residents for that much property loss.

The Future

For the hyperloop to happen, the routes chosen would have to allow for linear motion over many hundreds of miles. As well, tens of billions of dollars of funding would have to be available for whoever is chosen to undertake the project. Although the physics behind

hyperloop is sound, the feasibility of implementation still needs a stronger foundation. Whether this type of travel will be implemented in the near future is questionable, but it's obvious that current transportation methods are becoming outdated. Bent Flyvbjerg, a professor at Oxford Business School specializing in infrastructure policy, claims that productivity in the transportation sector has been lacking for the past fifty years. The industry has been stagnant, and it's begging for new ideas. Although some argue that hyperloop won't be a reality for some time, at the very least, it's breaking new ground (idiomatically and literally) in a currently uninspiring field and inciting innovation.



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