



## Insight

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# Hyperloop – transportation of the future



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Five years ago, Elon Musk, creator of Tesla, published a white paper on a theoretical system called hyperloop, inviting anyone to make it a reality. At first it seemed like a mere exciting futuristic possibility.

However, since then, several companies have attempted to be the first to build a fully functional hyperloop and loop transportation system. Virgin Hyperloop One, Hyperloop Transportation Technologies and Musk's own company, Boring Co. are the companies paving the way for this exciting future of transportation

Hyperloop is an ultra-high-speed public transportation system, which allows customers to travel on autonomous electric pods at around 960 km/h. It will essentially embody an elevated structure, metal tube, bullet train, pressure vessel and vacuum system combined as one.

It's aimed at removing the two things that decrease the speed of normal transportation - friction and air resistance.

## How does hyperloop work?

This concept developed by Elon Musk is said to allow travel up to 1,223 km/hr. Imagine getting to Melbourne from Sydney in 50 minutes, or Melbourne to Brisbane in 1.5 hours.

Elon Musk's initial plans for hyperloop involved having the pods float on a layer of pressurized air, similar to how a puck moves on an air hockey table. However, the focus is now on magnetic levitation (maglev) technology to 'float' the pods.

Maglev enables an object to be suspended in the air using magnetic fields with no other support. Magnets are placed on the bottom of the capsules, which focuses the force of the magnets on one side, while cancelling out the field on the other side. The pods will float when they glide over electromagnetic coils in the track of the hyperloop. Speed and acceleration is achieved by linear motors which thrust the pods forward. Within the tunnels, air pressure is lowered using air pumps to create a vacuum which enables the pods to glide with much lower drag, and less electricity usage.

Currently, a few countries (China and Japan) have already utilised this technology within national transport systems, where the fastest trains in the world reach up to 600 km/h.

## Virgin Hyperloop One

Virgin Hyperloop One has established a 500m long test loop in the Nevada Desert, which is the experimentation ground for the maglev and pump technology. However, despite the test location, it is likely that the first hyperloop won't be built in the U.S. but possibly in India or the United Arab Emirates. Hyperloop One aims to launch at least three fully operational commercial systems by 2021.

- They have signed a deal with the state of Maharashtra in India, to examine if a loop between Pune and Mumbai is feasible, shrinking the usual three hour travel time to 25 minutes. Richard Branson claims that travel will cost less than the price of flights, but more than a first-class train coach ticket
  - Eventually, they want to build a 1,000 km long national network connecting India's major cities
- Looking into a possible hyperloop between Dubai and Abu Dhabi, which aims to cut travel time from 90 minutes (car) to 12 minutes. It will be able to transport 10,000 passengers per hour in both directions. The tunnel will be elevated upon concrete pylons or pillars, which are designed to adjust to the movement experienced when a pod passes

In order to create a vacuum, the test loop (DevLoop) has been able to decrease the air pressure inside the tube to be equivalent to what you get at 200,000 feet in the air. Several hundred test runs have been conducted, and the pod was successfully accelerated to 380 km/h in a few seconds.

There have been several plans as to what types of pods will be developed, such as a pod that can carry both passengers and cargo. There are also prototypes detailing a pod containing leather seats, no windows and an interactive entertainment screen in arm rests, like in a plane. Each pod is designed to carry up to 10 passengers.

## Hyperloop Transportation Technologies (HyperloopTT)

HyperloopTT is yet another company competing in the race to build a fully operational hyperloop. It has begun construction of a kilometre-long test track in France, which makes it the third hyperloop test track to date. It has received a large portion of its capital through a crowdfunding campaign and has numerous volunteers from established technology-based companies such as NASA, Boeing, Tesla and even SpaceX.

## Boring Co.

Elon Musk's role in hyperloop was never meant to be anything but preaching the idea to the masses and watching from the sidelines as another company built what he envisioned. However, he has decided to get involved, which may threaten the other hyperloop companies discussed above. His financial, technical and political expertise may outshine other competitors, and Space X holds the trademark to 'hyperloop'.

One of his other companies, Boring Co., specialises in tunnel construction and reinventing roads, with the goal to transport vehicles in a subterranean tunnel system, to decrease the level of traffic congestion we experience today – a system called 'loop'.

Loop is a similar concept to hyperloop, but rather than enabling high-speed long-distance travel, the system would be designed for shorter routes, such as being an underground metropolitan public transportation system.

- It is designed to give priority to pedestrians and cyclists first, transporting 8-16 passengers in any one pod
- Once the mass transportation needs are met, it will be able to transport cars on individual pods
- The pods are loaded/unloaded at street level before descending underground, where they travel on an electric skate platform
- The skate platform would be propelled by multiple electric motors, and would offer numerous benefits such as increased safety, speed (200-240 km/h within cities), and reduction of hazardous emissions

It has completed the first part of the tunnel in Los Angeles, connected to SpaceX's parking lot, as a first step to building the network of tunnels around LA.

In 2017, Musk announced that he sought permission to build a link between Washington D.C., Baltimore and New York City.

## Challenges

- How to ensure and guarantee that travelling by hyperloop is safe? – i.e. what if the supporting pillars collapse or shift in an earthquake? What if a hole is pierced through the side of the tube, what will happen to the air pressure?
- Need to consider how to supply enough energy to allow the pods to travel at near supersonic speeds. While the initial plan was to use renewable energy, such as solar power, this probably won't be feasible considering the sheer amount of energy required for the vast network
- Overcoming bureaucratic regulations that dictate where things can be built and what can be built
- How to compete against already established and highly favoured modes of travelling long distance, such as planes and trains? Particularly in terms of pricing and safety. This issue is highly pertinent in India, which is a highly price sensitive market
- Maintenance costs involved with ensuring the loop system continues to work over hundreds of kilometres

# Thanks for reading

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