

## **HYPERLOOP**

The concept of transportation of passengers in pneumatic tubes is not new. The first patent to transport goods in tubes was taken out in 1799 by the British mechanical engineer and inventor George Medhurst. In 1812, Medhurst wrote a book detailing his idea of transporting passengers and goods through air-tight tubes using air propulsion. In the early 1800s, there were other similar systems proposed or experimented with and were generally known as an Atmospheric railway.

The system worked at near-atmospheric pressure, and the passenger car moved by means of higher-pressure air applied to the back of the car while somewhat lower pressure was maintained on the front of the car.

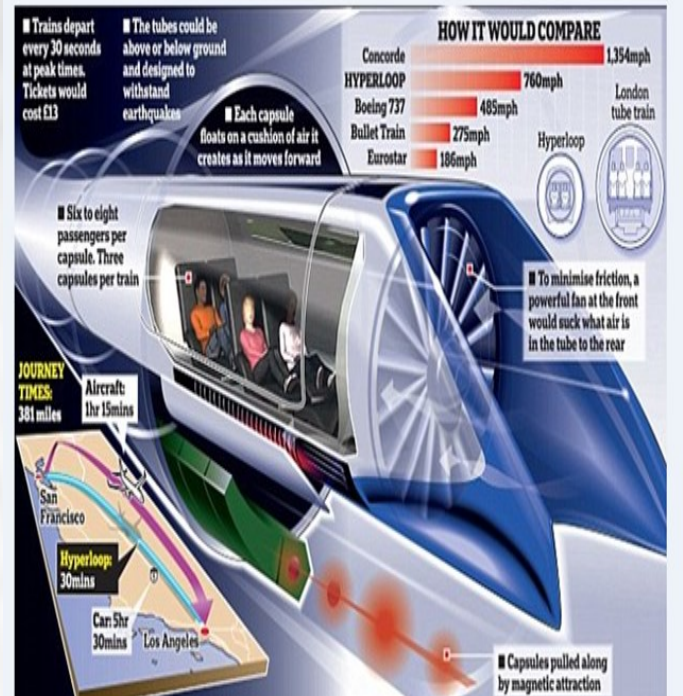
In the 1910s, vacuum trains were first described by American rocket pioneer Robert Goddard. Hyperloop is a proposed mode of passenger and freight transportation that propels a pod-like vehicle through a near-vacuum tube at airline speeds.

The pods accelerate to cruising speed gradually using a linear electric motor and glide above their track using passive magnetic levitation or air bearings. The tubes can go above ground on columns or underground, eliminating the dangers of grade crossings. It is hoped that the system will be highly energy-efficient, quiet and autonomous. The concept of high-speed travel in tubes has been around for decades, but there has been a resurgence in interest in pneumatic tube transportation systems since being reintroduced, using updated technologies, by Elon Musk after 2012, incorporating reduced-pressure tubes in which pressurized capsules ride on an air cushion driven by linear induction motors and air compressors.

### **THEORY & OPERATION**

Developments in high-speed rail have historically been impeded by the difficulties in managing friction and air resistance, both of which become substantial when vehicles approach high speeds. The vactrain concept theoretically eliminates these obstacles by employing magnetically levitating trains in evacuated (airless) or partly evacuated

tubes, allowing for speeds of thousands of miles per hour. However, the high cost of maglev and the difficulty of maintaining a vacuum over large distances has prevented this type of system from ever being built. The Hyperloop resembles a



vactrain system but operates at approximately one millibar (100 Pa) of pressure.

The Hyperloop concept operates by sending specially designed "capsules" or "pods" through a continuous steel tube maintained at a partial vacuum. In Musk's original concept, each capsule floats on a 0.02–0.05 in (0.5–1.3 mm) layer of air provided under pressure to air-caster "skis", similar to how pucks are suspended in an air hockey table, while still allowing for speeds that wheels cannot sustain. Hyperloop One's technology uses passive maglev for the same purpose. Linear induction motors located along the tube would accelerate and decelerate the capsule to the appropriate speed for each section of the tube route.

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With rolling resistance eliminated and air resistance greatly reduced, the capsules can glide for the bulk of the journey. In Musk's original Hyperloop concept, an electrically driven inlet fan and air compressor would be placed at the nose of the capsule to "actively transfer high pressure air from the front to the rear of the vessel," resolving the problem of air pressure building in front of the vehicle, slowing it down.. A fraction of the air is shunted to the skis for additional pressure, augmenting that gain passively from lift due to their shape. Hyperloop One's system does away with the compressor.

In the alpha-level concept, passenger-only pods are to be 7 ft 4 in (2.23 m) in diameter and projected to reach a top speed of 760 mph (1,220 km/h) to maintain aerodynamic efficiency; the design proposes passengers experience a maximum inertial acceleration of 0.5 g, about 2 or 3 times that of a commercial airliner on take off and landing. At those speeds there would not be a sonic boom.

Government for a proposed route between Chennai and Bengaluru. If things goes well, the distance of 345 km could be covered in 30 minutes.



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Hyperloop One of Los Angeles is the only company currently building a full-system and full-scale Hyperloop prototype and is expected to run the first test in early 2017, having demonstrated its propulsion system in May 2016. SpaceX built an approximately 1-mile-long (1.6 km) subscale track for its pod design competition at its headquarters in Hawthorne, California.

Hyperloop Transportation Technologies (HTT) is (a group of 500 part-time engineers) in process to sign a Letter of Intent (LoI) with the Indian