

YOUNG
ENGINEERS
CLUB

SINGAPORE
POLYTECHNIC | **SP**



PHOTO: Yosemite (Wikipedia)

Flying without Wings

Flying without Wings

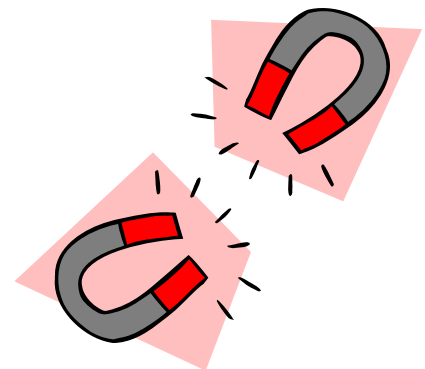
CAN TRAIN FLY?

Before you shout “NO WAY”, trains are already flying in Shanghai, China. The Shanghai Maglev Train (SMT) is a magnetic levitation train that has no wheels and float on air. This train can reach 350 km/h in 2 minutes, with the maximum normal operation speed of 431 km/h. At that speed, Maglev is even faster than a F1 racing car whose top speed is 370km/h. The SMT currently ferries commuters between downtown Shanghai and Pudong International Airport in less than 8 minutes, as compared to an hour of taxi ride.

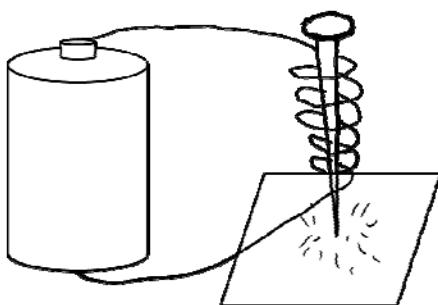


WHAT IS MAGLEV

How can Maglev train fly without wings? Maglev is short for magnetic levitation, which means that these trains will float over the track using the basic principles of magnets. If you've ever played with magnets, you know that opposite poles attract and like poles repel each other. This is the basic principle behind electromagnetic propulsion.



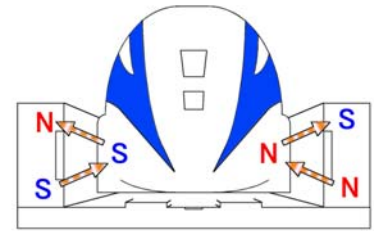
ELECTROMAGNET



Electromagnets are similar to other magnets in that they attract metal objects, but the magnetic pull is temporary. You can easily create a small electromagnet yourself by connecting the ends of a copper wire to the positive and negative ends of a battery. This creates a small magnetic field. If you disconnect either end of the wire from the battery, the magnetic field is taken away.

To concentrate the magnetic field in an electromagnet, the wire is wound into a coil, with many turns of wire lying side by side. The magnetic field of all the turns of wire passes through the centre of the coil, creating a strong magnetic field there. By controlling the amount of electric current, the strength of the magnetic field can be rapidly manipulated over a wide range.

The magnetic field created in this wire-and-battery experiment is the simple idea behind a maglev train rail system – to create a transportation system that flies above track – with no engine, no wheels and of course no wings! The magnetized coil running along the track, repels the large magnets under the train, allowing the train to levitate up to 10 cm above the track. The train simply moves forward using the repulsive and attractive forces of magnetism by alternating the electric current supplied to the coils.



BENEFITS OF MAGLEV TRAIN



Maglev trains float on a cushion of air, eliminating friction. This lack of friction and the trains' aerodynamic designs allow these trains to reach unprecedented ground transportation speeds of more than 400 km/h. In comparison, the top speed of a Boeing-777 commercial airplane is about 900 km/h.

Beside speed, Maglev offers many unique benefits. Comparing to other transportation system, Maglev is very energy efficient. Unlike cars, trucks, and airplanes, Maglev does not burn oil, but instead consumes electricity. Operating costs is only 3 cents per passenger mile, compared to 15 cents per passenger mile for airplanes.

Maglev tracks are cheaper to maintain, because there is no mechanical contact and wear. Similarly, Maglev vehicles will last longer than autos, trucks, and airplanes.

Maglev trains emit no pollution. When they consume electricity, no carbon dioxide is emitted. Maglev vehicles are much quieter than autos, trucks, and airplanes, thereby reducing noise pollution in their surroundings.

MAGLEV – THE FUTURE OF HIGH SPEED TRAVEL

If you've been to an airport lately, you've probably noticed that air travel is becoming more and more congested. Despite frequent delays, airplanes still provide the fastest way to travel hundreds or thousands of miles. However, as engineers work to perfect the Maglev technology, we expect to see Maglev trains replacing most domestic flights, ferrying passengers between distant cities in a cheaper, cleaner, quieter and greener way.

References:

<http://en.wikipedia.org/wiki/Maglev>