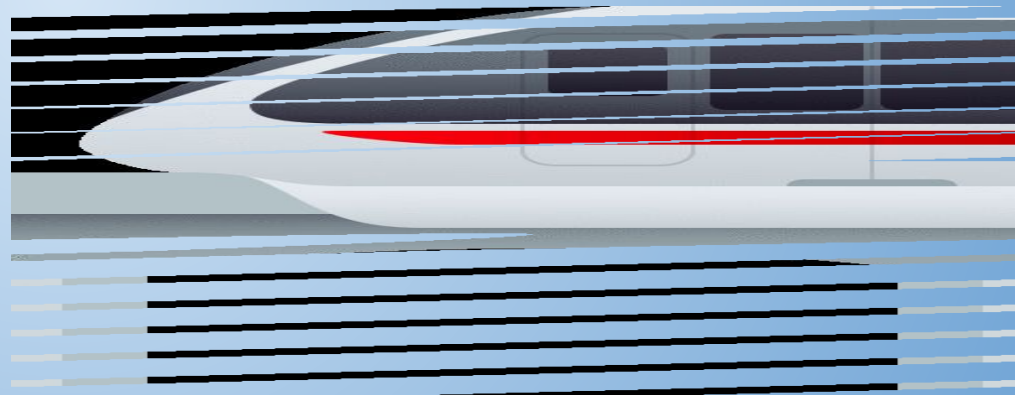


Magnetic Levitation

How do magnets fight gravity?

Introduction

This project is about using magnets to make a maglev train float, and move without touching the track. Instead of using wheels, the train uses magnetic forces to lift up slightly above the track. This helps reduce friction, which is known to be the force that slows things down when they rub together. This is to demonstrate how magnets can push against each other and allow the train to move more smoothly while traveling, similar to how real maglev trains work.



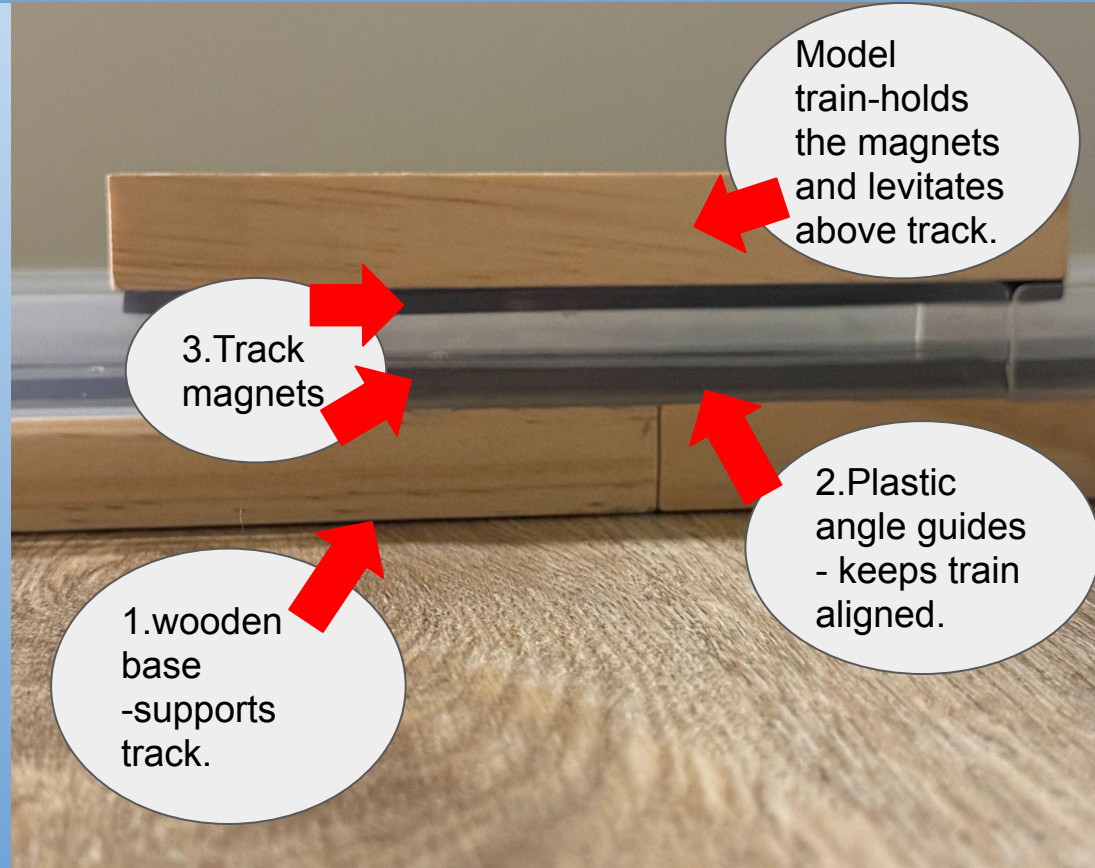
Problem & Predictions

It is hypothesized that if the magnetic track and the train are oriented with the poles facing, then the resulting repulsive magnetic force will counteract gravity, allowing the train to meet the criteria for levitation. This interaction is expected to create a stable air gap satisfying the criteria for levitation by maintaining a state of equilibrium, where the train remains suspended without physical contact on the track. The problem is finding out how much power is needed to create levitation with a stable force.



Procedure

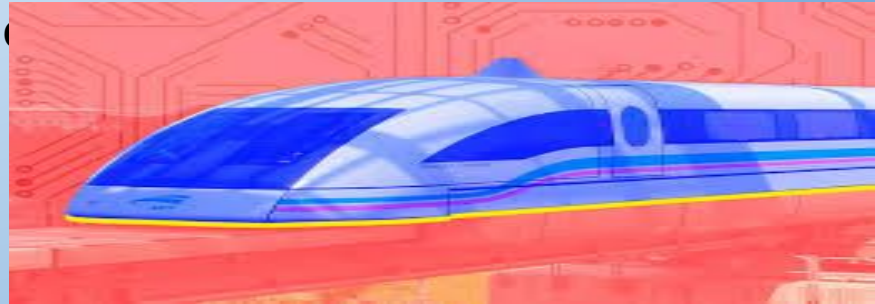
Magnetic repulsion occurs when like poles (north to north) face each other, which causes the train to levitate above the track.



Results

During the experiments it was learned that the spacing between plastics guides was highly important. At first, the guides were too close or crooked. And the wooden block train either got stuck or rubbed against the sides too much. There was different spacing tested and it had to be made sure the guides were completely straight. When the right spacing was found the train could then slide smoothly without touching the sides or getting stuck.

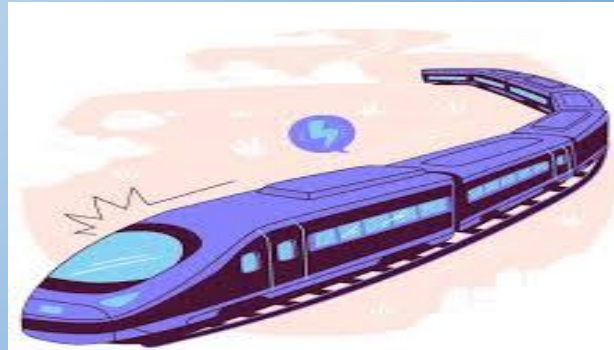
The magnets had to be lined up perfectly, or the train would wobble instead of float. It had to be tested in different positions and alignments until the magnets were straight and evenly spaced. Eventually the magnets were lined up to repel evenly, and the train levitated properly and the



Discussion & Interpretation

The maglev train model was successfully demonstrated magnetic repulsion. like when poles faced each other, the train lifted above the track. The angle guides helped keep the train stable and aligned.

Magnet size and spacing are important design factors. If the magnet strips were too large then it would not fit properly on the track. If the magnet strips are too small, the magnetic force would be too weak, causing the train to become unstable. Precise alignment and correct magnet size which is about 3-4 cm in width would fit the track and would not be too weak and spent fit.



Implications & Ideas for future research

This project demonstrates how magnetic repulsion can reduce friction by allowing objects to levitate. Real maglev trains use similar principles to travel efficiently at high speeds.

Future research could test different magnet strengths, track lengths, or guide designs to improve stability and lift. Additional experiments could also measure how weight affects levitation height and performance.

References

Information for this project was gathered from Britannica kids, NASA's website about magnetic levitation, Science Buddies. These sources helped explain how magnetic repulsion works and how real maglev trains use magnets to reduce friction and travel at high speeds.

