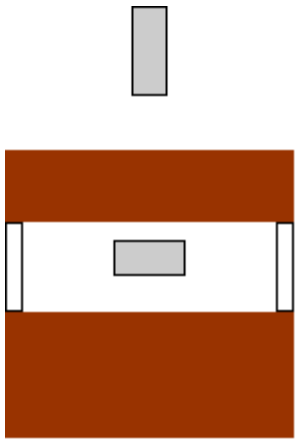
Floating in Copper

You can fly with a little help from your friend Eddy



Introduction

Eddy currents in copper help you to fly a magnet in midair.

Materials

- Thick pieces of copper or aluminum. (Copper is twice as conductive as aluminum, silver would be better still!)
  The bottom piece should be as thick as possible the top piece 4 cm thick or less. The pieces should be at least 10 cm in diameter (but they need not be round.)
- Neodymium magnets, the flying magnet should be at least an 2 cm in diameter and 1 cm thick. The lifting magnet should be at least 2 cm in diameter and 5 cm thick.
- Spacers, non magnetic materials to keep the two pieces of copper apart. keep them about 5 cm apart.

Assembly

Use the nonmagnetic spacers to keep the pieces of coper separated.
The closer the pieces of copper are to each other the easier it is to fly the magnet.

To do and notice

Place the flying magnet between the slabs of copper.
Raise and lower the lifting magnet to fly the flying magnet between the slabs of copper.

If you completely remove the lifting magnet then raise the flying magnet and drop it you will see that it falls slowly. Much slower than freefall under gravity.

What's going on?

When a magnet moves near a conductor of electricity electric currents called eddy currents are induced to flow in the conductor.

These eddy currents make magnetic fields which oppose the motion of the magnet.

These eddy currents slow the fall and the rise of the flying magnet.

They slow the motion of the flying magnet enough that the human eye-brain-hand feedback loop has enough time to adjust the position of the lifting magnet to keep the flying magnet in the air between the slabs of copper.

So What?

Eddy currents are used to stop some freefall rides at amusement parks. Large neodymium magnets are placed on the back of a car. The magnets surround a rail.

Part way down the fall the rail is made of copper.
Eddy currents in the copper slow the car to a safe stop.

At Great America south of San Francisco, the ride is known as the drop zone.

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