

A train as fast as a plane

The world's first commercial magnetic-levitation train – nicknamed the 'whispering arrow' – is to be built in Germany. The 400km/h train will run between Hamburg and Berlin, cutting travelling time from over 3 hours to less than an hour. The train glides on a magnetic cushion created using the principle of attraction and repulsion

Unlike magnetic poles attract

Like magnetic poles repel

Copper wire

Iron core

Electromagnet: Magnetic field is generated by passing a current through a coil of wire. Changing direction of current reverses polarity of magnetic field

Hamburg

Berlin

GERMANY

200 km

Elevated steel guideway

Transrapid

Lift

Gap of 1cm under train

Side magnets to stabilize train

Track magnet

Train magnet

Magnetic levitation:
Attraction between magnets lifts train above the track

Forward motion: Electric current in track magnets switched on and off 100,000 times per second produces frictionless, forward motion

Magnetic repulsion: A Japanese system is being developed on an 18km test track in which superconducting magnets in the guideway repel those in the train, thereby levitating the train