

Variable banking to suit the speed

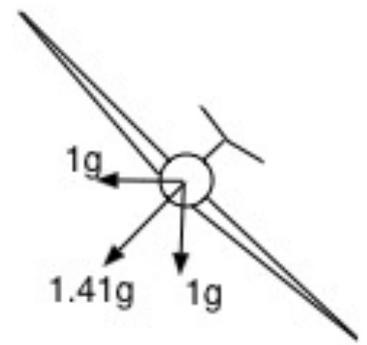
Correct bank angle for high speeds

The correct bank angle is a vital requirement for Hyperloop to achieve passenger comfort at high speeds.

Aircraft do this by adjusting the bank angle so that people feel 'upright' and only notice an increase in g forces. This is an aircraft in a 1 g turn with the correct 45 degree bank, the passengers would feel an extra 41% of g force.

High-speed-rail has a maximum curve limit of about 0.16 g, which corresponds to an bank angle of 9 degrees. Typically the rails are canted to 4-6 degrees, the excess is felt by the passengers. At 350 km/hr, the required curve radius is about 6 km.

For Hyperloop at 1,200 km/hr, the required turn radius is 11.3 km, for a 1g, 45 degree bank angle. A 5 km radius curve would require slowing down to 800 km/hr



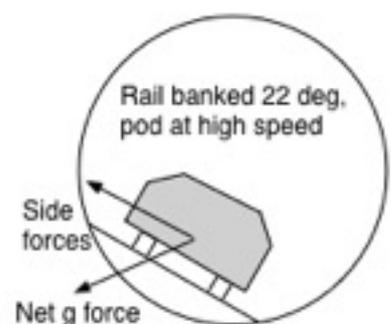
The problems of rails with a fixed bank angle

Rails have problems with mechanical side-loads and passenger discomfort when the bank angle is not correct. But the correct angle is impossible, because the pod may take curves at full speed, or take the same curve slower due to stations, traffic or maintenance.

High-speed rail uses canted tracks with about half the full-speed bank angle, so there are side-loads at fast and slow speed. But railways have very low cornering g-forces, and the passenger discomfort is minor.

Hyperloop needs 1g cornering to achieve fast trip times, this is acceptable with a 45 degree bank angle. If we build the rails at a half angle of 22 degrees, we will have a 22 degree out-of-level problem when running very fast or slow. This would be very uncomfortable for the passengers and require the wheels (or maglev or skis) to support high side-loads.

Passenger comfort is possible by tilting the passenger cabin with a gimbal mounting, so the passengers always feel 'upright'.



Round tube is the perfect solution for free-banking

The circular tube is a perfect running surface for high-speed travel, it is a simple solution for 'free-banking' and the elimination of side-loads.

The pod will steer to achieve the correct banking angle, which will change according to the speed of the pod. Electronic steering will adjust the bank angle gently to avoid passenger nausea. If the electronic steering fails, the front wheels caster effect will allow the pod to align safely.

