

Continuous traction - the advantages

Passenger comfort

Hyperloop Alpha has been criticised as a 'barf ride' by several commentators. This is due to the proposed sharp acceleration, braking and un-banked cornering.

Passenger comfort is vital to the success of Hyperloop. We can achieve this with gentle acceleration and braking all along the route, and smooth but firm cornering with the correct bank angle.

Hyperloop Alpha linear motors

Hyperloop Alpha proposed limited lengths of linear motor track, due to the high cost. The motors would give 1g acceleration and braking, and the pod would coast between the motor sections with some help from the exhaust nozzle. The strong and intermittent acceleration would be uncomfortable for the passengers. Also the power requirement is massive. For a 10 tonne pod at 1,200 km/hr accelerating at 1g, the power is 32,700 kW, (32 mW)

Continuous traction with wheels

Wheels have the advantage of continuous traction along the tube, but the acceleration rate is limited to about 0.3g due to the traction of the wheels, and there is a limited maximum power output from the motors in the pod. The proposal for Hyperloop Cheetah is to use 0.3g acceleration and normal braking, up to a limit of 3,500 kW, which reduces to 0.1g acceleration at full speed.

These are the calculations for the proposed LA-SF route. This route is very simple, with high speed possible for the whole centre section. A more typical route with various slow sections due to geography or stations would very much favour continuous traction using wheels.

Trip with linear motors

Motor track length about 15km.
Max cornering 0.5g (without banking)
Accel/braking 1g at all speeds
Max power 32,700 kW (32.7 mW)
Trip time 31 mins.

Wheels traction, continuous.

Max cornering 1g, correctly banked
Accel/braking 0.3g up to 440 km/hr.
To a max power 3,500 kW. (3.5mW)
Accel/braking 0.1g at 1,200 km/hr
Trip time 35 mins.

So, it can be seen that the total trip time has only increased by 4 minutes, despite the maximum power being reduced by almost 90%, and the passengers having a much more comfortable journey.



The LA to SF route used by Alpha

Breakdown recovery

One emergency situation is a breakdown of one pod. All the pods behind it, possibly up to 50, would be forced to stop and wait for the problem to be resolved. Alpha would be in a serious situation with a large number of pods stranded between linear motors, with only their low-speed wheels to take them to an emergency exit.

With wheels and continuous traction, the disabled pod could be pushed by another pod to an exit, or it may need to be recovered. Once the obstruction is cleared, all the pods could continue their journey at normal speed.