What if we were to travel on levitating trains?

Magnetic levitation-based transport might be about to enter our lives, providing for faster, safer and more energy-efficient journeys. As it will enable longer distances to be covered more rapidly and cleanly, could it affect where we choose to live?

Technology is paving the way for new means of transport. Some of them are the smart versions of traditional vehicles (e.g. autonomous vehicles); some (such as levitating hoverboards) were first imagined in the pages of science fiction comics; while others have been born out of innovation (for instance superconductor trains).

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Levitating hoverboards enable a standing person to float along just above the ground. Today, their first users are just getting to grips with hovering across indoor and outdoor spaces. Superconductor trains can achieve speeds greater than 500 km per hour, by eliminating the friction of train carriages with railway tracks. Superconductor trains have begun commercial operations in China and South Korea, and are under construction in Japan. In the EU, plans to implement them have already been considered in Germany, Italy and the United Kingdom, but only in Italy has the project recently seen renewed interest.

Potential impacts and developments

The technology behind levitating hoverboards and superconductor trains is known as magnetic levitation or 'maglev'. It is based on the creation of opposite magnetic fields that repel each other to counteract gravity, thus elevating the magnetised objects off the ground. Maglev can be applied to transport modes of all sizes, from individual hoverboards to high-capacity bullet trains.

The maglev hoverboards of today still require special copper floors; improvements to allow levitation on concrete or water are ongoing. The first prototype was presented in 2015, but no further announcements have been made since then.

The first commercial superconductor train runs from Shanghai Pudong International Airport to the outskirts of the city of Shanghai, linking up with Shanghai's underground network. The service was launched in 2003, delivering speeds of over 500 km an hour. Superconductor trains reaching similar speeds are expected to be deployed in Japan, serving the route between Tokyo and Nagoya (286 km) by 2027, and Osaka (410 km) by 2045. In the future, this technology is expected to further evolve into the Hyperloop – a travelling pod moving at high speed inside a magnetised tube. One proposed route for the Hyperloop could in the future link Los Angeles with the San Francisco Bay area.

EPRS | European Parliamentary Research Service
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Scientific Foresight Unit (STOA)
April 2018 - PE 614.558

In the long run, maglev trains offer the prospect of travelling faster than conventional trains without the environmental impact of aviation (noise and pollution), linking large metropolitan areas over distances of several hundred kilometres.

In addition to providing a convenient means of transport, the introduction of maglev train technology could alter our perception of distances. As it will allow us to cover longer distances in shorter times, it could result in a wider spread of the population both within and beyond city limits. Superconductor trains could connect capital cities with secondary cities, thus leading to a renaissance of secondary cities with maglev stations.

Maglev trains require a dedicated infrastructure, and this could trigger a rethink of EU transport policy. The EU's trans-European transport network (TEN-T) programme seeks, among other things, to fund railway infrastructure, aiming to build a comprehensive network across the Union. It targets bottlenecks, as well as cross-border and multi-modal infrastructure (connectivity of railways with ports and highways). As the network is based on traditional railways, maglev would create an opportunity for a major overhaul across the network.

By contrast, levitating hoverboards are still a relatively new technology, but could eventually revolutionise the way people and goods move over shorter distances, providing a fast alternative to walking, driving or public transport, or a more efficient way to move goods around a factory floor.

Maglev hoverboards would at first be expected to share spaces with pedestrians. As the technology improves, however, hoverboards could manage greater levitation distances and faster speeds, bringing about the possibility of installing hoverboard-dedicated lanes to ease the co-existence of pedestrians and hoverboard riders in public spaces.

Maglev technology could, however, also develop in completely different fields of application in the near future. The EU-funded GABRIEL project (FP7 funding programme for 2007-2013) investigated the feasibility of introducing maglev for aeroplane landing and take-off, leading to a reduction in energy consumption, cost and noise.

Anticipatory policy-making

One of the major stumbling blocks facing the introduction of maglev transport is the fact that it requires dedicated space and infrastructure, separate from current rail or road networks.

Commercial maglev trains currently run only in China and South Korea, but might begin operating in Japan in about a decade. The EU will need to evaluate whether it wants to remain involved in this emerging technology by supporting the development of early commercial applications in selected locations, e.g. through the TEN-T funding programme. In the longer term, maglev trains will likely see their biggest potential in connecting metropolitan areas across national boundaries in Europe, and the EU could play a decisive role in creating the right conditions for such transnational links to become reality.

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