Magnetic attraction

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While the investigation into last month's magnetic levitation train crash in Germany continues to progress, details of the events leading up to the collision are beginning to emerge.

Human error appears to have been the primary factor in the tragic incident, which saw a high-speed train slam into a maintenance cart on an elevated section of track at Lathen, claiming 23 lives. The accident has put the commercial future of maglev technology under the spotlight.

The maintenance vehicles on the German test track run along the 31.8km stretch of track each morning to check for fallen branches and other debris.

Control room staff must then perform a series of checks to ensure that the carts have been placed back in the sidings before the maglev trains are permitted to run. These procedures included filling in a log book and a check of the shed.

Alexander Retemeyer, a prosecutor speaking for the crash investigators, said they were focusing on what happened in the control centre: "We are looking into why the train was given the go-ahead even though the maintenance vehicle was on the track."

On the Transrapid system used in Germany, only the maglev trains are overseen by the sophisticated control system, which monitors vehicle speed and position, adjusting propulsion power to maintain correct separation. The 60-tonne wheeled maintenance vehicles, which use diesel engines, operate independently. And therein lies the problem.

Alan James, chief executive of UK Ultraspeed, a company set up to promote the Transrapid technology in Britain, says that on commercial maglev lines such as the one in China, all vehicles including wheeled variants would come under the operational control system, so something like this couldn't happen. "However, on the German test track there remained a human element still in the loop. That's something to be looked at."

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Although it looks like human error, the incident has focused attention on safety. But James says that he remains convinced that the "fundamentals of the Transrapid system are still strong".

The force of the impact was so great that the low nose of the Transrapid train flung the maintenance cart upwards, ripping open the top of the first-class carriage. Mangled seats, shards of glass and twisted metal parts were strewn below the elevated track.

There has been some criticism of the crashworthiness of the Transrapid front carriage which suffered significant damage. But James says: "That's unfair, because the fundamentals of the Transrapid system are built around collision avoidance. No one engineers a plane to be crashworthy because it simply wouldn't fly. But that doesn't deter us from using them.

"The trains on the Transrapid system are designed to withstand some collisions, such as a tree falling across the track and being hit at full speed. But it is pre-emptive safety that lies at its heart."

Even before the accident at Lathen, maglev technology has always been a hard sell. It is nearly 60 years since Professor Eric Laithwaite outlined the discovery of the linear induction motor, proposing it as the basis of a device to move objects with magnets down a track at high speed with almost zero friction. Since then, adoption of the technology has been slow. Aside from the German test track, the world's first commercial application of a high-speed maglev line is in Shanghai, where it transports people 30km to the airport in just 7 minutes 20 seconds at a top speed of 501km/h. Other than that, maglev has been restricted to use in Japan and at a few small-scale tracks, such as the one that used to operate at Birmingham airport.

Despite this, UK Ultraspeed remains convinced that there is a case for the technology. It is proposing to build a 500km/h maglev from the Channel Tunnel to Glasgow, linking London, Birmingham, Liverpool, Newcastle and Edinburgh. The project would slash rail journey times, making them

comparable to air travel.

"Maglev is required to deal with economic problems in Britain," says James.

"Investors are choosing to go elsewhere because of the chronic state of our transport network. Research has shown that 80 out of 100 inward investors cite poor transport as the number one or two reasons for not investing in Britain. We are missing out on hundreds of billions of pounds of foreign direct investment each year."

The UK Ultraspeed plan is being developed with the support of Siemens and ThyssenKrupp, which owns the technology behind the Transrapid system in Germany. James and his team have conducted a £2 million pre-feasibility study [US$3.76 million] for the rail link. He says that, in terms of design and construction costs, the numbers add up, providing a cost-effective and green solution to Britain's transport woes. "Much of the link would be elevated, which means it would be far less intrusive than motorways. For every metre of distance travelled, motorways eat up 96m^2 of land. For every metre of our elevated guideway, we would require just 2.1m^2."

The route would follow existing corridors where possible, such as the M62 across the Pennines. The funding would be from a private finance initiative, with "zero upfront public costs", he says. "Track and technology costs, excluding land, would be £21 million a kilometre [US$63.5 million a mile]. The Channel Tunnel rail link cost £48 million per kilometre [US$145 million a mile], including land. That gives us quite a cushion," he says.

James says that discussions about maglev continue apace. Earlier this year, a group of MPs and the Association of North East Councils joined forces to urge the Department for Transport to consider building the north-south link. Mick Henry, chairman of the association, praised it as a "bold" technology. So James is convinced there is a groundswell of support.

"There is an extraordinary impetus behind maglev technology," James insists.

"We are moving towards a detailed study for phase one, which would comprise the construction of a link between two cities, such as Liverpool and Leeds or Edinburgh and Glasgow. It would have to be done in phases because the UK simply wouldn't have the construction resources to do it any other way."

And he insists that, despite the accident in Germany, many other countries still view maglev as a safe, clean and cost-effective transport solution.

"Abroad, the interest is still there. China is looking at expansion of maglev to intercity services. If that happens other countries will look closely at the technology."

GUIDEWAY FROM GLASGOW TO THE CHUNNEL

UK Ultraspeed's proposed maglev system for Britain would consist of three main elements, all fully integrated with each other. A fixed guideway houses a long stator linear motor. This can be envisaged as a traditional rotating electric motor whose stator coils have been unrolled and laid lengthways along the underside of the guideway.

The guideway could be built at ground level, or elevated up to 20m above the ground, passing over existing infrastructure without complex and costly civil engineering.

Transrapid's vehicles comprise up to 10 sections, capable of seating up to 1,200 passengers, although 840 passengers is the more likely capacity in the UK system. The vehicles levitate above the guideway and are steered along it by electromagnetic cushions. They are propelled and braked by variable electric current passed through the linear motor.

Safety and reliability are overseen by an automated operational control centre. This monitors vehicle speed and position and adjusts propulsion power supplied through the guideway to ensure that every vehicle operates at the prescribed speed for each section of the route.

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