# Is the SCMagLev Safe? (Part 2)

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The Baltimore-Washington Rapid Rail (BWRR) (the project developer) and the Northeast MagLev (TNEM) (the promotional entity) have the short-term goal of obtaining Federal Railroad Administration (FRA) approval to build a magnetic levitation (maglev) train between Baltimore and Washington, DC, with the long-term goal of extending the train operation to New York City by way of Philadelphia. Japan's Superconducting Magnetic Levitation (SCMagLev) train is the high-speed, ground-based transportation system TNEM is promoting to build in the northeast corridor of the United States.

Information about the SCMagLev and BWRR's plans to build and operate the system have raised many questions and concerns. This is one of a series of articles that identifies and discusses some the many questions and concerns citizens and communities have identified with moving forward in building and operating the SCMagLev.

**Abstract**

This article identifies and discusses questions and concerns about the structural safety standards being used to assure passenger crash survivability and the impact of the SCMagLev operation on the residents living near the guideways. The trial operation of the SCMagLev train on the present 26-mile test track in rural Japan, mostly in tunnels, does not fully validate its ability to function safely and reliably in day-to-day, high-frequency service in the urban and suburban environment of the Baltimore-Washington metropolitan area. The German maglev accident of September 22, 2006, which killed 23 people after the safety of the system had been certified by the German government should be a cautionary note as this project is considered.

**Questions & Concerns**

(1) The Federal Railroad Administration (FRA) approval process must first consider safety before deciding whether to allow construction.

- The SCMagLev safety decisions, that is, the "Rule of Particular Applicability" (RPA),[1] should be completed by the FRA before the Final Environmental Impact Statement (FEIS) or any authorization for construction is issued. This ordering of priorities, in addition to being common sense, is supported by the U.S. Department of Transportation (USDOT) report *Pathways to the Future of Transportation* (USDOT, p.3).

    - SCMagLev safety is an important issue, as confirmed by the reporting of an accident on the German maglev at Lathen, the location of the Emsland Transrapid Test Facility, on September 22, 2006. This occurred after its safety had been approved by the German government. Twenty-three (70 percent) of the passengers riding the German maglev system at the time of the accident were killed and the rest were injured.

    - On December 15, 2016, Louis Cerny, past executive director of the American Railway Engineering Association, submitted commentary to BWRR asking a series of important safety questions. BWRR responded to Mr. Cerny on January 23, 2017. Their reply included the statement: "Issues related to safety will be addressed in the RPA process." This or similar language was the only answer to six of the critical safety questions he raised.

(2) Japanese wheel-rail history is not transferable to SCMagLev experience.

- Successful Japanese safety experience with high-speed wheel-rail trains since 1964 is no more transferable to the SCMagLev technology than was German high-speed wheel-rail (called ICE) technology to its maglev. The Japanese SCMagLev currently operates on a test track and has not yet operated in regular service. Revenue service on the planned line between Tokyo and Nagoya is not expected to begin until 2027 at the earliest, with many questions being raised in Japan about whether that date can be met.

(3) More questions about the safety issues with SCMagLev vehicles.

- Especially worrisome is the lack of information and data on the crashworthiness of the SCMagLev train and its structural ability to protect occupants of the vehicles. The existing FRA vehicle strength standards are in 49CFR, part 238. Regulation 238.703, for instance, requires a basic vehicle compressive strength. There are many additional requirements. As detailed in Mr. Cerny's comments, there are good reasons the required compressive strength for SCMagLev vehicles should be at least as high or even higher than those for Amtrak trains.

- It is a fatal safety flaw in the project if the current SCMagLev technology cannot support the vehicle weight necessary to meet existing vehicle crashworthiness and occupant protection standards. The Japanese, as the Germans before them, appear to be refusing to provide vehicle compressive strengths. It seems that the present course of action is to push for project approval before SCMagLev vehicle and passenger safety regulations are established.

- Kemp and Smith detail the arguments for the need for crashworthiness of maglev vehicles. In referring to the German "Transrapid" maglev, their report states: "The Transrapid policy is that vehicles do not need inherent crashworthiness as they will be under close computer control and thus will not crash. The Emsland accident reinforces the fact that, even if there are rigorous procedures to prevent an accident, they are never foolproof. The same is true of automatic systems." (Kemp and Smith, 2007, p. 9). The accident at Lathen would seem to blunt or even negate the argument that computer control will ensure safety.

- The SCMagLev is an extremely complex technological way of accomplishing what is achievable by the relative simplicity of steel wheels and rails.

    - Components of the SCMagLev vehicles must be kept at the unimaginably cold temperature of around 450 degrees below zero Fahrenheit. What are the safety consequences if the elements containing the supercooled liquid are ruptured in an incident?

    - The complexity of having to individually extend and retract dozens of wheels prior to and after each station when speeds drop below 93 miles per hour raises many safety issues. For example, what happens if there is a power failure of the system when the SCMagLev is travelling over 300 miles per hour? Will the train drop to the guideway prior to the wheels coming down? What happens when the SCMagLev hits the guideway at 300 miles-per-hour?

- This will be the first time the FRA is being asked to approve a passenger train operation without a human driver (engineer) on each train. What are the guidelines the FRA will implement to review and approve this driverless high-speed train?

(4) What is the electromagnetic radiation danger from the SCMaglev guideway?

- BWRR has stated that there would be a " … need to maintain a minimum distance of 20 feet between the magnets along the guideway and people traversing below." (BWRR, November 2018, p. 42). This is clearly a negative environmental effect on the area below elevated guideways and, therefore, needs to be discussed in the DEIS and as part of the RPA. Is the 20-feet "avoidance zone" sufficient? Note that the electromagnetic radiation levels associated with the operation of the SCMagLev train are much higher than those generated by the German Transrapid maglev.

- BWRR also explains how passengers will walk under the guideway in tunnel sections during emergency tunnel egress (BWRR, November 2018, p. 10; also see Appendix B: Figure B-3). How would the passengers be shielded from the SCMagLev's electromagnetic radiation, considering that the distance below the guideway is less than 20 feet? The same question applies to concourses under the guideway at stations (BWRR, November 2018, Appendix B: Figure B-2).

(5) The Japanese are questioning environmental (including energy consumption) and financial aspects of this technology.

- Japanese researchers Anki and Kawamiya state that the SCMagLev "constitutes not only an extraordinarily costly but also an abnormally energy-wasting project, consuming in operation between four and five times as much power as the Tokaido *shinkansen*" (or the Japanese wheel-rail high-speed train) (cited in Harding, 2017, p. 2).

- The proposed SCMagLev technology is not needed to achieve the purported goals of this project. While it is understood that this project is legislatively limited to the SCMagLev train, this does not mean the environmental effects of satisfying future traffic needs by constructing it outweigh improving existing and soon-to-be-implemented rail-wheel capabilities. Maglev and steel-wheeled systems have similar speed achievements. The record speeds attained by the Japanese SCMagLev and the French intercity high-speed rail service (TGV) are comparable, 375 miles-per-hour for the SCMagLev and 357 miles-per-hour for the TGV. At these speeds, most of the energy used is in overcoming air resistance, which is basically the same for the SCMagLev and steel-wheel systems. Restricting consideration to the SCMagLev goes against the spirit of "technology neutrality" described in *Pathways to the Future of Transportation* (USDOT, July 2020; see the introductory letter from Secretary Chao).

(6) Until it reaches a speed of 93 miles-per-hour, the SCMagLev will be a guided rubber-tire bus. This creates a "new" series of safety issues the FRA must assess.

- The FRA needs to develop safety standards to assess the safety of the SCMagLev during its "rubber-tire" operation as the train ramps up to 93 miles-per-hour and the magnetic levitation takes over. These new standards should include specific hardware specifications. The "bogies" (called "trucks" in normal railroad parlance), which are the two separate parts of each vehicle to which the wheels are attached, are extremely complex. Each of the two bogies on each car of the SCMagLev train has four wheels for support, which need to be (1) retracted after leaving each station and the train reaches the "levitation" speed of 93 miles-per-hour and (2) extended before each station is reached as the train slows down to rubber-tire speed of 93 miles-per-hour and less.

- In the event of a loss of power, the rubber wheels will automatically descend (BWRR, November 2018, p. 36). Thus, according to the report, the rubber-tired wheels must be able to safely handle supporting the vehicle at 311 miles-per-hour, as well as the near-instantaneous speed change of the rubber tire and wheel rim from zero to 311 miles-per-hour. This is a more stringent requirement than for tires during commercial aircraft landings.

(7) How will breakdowns of the SCMagLev while between stations be addressed?

- What happens when an SCMagLev train has a mechanical issue that causes it to be stopped between stations? The highly-complex nature of the bogies makes it likely such incidents would be relatively common. What procedures would be used to retrieve the stranded train? How would the safety of other trains on the line be assured while the non-maglev rescue locomotive hauls the disabled train down the guideway to the maintenance area?

(8) Work requiring presence of employees in the guideway.

- Work requiring the presence of employees in the guideway cannot realistically be confined to non-operating hours. Therefore, similar safety regulations to those applicable for all other rail workers are needed.

- Unexpected occurrences include mechanical breakdown of a train, debris blown by wind into the guideway, structural checks for safety after damage to elevated guideways, and problems with guideway switches. To avoid having to take the entire system out of service for such incidents, switches between guideways at intervals along the line are needed to allow “single-tracking,” such as is done on the Washington Metro. For example, what if there is a medical emergency aboard an SCMagLev train while it is in the BWI station? The more hours the SCMagLev system is out of service each day because maintenance is not allowed during operations, the lower its transportation value.

**Findings/Conclusion**

The serious issues, questions, and concerns about the SCMaglev’s impact, safety, and operation, both for the passengers and for the residents living near and alongside the guideways, continue to mount. This article identifies and explores some of them.

**Want to Help?**
(1) Share this information with your family, friends, neighbors, and community.
(2) Join our Facebook page: www.facebook.com/groups/CitizensAgainstSCMaglev.
(3) Contact your elected officials to express your opposition to building the SCMagLev, go to: myreps.datamade.us.
(4) Submit multiple public comments often at www.bwmaglev.info/index.php/contact-us. State your objection(s), and always end by saying you support the "No Build Alternative."
(4) Learn more about the concerns and impacts the SCMagLev will have on our communities, see: www.stopthistrain.org/.
(5) Make a contribution to support Citizens Against the SCMagLev (CATS) and Maryland Coalition for Responsible Transit (MCRT) at mcrt-action.org. Your donation, in any amount, is appreciated. Thanks for your support!

**About the Author**

Daniel E. Woomer is a community activist and technical expert. He retired after a long career that included positions with Westinghouse Defense Center, Johns Hopkins University's Applied Physics Laboratory, and the U.S. Department of Energy (DOE). During his career with the DOE, he worked in various positions with the Energy Information Administration and the Office of Congressional and Intergovernmental Affairs, and he helped set up the Office of Technology Transitions. He also served for several years as an adjunct faculty member with the University of Maryland University College, where he developed and taught mathematics, supervisory and leadership classes.

**Sources**

*Note*: The principal source of information for this article are responses by Louis T. Cerny, PE, to FRA notices, including his November 25, 2016, response to a notice in the *Federal Register*. Mr. Cerny has been involved with maglev proposals since the late 1980s, when he served as the executive director of the American Railway Engineering Association. He has continued to study maglev technology as a private consultant and has commented on many maglev proposals. Mr. Cerny was a voting member of FRA committees that developed safety standards for high-speed rail.

(1) Baltimore-Washington Rapid Rail. "Interface with Other Infrastructure (Roads/Bridges/Rail Systems/Structures)." *Final Alternatives Report*, p. 42. November 2018. https://www.bwmaglev.info/images/document_library/reports/alternatives_report/SCMAGLEV_Alts_Report_Body-Append-A-B-C_Nov2018.pdf. November 2018.
(2) Cerny, Louis T. "Comments on Final Alternatives Report November 2018." Gmail dated December 14, 2018.
(3) Cerny, Louis T. "Response to November 25, 2016 Federal Register Notice regarding Baltimore-Washington Maglev Proposal (SCMAGLEV)." December 10, 2016.
(4) Harding, R. "Japan's new maglev train line runs headlong into critics." *Financial Times*. October 17, 2017. https://www.ft.com/content/5d4e600a-9e12-11e7-8b50-0b9f565a23e1.
(5) Kemp, R., and R. Smith. *Technical issues raised by the proposal to introduce a 500 km/h magnetically-levitated transport system in the UK*. Lancaster University (R. Kemp) and Imperial College London (R. Smith). Report prepared for the Department of Transport. June 17, 2007. https://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/about/strategy/whitepapers/whitepapercm7176/railwhitepapersupportingdocs/railwhitepapermaglevreport.pdf. [*Note*: 500 kilometers-per-hour is 311 miles-per-hour.]
(6) Technology. https://en.wikipedia.org/wiki/SCMaglev.
(7) U.S. Department of Transportation. *Pathways to the Future of Transportation: A Non-Traditional and Emerging Transportation Technology (NETT) Council Guidance Document*. July 2020. https://www.transportation.gov/sites/dot.gov/files/2020-08/NETT%20Council%20Report%20Digital_Jul2020_508.pdf.

Endnotes:

(1) The "Rule of Particular Applicability" is the process the Federal Railroad Administration goes through for situations where existing safety standards for railroads need to be modified to suit a particular situation. In the case of the SCMagLev, for example, the guideway would need different detail standards than a typical steel-wheeled train's railroad track.

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Citizens Against the SCMagLev (CATS) is a confederation of scientists, engineers, experts, community organizations and citizens in support of transportation infrastructure improvements that benefit our communities, state, and nation. CATS opposes the construction of an expensive transportation system serving a small minority of the wealthy at the cost of taxpayer funds far better used to maintain and improve the transportation infrastructure needed and used daily by all

citizens, businesses, and commerce. For up-to-date information on the SCMagLev opposition, see our Facebook page at: https://www.facebook.com/groups/CitizensAgainstSCMaglev.