

# Magnets put scientist on right track

By J.N. Sbranti, Modesto Bee staff writer, July 28, 1998

When the physicist handed him that box of 100 magnets with a sketch of how to arrange them, Bill Kent figured it wouldn't fly -- literally.

But it was Kent's job to prove the scientists right or wrong, so the Ceres resident built a magnetic levitation train from scratch.

"I remember the first day I launched it, and it flew. I was amazed," said Kent. "All of a sudden I could share the vision the bosses had."

That vision materialized a few months ago in a dingy sub-basement at Lawrence Livermore National Laboratory, where Kent crafted a magnet-powered train prototype atop a 60-foot track.

"Some day we could have maglev trains crisscrossing the state. They'll be safe and cheap," said Kent, whose enthusiasm grows every time he sees the prototype soar. "Defying gravity and flying without some additional energy input is pretty incredible."

The repulsive properties of magnets have been known for centuries. What's new is being able to harness that power safely and efficiently. The "Inductrack" train assembled by Kent is the first levitated model to use passive permanent magnets.

Powerful rare-earth magnets arrayed in a special pattern under the train create a magnetic field as they pass over the inductive coils wrapped around the track.

That field causes the track to repel the magnets, levitating the train. The energized coils make the track function like a linear motor, providing both acceleration and braking.

"It's an innovative application of a simple principal," said Kent. "That's what most inventions usually are."

At age 44, Kent finds himself in the thick of cutting-edge inventions. In his two decades "knocking around" the Livermore Lab, Kent said he's dabbled with magnetic fusion, electron beams, lasers, vacuums and now flying trains.

A career as a mechanical technologist is not what Kent planned on when he earned his junior college electrical degree.

"I sort of thought I was going to be an electrician for life," Kent said. But a downturn in the building trades 20 years ago forced him to accept a temporary job at the lab.

"Once I got here, I caught the lab bug, and I've never wanted to leave," he said. "The assignments here vary so much I love it. Anything's possible. ... And the lab has great education opportunities for taking course work in the sciences."

His natural curiosity and passion for tinkering proved a perfect match for life at the lab.

"Bill Kent is our right-hand guy in making our high-tech stuff come together," said mechanical engineer Ray Smith, who works with physicist Richard Post on the Inductrack project. "Bill's the one who went out and built all the hardware and got all the rails just right."

There were no blueprints to follow in building the maglev train.

"This is not a very formal engineering project," Smith explains. "It's one where you evolve the engineering as you go."

So Kent winged it.

“We had to be a little creative because we had a low budget,” said Kent, who’s known for darting about his underground workshop in a light-blue lab coat.

He did most of the electrical, mechanical and carpentry work on the train and track with his own hands, and he scrounged around for bargain parts.

In his earliest model, Kent gave the 50-pound train a jump start by connecting it to a 300-pound bucket of bricks dropped from a pulley hung from the ceiling.

These days, a tug from a modified bungee cord gets the train moving. Once it’s on its way, the magnets take over.

Since research on the project began three years ago, the lab has spent about \$450,000 to develop Inductrack.

There’s more to come. NASA has awarded the lab a \$1.5 million grant to build a larger, faster prototype for potential use in launching satellites. The maglev tracks would run up a ramp, accelerating a rocket to near Mach 1 before its main engines fire.

“We’ve kidded that this will make a great amusement park ride,” said Kent, who will help build the NASA model.

He’s excited by the prospect of Inductrack becoming reality. Many of his previous Livermore Lab projects haven’t.

“Working in research and development, it’s not unusual to be disappointed because not everything works,” Kent said. “But this time we proved the theory worked great.”

For more technical information about Inductrack and maglev trains, see the June issue of Science & Technology magazine or the May issue of Popular Mechanics.

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