



Ignition

News from TRB's IDEA Programs

HIGH-SPEED RAIL
HIGHWAY SYSTEMS
TRANSIT &
TRANSPORTATION SAFETY



INSIDE:

- Help from TSA
- We Have a Winner!

THE IDEA PROGRAMS

Innovations Deserving Exploratory Analysis

IDEA programs provide start-up funding for promising but unproven innovations in surface transportation systems. The programs' goal is to foster ingenious solutions that are unlikely to be funded through traditional programs.

Managed by the Transportation Research Board, IDEA programs are supported by the member state departments of transportation of the American Association of State Highway and Transportation Officials (AASHTO), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and the Federal Motor Carrier Safety Administration (FMCSA).

The Transit IDEA program, which receives funding from FTA as part of the Transit Cooperative Research Program, is guided by a panel chaired by Fred Gilliam, President/CEO, Capital Metropolitan Transportation Authority in Austin, Texas. Harvey Berlin is the TRB program officer.

High-Speed Rail IDEA is funded by the FRA as part of its next-generation high-speed rail research. A committee chaired by William J. Harris, Consultant, has oversight. Charles Taylor is the TRB program officer.

The NCHRP Highway IDEA program is supported by the member state departments of transportation of AASHTO through the National Cooperative Highway Research Program (NCHRP). It is guided by a panel chaired by Carol A. Murray, Commissioner, New Hampshire DOT; Inam Jawed is TRB program officer.

Safety IDEA is jointly funded by FMCSA and FRA. The committee is chaired by Ray Pethtel, Virginia Tech Transportation Institute. Harvey Berlin is TRB program officer.

Visit the IDEA web site:

www.trb.org/idea

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Cover photo courtesy of Tri-County Commuter Rail Authority of South Florida.



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SAFETY

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From the **Director's** Desk

That's the Ticket

From gas pumps and ATMs to voice mail and web mail, we're developing a routine rapport with machines. But the dialog can become one-sided and decidedly less than friendly when communication breaks down. The frustration of a glitch at the gas pump that keeps us from getting on with our trip, even if it's compounded when the ATM eats our card, is still not an equivalent for the experience of learning to navigate a transit system for a person who is blind or has impaired vision. The obstacles and opportunities for confusion are staggering.

In this issue of Ignition (named for that moment when progress becomes possible), we talk with contractor George Leonard about a Transit IDEA project that can help all transit riders communicate with machines that sell the tickets to ride. The Transit IDEA program, funded through the Federal Transit Administration's support of the Transit Cooperative Research Program, is one of the oldest programs of its kind.

The New Ideas Section brings us several efforts to make it safer to ride. Improving the process for welding rail sections can literally keep trains on track. Two High-Speed Rail IDEA projects take different approaches to this serious issue. Three other projects, investigating new ways to improve the security of transit systems and the safety of its riders, reflect the high priority assigned to security by the Federal Transit Administration, a program sponsor, and by the Transportation Security Administration.

In the Business section, we report on an NCHRP IDEA project that not only made it out of the lab into the wide world of commercial products, it's won an international award. Now there's a good IDEA.

Neil F. Hawks
Director, Special Programs
Transportation Research Board
of the National Academies



Your comments
are welcome
and may be sent
to the editor at:
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A Ticket and a Passport

Erik Weihenmayer was 13 years old when he lost his vision. When he reached the top of Mt Everest at age 34, in May of 2001, he still hadn't reached the pinnacle of his success. Last September he completed the Seven Summits, having climbed the highest mountain on each of the world's continents. Blind people are mountain climbers, factory workers, lawyers, teachers, musicians. But according to President Marc Maurer of the National Federation of the Blind, the unemployment rate for working-age blind people is 74 percent.

Transportation is often a barrier for people with impaired vision, and a significant challenge to employment. Transit agencies are striving to meet the guidelines established in the Americans with Disabilities Act (ADA), which aim to improve accessibility, but progress is difficult given constant budgetary constraints. A Transit IDEA project has developed a cost-effective system that helps clarify (for all riders) the surprisingly complex process of purchasing a ticket from transit fare vending machines and requires few modifications to existing equipment. (See "Ticket Talk," p. 6)

KRW Inc. of Alexandria, Virginia, an engineering and management firm with a history of work in advising and evaluating transit agencies for ADA compliance, partnered with Tri-County Commuter Rail Authority (Tri-Rail) in South Florida and the National Federation of the Blind of Florida to develop an interactive system of spoken prompts and tactile guides that make buying a ticket to ride one less barrier to independent travel for those with impaired vision. KRW's team included engineers George Earnhart and Don Kloehn as principal investigators.

George Leonard, Vice President of KRW, Inc., (now owned by SEB Associates) talked with us about the team's investigation and the importance of working outside of the laboratory.

Your project stands literally at the interface of man and machine, in some ways the ultimate communications challenge. How does this system address that challenge for transit riders with impaired vision?

With the help of volunteers organized by the National Federation of the Blind, we evaluated the raised letter and Braille instruction systems commonly found on fare vending machines. We learned that very often, these systems were inadequate for the complicated fare structures that involve many possible responses. It took much longer than we expected for blind people to read the tactile instructions and was very frustrating for inexperienced riders. Several attempts to follow the tactile cues were often necessary to complete a purchase.

The system we've developed identifies the station, gives an audio beacon that leads to the fare vending machine, and indicates the direction of the boarding platform. The voice synthesis software tells customers to push the large button just below the speaker if they want audio instructions for purchasing their ticket. Customers control the process by pushing the large 'mushroom' button to hear prompts for each step in the process. They have the opportunity go back and listen to an instruction again at every step. Raised buttons on the face of the machine form tactile pathways to each selection button and the mushroom button provides a kind of landmark, a reference point for other actions.

During the testing phase at the Deerfield Beach Station, sighted patrons sometimes abandoned the standard machine they had been using and moved to the machine with voice instructions because it was easier to use. And that's something we've found over and over again in working with advocates for accessibility: improvements made to provide better access for those with disabilities improve access for everyone.

Would you describe the product that resulted from this IDEA project and the plans for it.

We developed a user’s guide that does several things: offers step-by-step instructions on how to develop and test a tactile instruction panel; gives specifications, salient characteristics, and instructions in the procurement process for the panels and other components from commercial vendors. It has guidelines for participation by disability organizations, especially in evaluating and refining the audio instructions. And finally, it describes how to install, program, and test the audio instruction devices.

“..improvements made to provide better access for those with disabilities improve access for everyone.”

State-of-the-art fare vending equipment is designed with audio instruction capabilities, often using a standard keypad for responding to prompts, but it could be many years before that equipment is operational in most transit systems. Our system offers an effective low-cost solution to the accessible fare vending problem for that interim. Several transit agencies have expressed interest in the device and the guide book is available from TRB.

This product potentially eliminates a barrier to mobility for people with vision impairments. What are the broader benefits of facilitating independent travel?

Well, the benefits ripple out. If you can independently use your transit system, your world expands. It’s like getting a passport. You can get to job interviews, to work, to shops, to concerts and cultural activities and the wider community benefits from your participation.

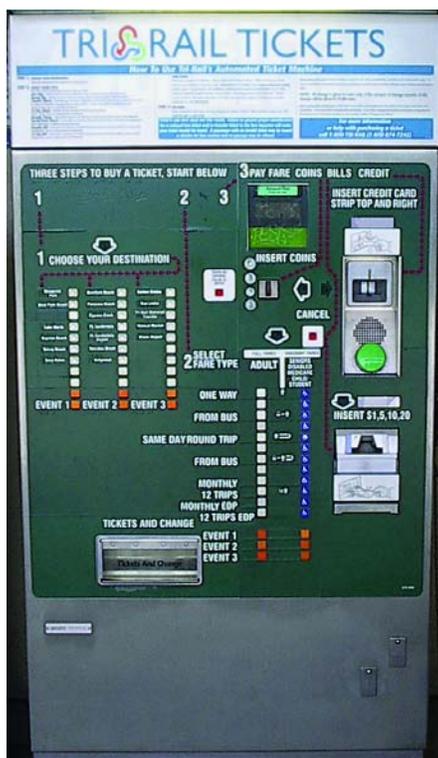
For transit agencies struggling to provide accessibility and to meet ADA requirements, there is the potential for a significant reduction in paratransit (door-to-door on-demand service) operation when this technology is coupled with an effective travel training program that permits individuals with disabilities to use fixed route services. That indicates that when people have confidence that they can get where they want to go on their own, their need for separate services goes down. Knowing that your customers won’t be frustrated by a ticket machine is part of building confidence and providing service.

Copies of the User Guide and the Final Report for the *Fare Machine Tactile/Audio Instruction System*, Transit IDEA Project 29, are available from TRB by sending an e-mail to dirvin@nas.edu. ♦



Transaction data recorded by George Earnhart of KRW, Inc. during the 3-month evaluation period at Tri-Rail show that the customer’s seeing-eye dog has less time to rest when his owner uses the ticket machine with audio instructions.

Ticket Talk



The green mushroom button just below the speaker is both landmark and control button for audio instructions.

A surprising number of decision points—dozens, in fact—are involved in buying a ticket from a transit fare vending machine. Transit IDEA project 29 has developed a way to communicate how to use the machines to riders with vision impairments—a fare machine that can talk you through each step of the transaction. A system of concise audio instructions that complement tactile instructions and guides on the face of the fare vending machine was developed by KRW Incorporated of Alexandria, Virginia, in collaboration with the Tri-County Commuter Rail Authority of South Florida (Tri-Rail) and the National Federation of the Blind of Florida.

The project first documented how existing raised letter and Braille faceplate instruction systems are developed and how people with impaired vision negotiate such systems. Investigators then developed and programmed an audio question and response dialogue that people with vision impairments could use independently. Housing for the necessary audio equipment was designed to fit within the standard ticket vending machine cabinet. Tri-Rail participated in a 3-month trial to test usability, maintainability, reliability, and overall patron acceptance.

A number of transit agencies have expressed interest in replicating this device for their own fare vending machines. Project investigators prepared a user guide that provides step-by-step information for developing an effective audio instruction system. ❖

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TSA Joins Transit IDEA on Security Projects

Staff from the Transportation Security Administration (TSA) have joined with subject matter experts, transit agency representatives, and leaders from the American Public Transportation Association and the Federal Transit Administration to guide Transit IDEA projects focusing on innovative measures to enhance transit security. The Transit IDEA panel, in cooperation with FTA and APTA, designated such projects high-priority after September 11, 2001. Currently three investigations in that focus area are under way.

• *Innovative Bioterrorism Detection for Transit Security*—Science Applications International Corp. is testing a new method of detecting and identifying potential biological warfare agents both in a lab and in a simulated subway situation. New York City Transit is participating.

- *Bandwidth Expansion and Real-Time Surveillance for Security on Transit Buses*—Carnegie Mellon University is developing real-time video surveillance technology that allows remote viewing, monitoring, and alerting functions at a central transit control room. The Port Authority of Allegheny County (Pittsburgh) is participating.
- *Counter Terrorism Chemical Detector for Rail Transit Systems*—A low-cost chemical detector prototype using wireless transmission to a central computer system is in development by Connecticut Analytical Corporation, with participation by New York City Transit.

IDEA proposals that address either of the Transit IDEA program's two priority focus areas, transit security and bus rapid transit, are encouraged. Instructions for preparing proposals are in the IDEA Program Announcement, available on the Internet at www.trb.org/idea. Descriptions of current and completed Transit IDEA projects are found in the Annual Progress Report of the Transit IDEA program, also on the IDEA website. ❖

On the Right Track

Thermite welding, which relies on a chemical reaction to create a bond between rail sections, is more readily accomplished in the field than welding methods used in rail fabrication shops. But failed thermite field welds are a major cause of rail-related train derailments. Two High-Speed Rail IDEA projects are addressing that problem. In HSR 24, the University of Illinois is investigating techniques for improving the fatigue performance of thermite welds. The project has developed new weld designs and sealants and tested alternative fluxes and coating techniques. In tests, the modified weld molds produced welds that extend the fatigue life 2 to 5 times beyond that of normal thermite welds.

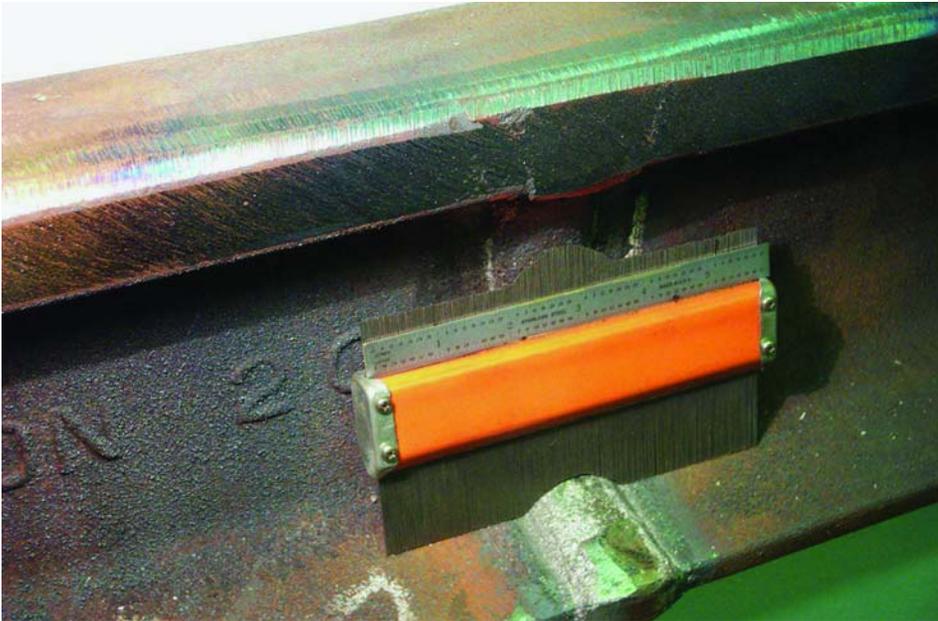


Photo courtesy of Fred Lawrence, University of Illinois.

Based on these findings, a follow-on IDEA project (HSR 41) was funded to investigate additional improvements and more testing. In January of 2004 samples of standard and improved weld designs provided by a major supplier of thermite welding equipment will be field tested at the Transportation Technology Center in Pueblo, Colorado.

The photograph shows a “dream weld” made to specifications developed in the IDEA project. Weld strength is tested with loads of 628 kN in continuous cycles. The test weld was still holding after 600,000 cycles; standard thermite welds typically withstand 125,000 to 200,000 load cycles.

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High-Speed Rail IDEA project 37 is investigating whether the electroslag welding process, in which electricity produces the required heat, can produce a stronger weld in the field at costs competitive with thermite welding.



Photo courtesy of Dan Danks, Electroslag Systems.

To identify an efficient process, alternative elements of the electro-slag methods are being tested, for example, various weld wires, fluxes, materials, and electrode configurations. The most promising combinations are being used to weld test rails that are evaluated through ultrasound and destructive tests according to industry standards. Properties of the test welds, including hardness, microstructure, profile, and chemistry are also being examined. Cost and time estimates of the process will be compared with those of thermite and flashbutt welding. The most successful version of the process will become the basis for a draft field manual.

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IDEA Graduate Wins Award

The Construction Innovation Forum, an international non-profit organization, encourages innovations that improve quality and reduce costs of construction. Each year, after a rigorous nomination process, the Forum's NOVA Award honors an innovation that meets those criteria.

The 2003 NOVA award was presented to TransTech Systems, Inc., in Schenectady, New York, for its Pavement Quality Indicator (PQI). The density gauge uses electrical impedance technology that was tested through the NCHRP IDEA program to determine the density of asphalt pavement. The early prototypes have

evolved over several generations of improvements, the latest being a sensor that provides an electrical field with a controllable depth of penetration. Another improvement is a data processor that corrects for surface moisture, temperature variation, and sensor impedance. The PQI is being used throughout the United States and in several European countries to determine pavement quality during a paving job without the limitations of nuclear devices or destructive testing methods. A draft specification is currently under evaluation by the American Association of State Highway and Transportation Officials (AASHTO) to establish national acceptance standards. ❖



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The 16-pound TransTech Systems Pavement Quality Indicator measuring density during compaction.



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