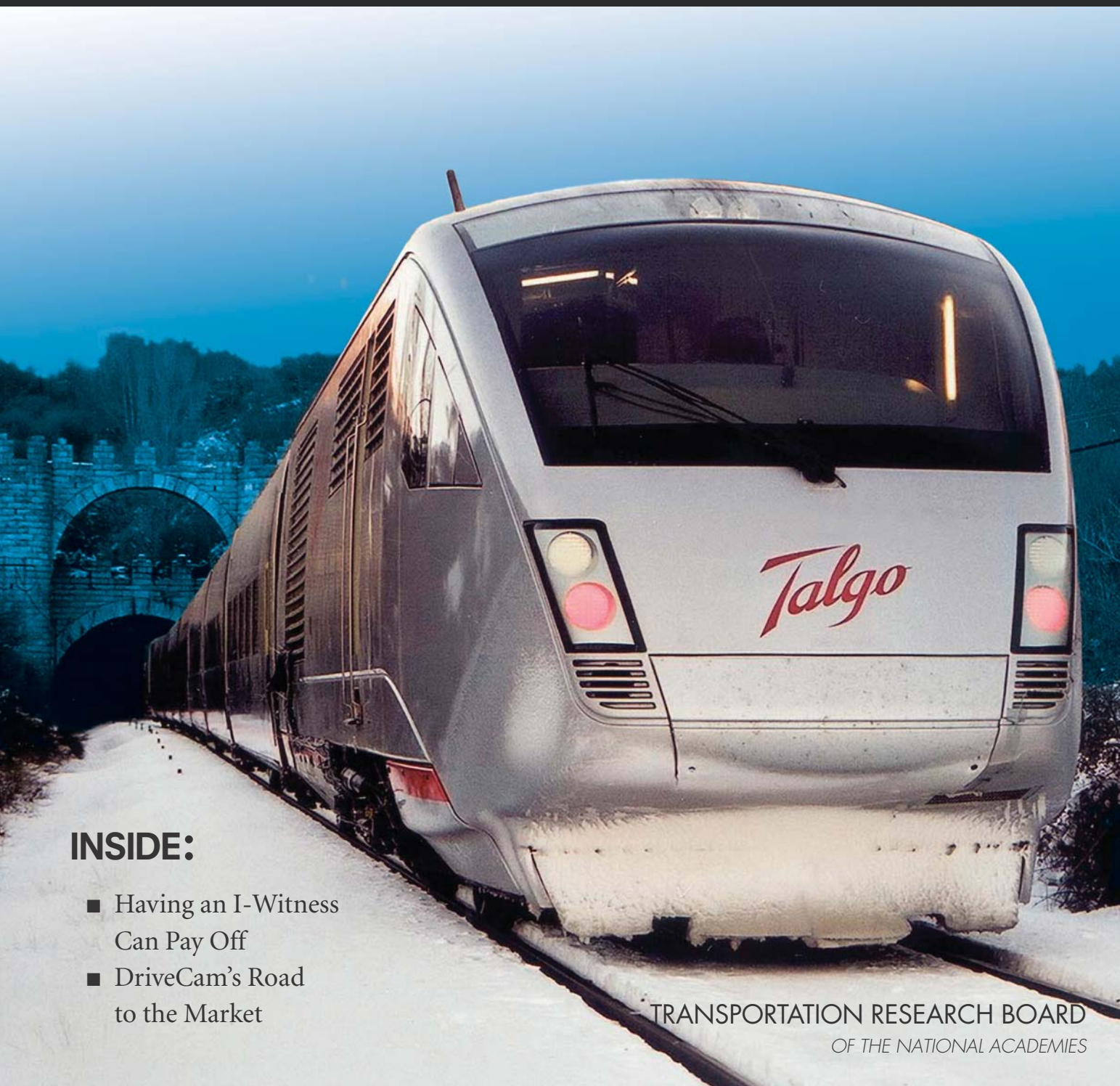




Ignition

News from TRB's IDEA Programs

HIGH-SPEED RAIL
HIGHWAY SYSTEMS
TRANSIT &
TRANSPORTATION SAFETY



INSIDE:

- Having an I-Witness Can Pay Off
- DriveCam's Road to the Market

TRANSPORTATION RESEARCH BOARD
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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 Eva Lerner-Lam, Palisades Consulting Group. 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 Pethel, Virginia Tech Transportation Institute. Harvey Berlin is TRB program officer.

Visit the IDEA web site:

www.nationalacademies.org/trb/idea

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SAFETY

Contents

3 FROM THE DIRECTOR'S DESK:

Going the Distance

4 INSIGHT:

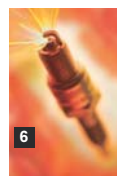
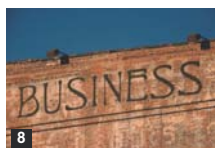
An Eye on the Road
Gary Rayner's
DriveCam Sees it All

6 NEW IDEAS:

A Wicked Combination
Can They Polka, Too?
The ARTS of Communication

8 BUSINESS:

High Stakes Investing





From the **Director's** Desk

Going the Distance

How do you measure the distance between inspiration and outcome? The necessary yardstick is calibrated not in feet or meters but in elements far less tangible. The yardstick might measure insight, curiosity, opportunity, rigor, access, conviction, and collaboration. Maybe the factors vary from project to project or inventor to inventor. Maybe a dozen others fit in between. In this issue's interview, we hear from one inventor who knows that his journey from one side of the world to the other and from road rage to a technology that might deter it, was measured in perseverance.

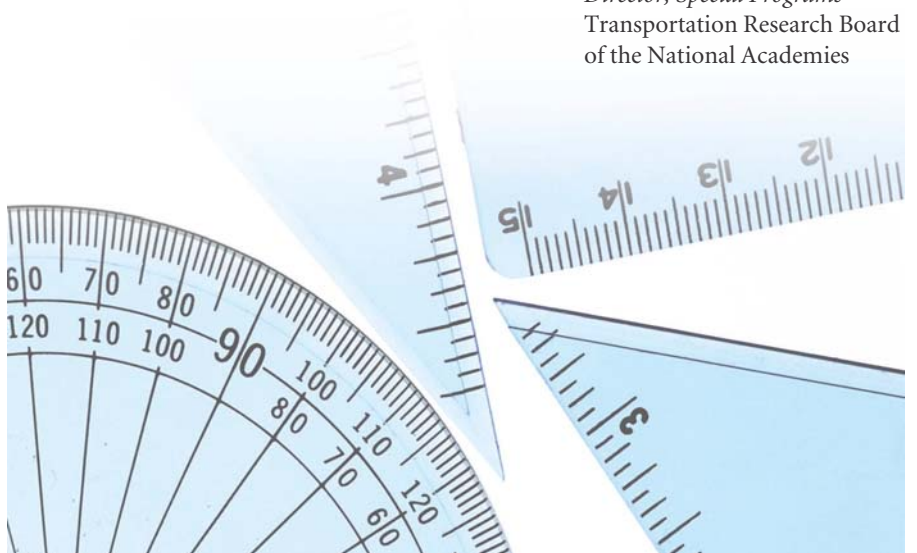
In *An Eye on the Road*, meet Gary Rayner, the inventor of DriveCam, among other things. This is the aviation world's 'black box' concept enhanced and configured for the roadways. Gary describes his trip from inspiration to outcome and offers advice for fellow travelers.

In our New Ideas department two projects address the critical need for improving safety in highway work zones. A rising work zone fatality rate requires not only new technologies to reduce risks, but new awareness among drivers. One of the projects described automates a high-risk task and the other combines an array of technologies to reliably inform motorists of changes ahead. A third project also helps reduce risk, but this sideways approach to wick drains relieves water pressure that causes dangerous, damaging, and costly landslides.

The Business section makes a case for high-risk investments, especially when the benefits of any payoff could extend across the nation—that's really going the distance.

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

Your comments
are welcome
and may be sent
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Gary Rayner



An Eye on the Road

Sometimes it's not enough for drivers to keep their eyes on the road. When an incident occurs, being able to show others what happened can make all the difference, especially if it's a boss, an insurance company, or the judge who needs convincing. Crash investigators famously decry the task of finding one witness who can corroborate another because one viewer's version may be substantially different from another's, even when both are telling the truth.

In 1999, the Intelligent Transportation Systems (ITS) IDEA Program awarded funding to a young man with an idea that addressed this problem. In this interview, Gary Rayner, the inventor of a kind of high-tech eyewitness, talks with us about what it has taken to put DriveCam on the road.

Tell us what DriveCam does, who is using it, and how they benefit.

The DriveCam video event data recorder is a palm-sized video recorder that mounts behind a vehicle's rearview mirror. DriveCam monitors driving activity by continuously recording video of the roadway, audio, and four directions of G-forces into a digital looping memory. G-forces are caused by activities such as hard braking, acceleration, harsh cornering, or collisions, all of which trigger DriveCam to save an event. The driver can also manually activate DriveCam at any time.

Fleets, including passenger transportation, limousines, ambulances, and service vehicles, use DriveCam's event recordings as part of a complete Driving Feedback System that provides accurate, unbiased feedback on driving performance. Fleets that regularly review the events with their drivers typically experience a 40–70% reduction in incidents. Of course, when incidents do occur, the information captured by DriveCam is invaluable for legal defense and insurance purposes. One insurance company is reimbursing 50% of the expense of installing DriveCam and others give substantial discounts to insure DriveCam protected fleets. There are also significant savings in costs for fuel, maintenance, and damage.

Do you remember the moment of inspiration, when DriveCam was born?

Vividly. The inspiration was a road rage incident in which half a brick was lobbed at me from a passing car, denting the hood of my car and cracking the windshield. I wished I had some evidence of what happened so I could prosecute the guys responsible and recover the damage costs. Shortly after that, Flight 800 crashed and we read a lot about the intensive search for the plane's black boxes, so that investigators could determine what caused the loss of several hundred people. It occurred to me that far more people—about 40,000 in the U.S.¹—die on the roads each year, yet we don't collect specific data that we could learn from, as the airlines do. I was convinced that lives could be saved, traffic safety improved, and costs reduced if we had the right technology.



DriveCam

¹The Fatality Analysis Reporting System Web-based Encyclopedia, a publication of the National Center for Statistics and Analysis, reports 42,116 deaths of traffic crash victims in the United States in 2001.

Have you always been a problem solver and has technology always been part of your solutions?

When I was growing up in Mullumbimby, Australia, my uncle, an electrical engineer, taught me how to solder when I was 5 years old. He taught me the elements of electronic components and circuitry, and by the time I was 8, I had built every kit available and was designing my own inventions.

What did you invent?

When I was 10 I invented an automatic car headlight dimmer, for example. Later there was a video paint box and animation system. It was licensed to a U.S. company, which sold about 3,000 of them. A more sophisticated special effects and animation system was very successful and that's what brought me to live in California in 1992. In 1995, I developed a computer controlled high-powered lighting system for bicycles. That was patented and licensed to another U.S. company, NiteRider, and has sold very well.

It's said that ideas ignore boundaries that thoughts respect². Did you have a sense that your idea for DriveCam was bigger than any boundaries that would confront it?

The power of perseverance and a vision that is greater than your obstacles is amazing. I was determined to develop this product and I was sure that people would eventually embrace the benefits of it. While working fulltime with NiteRider, I worked on DriveCam nights and weekends in my apartment, using my own credit cards to fund the prototypes. I even converted my bedroom to a lab and put the bed in the living room. It took about a year to develop a prototype that could be demonstrated.

What was your next step?

Connecting with other inventors. I learned about the IDEA programs through an organization called Trans Indus Entrepreneurs, which was enormously helpful, and then was introduced to the San Diego Regional Technology Alliance. Several people there helped to identify funding programs and guided me through the process.

Was the process of developing an IDEA proposal useful in any way beyond the funding that resulted?

In 1999 I submitted my IDEA proposal for funding to build several units to prove the viability and effectiveness of the technology. We received \$100,000 from IDEA, with another \$66,000 in cost sharing from California's technology investment program. The timing of the IDEA award was of paramount importance. It was a major vote of confidence and a key catalyst in being taken seriously during our first funding round. The core of the IDEA proposal became the basis of our official business plan, which helped to get that process started in time for approaching investors.

We also found that the contacts we made within DOT, National Highway Traffic Safety Administration and the transportation industry because of the IDEA award were almost as valuable as the funding itself.

² Austrian playwright Franz Grillparzer wrote, "A thought respects boundaries that ideas ignore and so fails to realize itself."

"The power of perseverance and a vision that is greater than your obstacles is amazing."

It sounds as though things began to move quickly.

The field tests were very successful, so later in 1999 I was able to raise \$1 million from angel investors. This underwrote development of the second generation of DriveCam, which was vastly improved. It now had dual cameras, high-resolution color, capture of more than a dozen events, and some

sophisticated tracking and database software. In 2000, DriveCam was patented and won The Most Innovative Product Award by the University of California San Diego Connect group. That same year I brought in a management team and in 2001 I was able to step down as CEO to focus on development. Now DriveCam Video Systems is expanding its range of industries and customers. Stronger ties with the insurance and automotive industries are being forged and we expect 2003 to be a big year.

Did you establish partnerships with potential DriveCam users during development?

We developed a good relationship with the San Diego Fire Department, who installed our prototypes and provided feedback. They proved to be a good partner in testing and improving the product, and were a great reference resource for paying customers. Without this initial installation, it would have been very difficult to get customers to commit to a new unproven technology.

Do you have any advice for other investigators?

If I were to offer any advice to entrepreneurs considering stepping out it would be that you cannot take half measures. It really takes total commitment to your vision if you expect it to succeed. This means financial risk, long hours, many setbacks, and very little short-term payoff. Receiving a funding award is just one step in developing a successful product, service, or company, but it can be a very valuable boost. The proposal process is very straightforward if you just carefully follow the instructions, so my advice is to avoid consultants who will take a cut to supposedly guarantee you success.

Do you have any advice for IDEA program administrators?

My advice is simple: These awards are enormously helpful to visionaries trying to bring to reality new ideas and products that can really make a difference. Without this help, many people simply would not have the resources to get started. Please keep these valuable resources available.



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In 2001, three people were killed in work zone areas of U.S. highways nearly *every day*.¹ As the aging interstate highway system is rehabilitated over the coming years, there will be more work zones in more places. Transportation leaders throughout the country have called for new safety strategies and emphasize that not only must highway workers be protected from high-risk exposure, but that drivers must understand their role in improving work zone safety. Two current NCHRP IDEA projects address these issues.

Another NCHRP IDEA project has combined two well-known geo-technologies used to stabilize landslides, which are both dangerous and expensive, to develop a new technique that is simple, effective, and relatively inexpensive.

¹ Pete Ruane, President and CEO of American Road and Transportation Builders Association. Reported August 20, 2002 by the National Work Zone Safety Information Clearinghouse and based on data collected by the Fatal Accident Reporting System

A Wicked Combination

Highway landslides cost millions in damage to roadways annually and are a danger to road users. Excess water pressure is a main cause of landslides and a traditional abatement method is installing horizontal drains. The technique can be expensive and the drains often rupture if the slide moves, which makes the drain ineffective.

For several decades now, vertically installed wick drains—geotextile sleeves around corrugated plastic inserts—have been used to dewater and consolidate saturated foundation areas for embankments and structures.

In NCHRP IDEA project 57 and its follow-on project 76, a combination of the two techniques was developed. Horizontal wick drains can be driven with common construction machinery, require little operator training, cost about \$2.50 per foot to install, including the cost of the wick drain material, and have an average installation rate of 50 to 60 feet per hour. Computer stability analysis of the landslide test sites showed as much as 42% increased stability after the horizontal wick drain installation.

More than 170 drains were installed at eight sites in Missouri, Colorado, and Indiana, with the cooperation of the local DOTs. Recent visits confirmed that the drain material was performing well, roadway pavement was undamaged, and low water levels were being maintained in the slide mass. ❖

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Can They Polka Too?

Another way to improve work zone safety is to eliminate tasks that expose highway workers to high risk. One such job is placing the plastic safety barrels used for traffic control, which literally puts workers on the line. NCHRP IDEA project 90 is investigating a robotic highway safety barrel that can self-deploy and self-retrieve. Barrel positions could be quickly reconfigured by remote controls as the work zone changes, and could continuously follow work crews to maintain proper placement for safety.

Stage one of the project will focus on a low-cost and reliable robot design. Stage two includes the design of a six-robot system and a distributed planning and control approach. In stage three, Nebraska Department of Roads will participate in field tests; the investigator has also received input from the Mid-American Transportation Center. “Roll out the barrels” could soon have a very different meaning. ❖

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Robotic highway safety marker

The ARTS of Communication

Timely information can provide better choices—that’s pretty much what the technology age is all about. With information from the Advanced Relocatable Traffic Sensor (ARTS) System, drivers can choose actions that will increase their safety as they move through highway work zones and incident management areas. Of course, the information would also be useful to law enforcement officers, should drivers not choose wisely.

What makes the ARTS system different from others is its wireless, portable, and self-orienting capabilities. The sensor requires little time to position or calibrate and can orient itself in relation to collaborative technologies. The highly integrated sensor gathers data on many parameters and is designed to operate under punishing roadway conditions. Its wireless data links will communicate to various driver information formats, including highway advisory radio, roadway message boards, and fixed traffic information centers.

The key features of the ARTS are small size; lightweight, self-powered, built-in wireless communication links; reasonable component cost; self-calibration and diagnostics; automatic configuration and ability to measure multiple parameters such as presence, speed, direction, volume and occupancy. The design integrates low-power microwave radar technology, GPS, angle sensors, advanced power and battery management techniques for small solar powered systems, and low-power advanced wireless technology.

The Scientex Corporation of Alexandria, Virginia, is developing the system under NCHRP IDEA project 93. ❖

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Business

High Stakes Investing

IDEA programs are the stock market of their sponsors' research investment portfolios. Investing in a concept that has yet to be proven viable is a high-risk venture in any field. But wise investors, while relying on their steady producers, stay alert to the possibility of the unexpected winner.

For sponsoring agencies working to provide safe and efficient transportation to a very mobile population, a small investment with even a small potential to reduce highway crashes or congestion or the cost of rebuilding a bridge could have a payoff of inestimable value.

Sponsors' investments often are augmented through cost-sharing arrangements, boosting the amount of research that can be supported through the programs. IDEA projects active in 2002, for example, attracted \$3.3 million in cost-share funds to sup-

plement the \$4.4 million awarded by program committees. When post-IDEA investments are considered, each dollar invested in IDEA yields \$3 in research.

For investigators, a funding source at the right time can be the bridge between concept and product. Investigators often find value in the very process of submitting a proposal to an IDEA program. Volunteer transportation experts who review IDEA proposals have knowledge of resources, likely problem areas, and possible partners for product trials that can ignite real interest in a project and help generate momentum.

All of which is why the high-risk IDEA programs, incurring relatively small costs to sponsors and offering timely funding to inventors, are good business. Visit the IDEA website to learn more: nationalacademies.org/trb/idea.



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