

Building capacity. The EAR Program also furnishes value by increasing the capacity of organizations and individuals to conduct research. For example, the EAR Program supports the National Research Council Research Associateship Program, which provides postdoctoral and senior scientists and engineers with opportunities to conduct research on projects that complement other EAR Program research.

RESEARCH LEADING TO ENVIRONMENTALLY SUSTAINABLE TRANSPORTATION

The EAR Program funds research that will help the transportation industry reach sustainability goals; for example:

- Greatly Increased Use of Fly Ash in Hydraulic Cement Concrete for Pavement Layers and Transportation Structures.
- Innovative and Environmentally Beneficial Infrastructure Materials.
- Next-Generation, Energy-Efficient Traffic Control Devices.
- New Technologies for Development of Renewable Energy in the Public Right-of-Way.
- A Remote, Self-Sustained System for Monitoring Water Quality near Highways.



GETTING INVOLVED WITH THE EAR PROGRAM

To take advantage of a broad variety of scientific and engineering discoveries, the EAR Program involves both traditional stakeholders (State department of transportation researchers, University Transportation Center researchers, and TRB committee and panel members) and nontraditional stakeholders (investigators from private industry, related disciplines in academia, and research programs in other countries) throughout the research process. Since 2006, the EAR Program involved stakeholders throughout the following program activities:

- **Identifying and scoping topics.** The EAR Program has identified and scoped topics as part of 50 meetings and scanning trips.
- **Reviewing proposals and projects.** More than 200 experts provided assessments of proposals, ongoing projects, or possible new projects. Most reviewers are from academic institutions and, in descending order, State and local departments of transportation, other Federal agencies, private companies, and the international community.
- **Conducting research.** The program has awarded 79 research projects on 47 different topics between 2007 and 2016. The research awards include work by multidisciplinary teams at 62 academic institutions, 39 private companies, 13 State and local agencies, 10 Federal laboratories, and eight institutions outside of the United States.

LEARN MORE

For more information, see the EAR Program Web site at www.fhwa.dot.gov/advancedresearch. The site features information on research solicitations, updates on ongoing research, links to published materials, summaries of past EAR Program events, and details on upcoming events.

EXPLORATORY ADVANCED RESEARCH



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VISIT THE EAR PROGRAM WEB SITE AT
www.fhwa.dot.gov/advancedresearch/index.cfm



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ABOUT EXPLORATORY ADVANCED RESEARCH

Exploratory advanced research focuses on longer term, higher risk research with a high payoff potential. It matches opportunities from discoveries in science and technology with the needs of specific industries.

The uncertainties in the research approach and outcomes challenge organizations and researchers to be innovative problemsolvers, which can lead to new research techniques, instruments, and processes that can be of value to future advanced or applied research projects.

ABOUT THE FEDERAL HIGHWAY ADMINISTRATION'S EXPLORATORY ADVANCED RESEARCH PROGRAM

Federal legislation establishes an Exploratory Advanced Research (EAR) Program to address longer term, higher risk, breakthrough research with the potential for dramatic, long-term improvements to transportation systems in planning, building, renewing, and operating safe, congestion-free, and environmentally sound transportation facilities. The Federal Highway Administration's (FHWA) EAR Program secures broad scientific participation and extensive coverage of advanced ideas and new technologies through three key processes:

- FHWA engages stakeholders in the EAR Program to evaluate potential research topics and through the transition of research results.
- FHWA identifies and scopes topics through extensive initial-stage investigations. The EAR Program has supported scanning trips and meetings involving hundreds of national and international experts to assure use of the most recent advances in science and engineering.
- FHWA uses expert panels to ensure the technical quality of sponsored research.

The panels are composed of Federal, State, academic, and international scientific and engineering experts who are vetted to avoid conflicts of interest. The panels frequently include members from multiple disciplines to assure that cross applications and novel approaches to research are fully assessed.

INTERNATIONAL COLLABORATION

Access to international expertise is critical for the EAR Program. In some research areas, governments, industries, and universities in other parts of the world have developed important advances that could be applied to U.S. highway transportation.

The FHWA EAR Program has engaged international experts by sponsoring scanning tours, convening forums, inviting expert reviewers, offering postdoctoral research fellowships, and participating in international pool-funded (also known as common pot) research programs. FHWA expects to continue these collaborations and longer term relationships.

EAR PROGRAM FOCUS AREAS

The EAR Program funds research across a range of issues that are critical to the transportation industry:

Connected Highway and Vehicle System Concepts — Emphasizes the longer term needs to reach critical FHWA safety and mobility goals by developing the theory and assessing the feasibility for systems that leapfrog current technological approaches for linking infrastructure with future vehicle and personal mobility technology.

Breakthrough Concepts in Materials Science — Leverages new approaches in materials science to produce innovative highway materials with characteristics that enable enhanced functionality (including multifunctionality), constructability, sustainability, and cost-effectiveness or operating characteristics of highway infrastructure.

Human Behavior and Travel Choices — Leverages research concepts from the social sciences, including psychology and economics, along with more traditional research for improving safety, reducing congestion, and improving the livability of the Nation's communities.

Technology for Assessing Performance — Seeks novel approaches and breakthrough technology that will revolutionize the use of performance management in the highway sector.

New Technology and Advanced Policies for Energy and Resource Conservation — Cuts across infrastructure, operations, and societal and complex natural systems to support innovative methods for reducing highway industry costs and moving toward sustainability.

EAR PROGRAM RESULTS

The EAR Program strives to develop partnerships with the public and private sectors, because the very nature of the EAR Program is to apply ideas across traditional fields of research and stimulate new approaches to problem solving. Through eight solicitations, the EAR Program has awarded 79 projects involving both government and academic researchers. These projects represent the investment of \$76 million in FHWA funds and leverage \$28 million in matching funds.

The EAR Program bridges basic research (e.g., academic work funded by National Science Foundation grants) and applied research (e.g., studies funded by State departments of transportation). Research may improve the understanding of phenomena that can accelerate or allow for new lines of applied research. For example, EAR Program-funded projects are researching methods for automating analysis of video data that will provide researchers new tools for understanding driver behavior in order to increase roadway safety and mobility.

In addition to sponsoring EAR Program projects that advance the development of highway infrastructure and operations, the

EAR Program is committed to promoting cross-fertilization with other technical fields, furthering promising lines of research, and deepening vital research capacity.

Cross-fertilization. Research may include the application of scientific and technological discoveries in other fields to transportation. An example is a project titled "Applications of Knowledge Discovery in Massive Transportation Data: The Development of a Transportation Research Informatics Platform," which is employing data analytic methods developed for financial and commercial retail industries to integrate and analyze disparate data sources, such as traditional structured crash data, with social media and sensor data.

Disseminating new findings. Each EAR Program-sponsored project includes a transition plan for finding appropriate research followup activities through disseminating new findings and pursuing the potential for continued research. Where the findings suggest the value of further investigation, the EAR Program identifies appropriate activities to engage interested stakeholders who may want to continue the research. For example, when new technologies developed in a project are meeting anticipated objectives, there may be interest in applied research at FHWA or among State departments of transportation, Transportation Research Board (TRB) cooperative research programs, or private industry. Other research projects may lead to unexpected findings or clarification about questions and approaches, which could suggest continued investigation under the EAR Program.

