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 entitled "Intelligent Multisensor Measurements to Enhance Vehicle Navigation and Safety Systems," in which researchers developed a robust and reliable vehicle-positioning system capable of providing accurate, high-update-rate, lane-level measurements for future vehicle navigation and control. In this project, investigators applied technology developed and tested in other industries, including aerospace, to improve highway safety.

• *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 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.

• *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.

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 Transportation Research Board 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. From 2006 through 2012, the EAR Program involved stakeholders throughout the following program activities:

• *Identifying and scoping topics* as part of over 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 50 research projects on 37 different topics between 2007 and 2012. The research awards include work by multidisciplinary teams at 33 academic institutions, 16 private companies, 10 State and local agencies, and 7 Federal laboratories.

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.

VISIT THE EAR PROGRAM WEB SITE AT

www.fhwa.dot.gov/advancedresearch

EXPLORATORY ADVANCED **RESEARCH**

U.S. Department of Transportation
Federal Highway Administration

EXPLORATORY ADVANCED RESEARCH PROGRAM

EXPLORATORY ADVANCED RESEARCH

About Exploratory Advanced Research

Exploratory advanced research focuses on long-term, high-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 problem-solvers, which can lead to new research techniques, instruments, and processes that can be applied to future high-risk and applied research projects.

ABOUT THE FEDERAL HIGHWAY ADMINISTRATION'S EXPLORATORY ADVANCED RESEARCH PROGRAM

Federal legislation establishes an Exploratory Advanced Research (EAR) Program for transportation to address longer-term, higher-risk, breakthrough research with the potential for dramatic long-term improvements to transportation systems—improvements 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 from evaluating potential research topics through communicating research results.

• FHWA identifies and scopes topics through extensive initial-stage investigation. The EAR Program has supported scanning trips and meetings involving more than 200 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, and offering postdoctoral research fellowships. FHWA expects to continue these ad hoc collaborations and to formalize 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 feasibility for systems that leapfrog current technological approaches for linking infrastructure with future vehicle and personal mobility technology.

Breakthrough Concepts in Material Science—Leverages new approaches in materials science to produce innovative new highway materials with characteristics that enable enhanced functionality (including multifunctionality), constructability, sustainability, cost effectiveness or operating characteristics of highway infrastructure and system monitoring sensors to enhance highway safety, reliability, and resilience.

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.

CROSS-CUTTING AREAS

Nanoscale Research—Cuts across all primary focus areas and takes advantage of higher magnitudes of investment from other agencies in support of greater highway system resilience, improved safety and operations, and reduced environmental impacts. This focus area encompasses modeling and measuring phenomena to increase understanding of properties as well as applying scientific advances from other fields that are critical to improving the safety, reliability, and resilience of the highway system.

Information Sciences—Takes advantage of paradigm-shifting breakthroughs found across academia, government, and the private sector in the computer and information technology fields, including automation, data processing and management, computing, cyber (or virtual) systems, communication, visualization, and control.

Research Leading to Environmentally Sustainable Transportation

The EAR Program funds research that will help the transportation industry to 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

EAR PROGRAM RESULTS

The EAR Program strives to develop partnerships with the public and private sectors because the very nature of EAR is to apply ideas across traditional fields of research and stimulate new approaches to problem solving. Through six solicitations, the EAR Program has awarded 50 projects involving both government and academic researchers. These projects represent the investment of $42 million in FHWA funds and leverage $17 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 include improved understanding of phenomena that can accelerate or allow for new lines of applied research. An example is a project called "Driver Behavior in Traffic," in which investigators characterize driver behavior using naturalistic driving data and agent-based modeling techniques for development of effective strategies to improve transportation safety and operations. This work will assist in future safety research.