

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 “Increased Understanding of Driver Visibility Requirements,” in which investigators are developing a

rational, theoretical framework for determining the quantity and quality of visual information needed by drivers to navigate the roadway safely and effectively. This work will assist in future safety research.

In addition to sponsoring EAR 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 are developing 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 are applying technology developed and tested in other industries, including aerospace, to improve highway safety.

• **Disseminating new findings.** Each EAR 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 re-

search process. From 2006 through 2011, the EAR Program involved stakeholders throughout the following program activities:

- **Identifying and scoping topics** as part of over 30 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 44 research projects on 34 different topics between 2007 and 2011. The research awards include work by multidisciplinary teams at 26 academic institutions, 15 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](http://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.

**For additional information, contact David Kuehn, 202-493-3414 (email: [david.kuehn@dot.gov](mailto:david.kuehn@dot.gov)); Terry Halkyard, 202-493-3467 (email: [terry.halkyard@dot.gov](mailto:terry.halkyard@dot.gov)); or Zachary Ellis, 202-493-3193, (email: [zachary.ellis@dot.gov](mailto:zachary.ellis@dot.gov)).**

### EXPLORATORY ADVANCED RESEARCH



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EXPLORATORY  
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RESEARCH  
PROGRAM

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Visit the EAR Program Web site at [www.fhwa.dot.gov/advancedresearch](http://www.fhwa.dot.gov/advancedresearch).

## About Exploratory Advanced Research

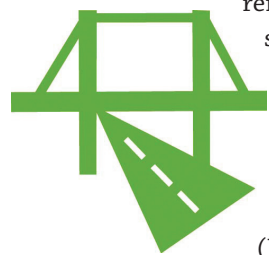
Exploratory advanced research focuses on long-term, high-risk research with a high payoff potential. It matches opportunities from discoveries in science and technology with the needs of specific industries.

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

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) established an Exploratory Advanced Research (EAR) Program for transportation. SAFETEA-LU designated funding for 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 50 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.

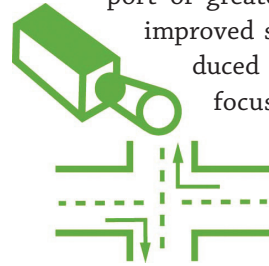
### EAR PROGRAM FOCUS AREAS

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

**Integrated Highway System Concepts**—Emphasizes the need to link highway infrastructure with future vehicle and personal mobile

technology to reach critical FHWA safety and mobility goals. This focus area includes development of theories and assessment of feasibility for systems that leapfrog current technological approaches.

**Nanoscale Research**—Cuts across all functional 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.



**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.

**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.

**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, and electronic systems for communication, visualization, and control.

**Breakthrough Concepts in Materials Science**—Leverages new approaches in materials science to produce innovative highway materials and new system-monitoring sensors. The search is for materials that can enhance the functional-

## 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

ity (including multifunctionality), constructability, sustainability, cost-effectiveness, and operations of highway infrastructure and for sensors that can improve highway safety, reliability, and resilience.

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

### 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 five solicitations, the EAR Program has awarded 44 projects involving both government and academic researchers. These projects represent the investment of \$32 million in FHWA funds and leverage \$16 million in matching funds.

The EAR Program bridges basic research (e.g., academic work funded by National Science