

The Development of a Transportation Research Informatics Platform” employed 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 poststudy transition plan to disseminate new findings and pursue the potential for continued research. When a project’s 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, promising new technologies developed in an EAR Program-sponsored project may spark interest among FHWA, State DOTs, Transportation Research Board (TRB) cooperative research programs, or private industry to conduct further applied research. Other research projects may lead to unexpected findings or clarification about questions and approaches, leading to further investigation under the EAR Program.
- **Building research capacity.** The EAR Program also creates value by increasing the research capacity of organizations and individuals. For example, the EAR Program supports the National Research Council Research Associateship Program, which provides postdoctoral and senior scientists and engineers with opportunities to research projects that complement ongoing EAR Program studies.

## 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 DOT 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 has involved stakeholders throughout the following program activities:

- Identifying and evaluating topics. The EAR Program has identified and evaluated topics as part of meetings and scanning trips.
- Reviewing proposals and projects. More than 250 experts have provided assessments of proposals, ongoing projects, or possible new topics. Most reviewers are from U.S. academic institutions, State and local DOTs, other Federal agencies, private companies, or foreign academic institutions.
- Conducting research. The program has awarded 101 research projects on 57 different topics between 2007 and 2021. The research awards include work by multidisciplinary teams at 80 academic institutions, 57 private companies, 13 State and local agencies, 10 Federal laboratories, and 10 foreign institutions.

## LEARN MORE

For more information, see the EAR Program website at <https://highways.dot.gov/research/exploratory-advanced-research>. 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 WEBSITE @

[HTTPS://HIGHWAYS.DOT.GOV/RESEARCH/EXPLORATORY-ADVANCED-RESEARCH](https://highways.dot.gov/research/exploratory-advanced-research)

### EXPLORATORY ADVANCED RESEARCH



#### Cover photos

Left: © 2021 Louisiana Tech University.  
Center: Source: FHWA.  
Right: © Henry Samueli School of Engineering and Applied Science, University of California, Los Angeles.

#### Inside photo

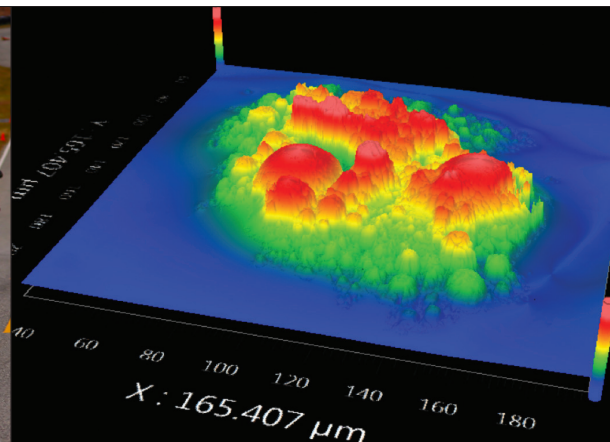
Source: USDOT.

Recommended citation: Federal Highway Administration, Exploratory Advanced Research Program (Washington, DC: 2021) <https://doi.org/10.21949/1521699>.



U.S. Department of Transportation  
Federal Highway Administration

FHWA-HRT-22-006  
HRTM-20/11-21(1M)E



U.S. Department of Transportation  
Federal Highway Administration

EXPLORATORY  
ADVANCED  
RESEARCH  
PROGRAM



## ABOUT EXPLORATORY ADVANCED RESEARCH

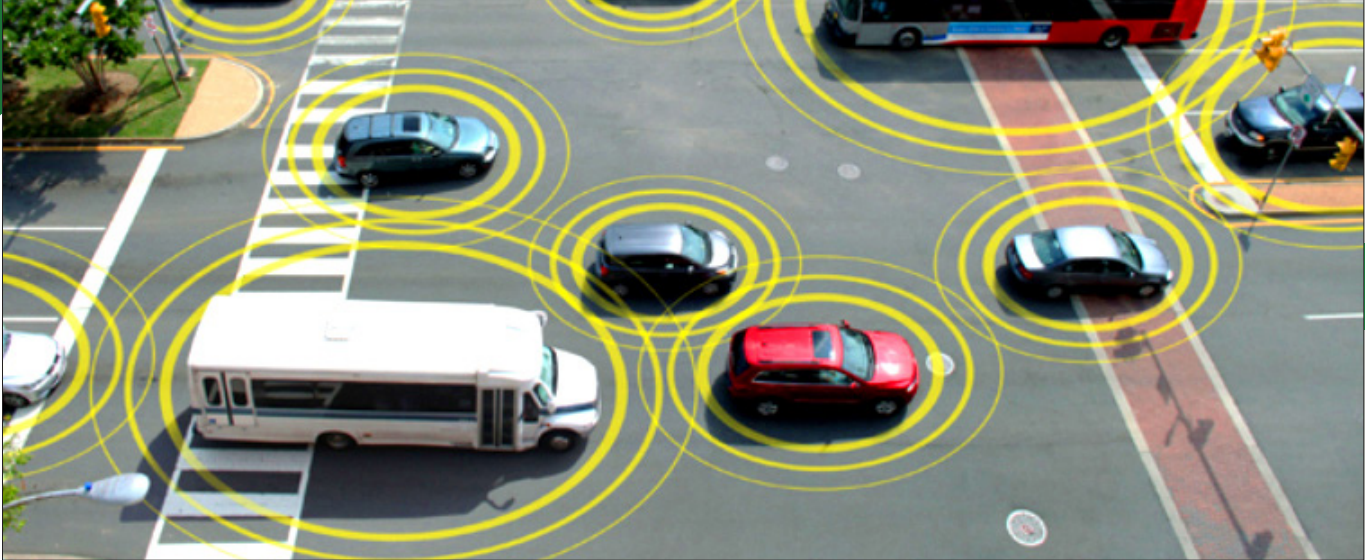
Exploratory advanced research focuses on longer term, higher risk research with tremendous potential for transformational improvements to plan, build, renew, and operate safe, congestion free, and environmentally sound transportation systems. Exploratory research matches opportunities from discoveries in science and technology with the needs of our Nation’s highway transportation system.

Organizations and researchers can face uncertainties in research approaches and outcomes. Those challenges can lead to innovative problem-solving and 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 established the Federal Highway Administration’s (FHWA) Exploratory Advanced Research (EAR) Program to support breakthrough research that has the potential for dramatic, long term improvements to transportation systems in planning, building, renewing, and operating safe, congestion-free, and environmentally sound transportation facilities. FHWA’s EAR Program secures broad scientific participation and extensive coverage of advanced ideas and new technologies through three key processes:

- FHWA engages stakeholders throughout the EAR Program, from the evaluation of potential research topics through the transition of research results.
- FHWA identifies and evaluates topics through extensive initial-stage investigations. The EAR Program has supported scanning trips and meetings involving hundreds of national and



international experts to ensure the use of the most recent advances in science and engineering in the EAR Program.

- FHWA uses expert panels to ensure the technical quality of the research and accelerate the transition of the research results. 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 ensure that cross-applications and novel research approaches 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 engages 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.

## 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**—Develop theory for and assess the feasibility of systems that leapfrog current technological approaches for linking infrastructure with future vehicle- and personal mobility technology.
- **Breakthrough concepts in materials science**—Leverage new approaches to produce innovative materials that enhance highway infrastructure functionality, constructability, sustainability, and cost effectiveness.
- **Human behavior and travel choices**—Leverage research concepts from the social sciences, including psychology and economics, along with more traditional transportation-related disciplines to improve safety, reduce congestion, and enhance the quality of life for communities throughout the United States.
- **Technology for assessing performance**—Seek 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**—Cut across infrastructure, operations, and societal and complex natural systems to support innovative methods for reducing highway industry costs and improving sustainability.

## EAR PROGRAM RESULTS

As a proponent of applying ideas across traditional research fields to stimulate new problem solving approaches, the EAR Program strives to develop partnerships with the public and private sector. Through 12 solicitations over the past decade, the EAR Program has awarded 101 projects involving both government and academic researchers, 19 of which are ongoing. These projects represent the investment of \$99 million in FHWA funds and leverage \$28 million in matching funds.

The EAR Program bridges basic research<sup>1</sup> (e.g., National Science Foundation grant-funded knowledge-driven academic work) and applied research<sup>2</sup> (e.g., State department of transportation (DOT)-funded studies developing standards). Research may improve the understanding of phenomena that can accelerate or allow for new lines of applied research. For example, investigators for an EAR Program-funded project are studying methods for automating video data analysis that will provide researchers with 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 the following practices:

- **Cross-fertilization.** Research may include the application of scientific and technological discoveries in fields unrelated to transportation. For example, a project titled “Applications of Knowledge Discovery in Massive Transportation Data:

<sup>1</sup> Research that develops theoretical knowledge, methods, and techniques in a field of science.

<sup>2</sup> Research that applies theoretical knowledge, methods, and techniques for a specific end goal or purpose.