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New Methods to Collect, Analyze, Apply Highway Data from work sponsored by the FHWA Exploratory Advanced Research (EAR) Program

Presentation for the

2011 Highway Data Workshop and Conference and

ITE NY Upstate Section Annual Meeting

U.S. Department of Transportation
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Presentation Objectives

- Set National data context
- Provide EAR Program info
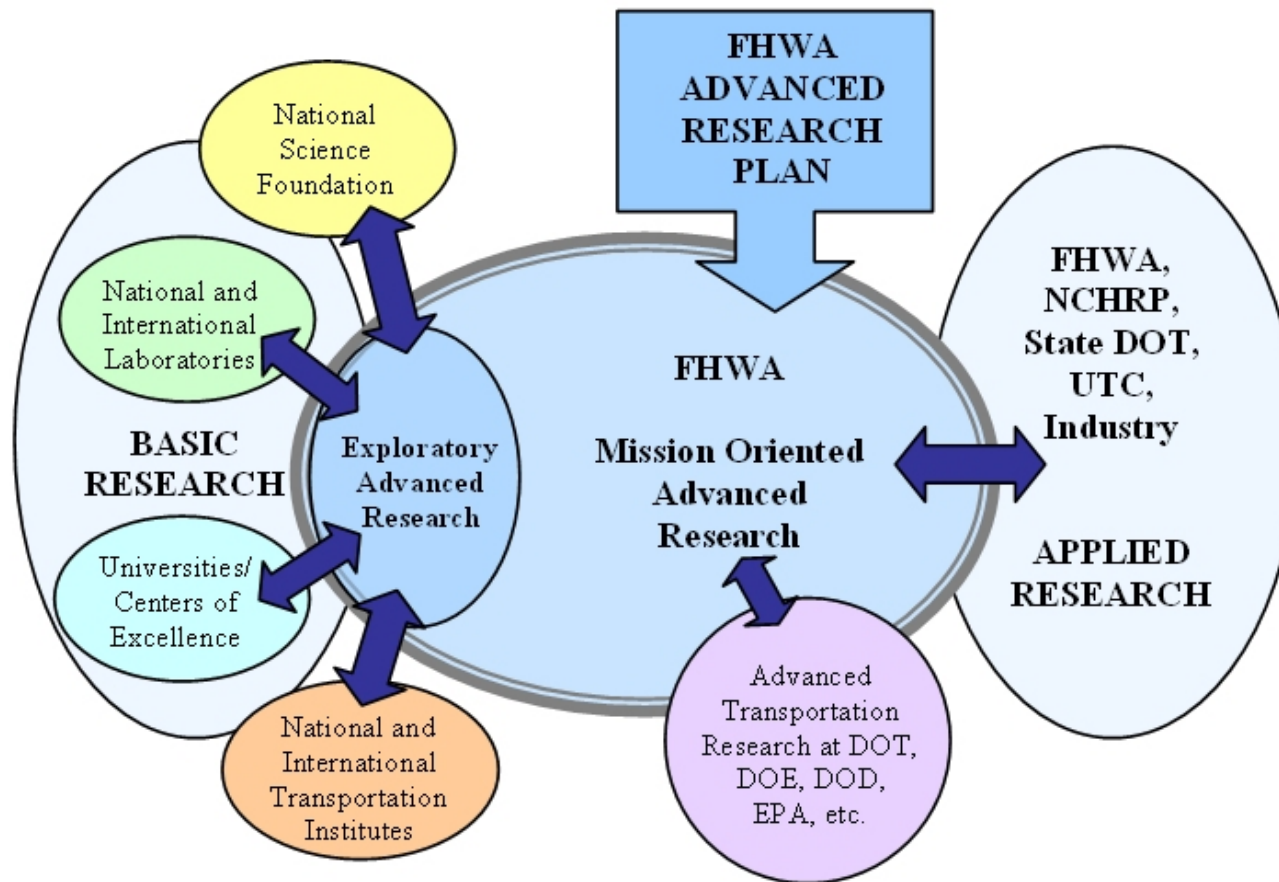- Discuss future directions

Nation Data

- ## System performance demands
  - Passenger, freight travel, traffic data
  - Infrastructure health conditions
  - Financial

- ## Evidence-based decision-making

- ## New acquisition, analysis methods

What is EAR?

Authorization

- ## SAFETEA-LU 2005 to present

  - Focus on high-risk, high payoff research

  - Strive for partnerships with public, private entities

  - Funding up to $14 million annually*

  * Appropriated funding may vary ($10-11 million annually)

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Key Processes

- Focus on high-risk, high payoff research

- Merit review is used to enhance the quality of research processes and results

- Research stakeholders are involved throughout

- Commitment to successful project handoff

Breadth with Depth

- All projects begin with initial stage investigations
  - Reference searches, scanning trips, convening workshops, etc.
- Assure leverage of the most recent, relevant and advanced research from all fields
- Not all initial stage investigations lead to (or are expected to lead to) follow-on or actionable results

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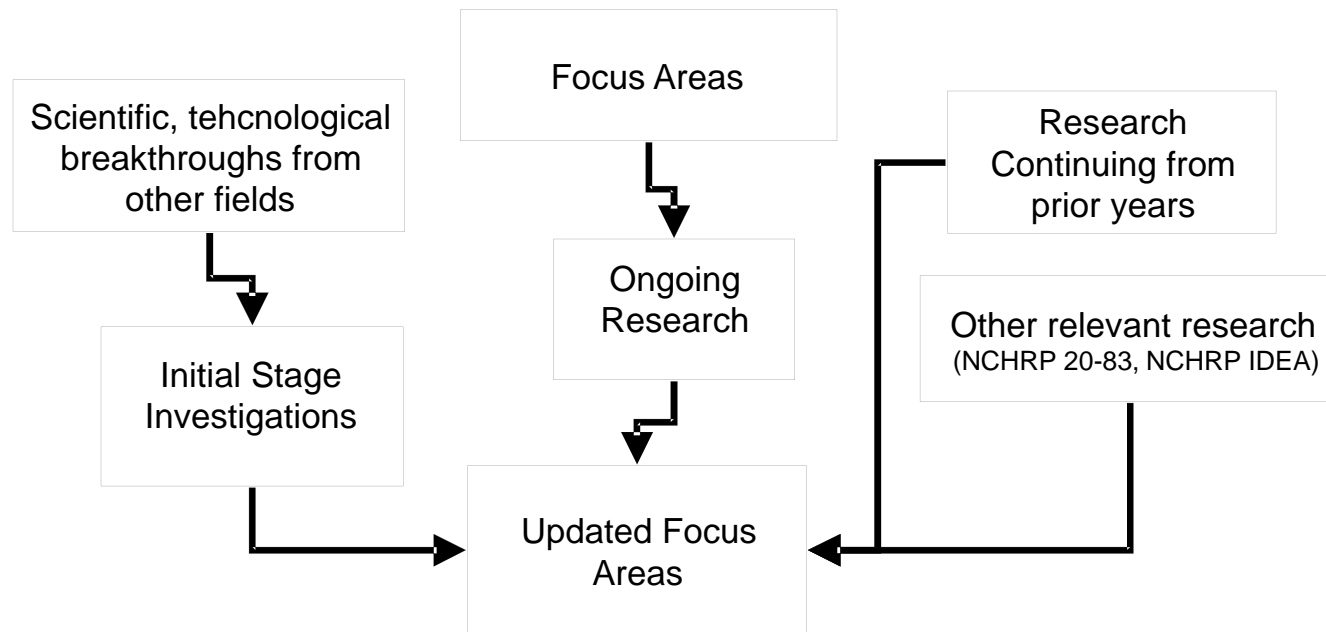**Federal Highway Administration**

Expert Review

- **Support from over 200 experts**
  - Topic generation and scoping
  - Evaluation of proposals, ongoing research
- **Building expert networks**
- **Anticipating emerging areas**

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Program Development

Focus Areas

Scientific, tehcnological breakthroughs from other fields

Research Continuing from prior years

Ongoing Research

Other relevant research
(NCHRP 20-83, NCHRP IDEA)

Initial Stage Investigations

Updated Focus Areas

Influences in the Development of EAR Program Focus Areas

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Focus Areas

- Integrating highway system concepts
- Nanoscale research
- Human behavior and Travel Choices
- New technology and advanced policies for energy and resource conservation
- Information sciences
- Breakthrough concepts in material science
- Technology for assessing performance

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Partner Collaboration

- Research stakeholders are involved throughout
  - From scoping of focus areas through communication of research results
- Stakeholders include
  - Academic
  - Government (federal, state, and local)
  - Industry (businesses, associations)
  - International

Core Audiences

- ## Idea Generators
  - Dream up the ideas for exploratory advanced research; curious about a topic or area of research; identify a need to conduct scientific evaluation of the feasibility of the idea.

- ## Program Participants/Researchers
  - Conduct exploratory advanced research projects; take the idea and test them by leading the research effort; have the capacity to conduct exploratory advanced research.

- ## Research Users
  - Make practical use of exploratory advanced research results.

Program Status

- ## 90+ Initial stage investigations
  - Vehicle noise, vibration, harshness to study road pavement conditions
  - Virtual worlds as an experimental research tool

- ## Five solicitations resulting in
  - 44 projects awarded
  - $32M federal, $16M match

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Sponsored Research

- Integrated Highway System Concepts
  - Layered object recognition system for pedestrian collision sensing (Sarnoff)
  - Advanced integration of private sector freight (SAIC with C-TIP)
- Human Behavior and Travel Choices
  - New approach for a national household-based long distance travel survey instrument (Battelle)
  - Foundational knowledge to support a long distance passenger travel demand modeling framework (RSG)

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Research continued

- Energy and Resource Conservation
  - Advanced traffic signal control algorithms (UC Berkeley)

- Information Sciences
  - Mathematical analysis of the empirical mode decomposition (Princeton U. with Duke U., FSU, NASA Goddard)

- Technology for Assessing Performance
  - System-based monitoring approaches for improved infrastructure under uncertainty (UCF with Lehigh U.)
  - Supply chain-based solution to prevent fuel tax evasion (ORNL)

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Project Handoff

- ## Continued Committment to projects transitioning out of Program

  - Focused outreach of project results
  - Meetings, demonstrations with potential new funders

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Program Payoff

- Encouraging original ideas
- Connecting with new partners
- Growing scientific capacity and pushing disciplinary frontiers
  - Building tools that accelerate discovery, allow for new measurements, concepts
- Pointing the way to new technology, applications

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Potential Breakthroughs

- ## New research methods
  - Driver engagement (GM)
  - Behavioral economics (UCF)

- ## New models
  - Micro-simulation for autonomous vehicles (UT Austin)

- ## New technology
  - Scour measurements (TFHRC, ANL, NASA JPL)

Topics under Investigation

- Integrated Highway System Concepts
  - Probe vehicles
  - Long term weather forecasting
- Human Behavior and Travel Choices
  - New technologies for detecting, counting pedestrians, bicyclists
- Energy and Resource Conservation
  - Energy efficient vehicle routing

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Topics continued

- **Information Sciences**
  - Video decoding, feature extraction
  - Probabilistic record linkage and data mining
  - Virtual worlds as an experimental research tool (active)
- **Technology for Assessing Performance**
  - Travel time and speed reliability
  - Remote sensing for environmental processes
  - Vehicle noise, vibration, harshness to study road pavement conditions (active)
  - Passive wireless sensors (active)

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Thank You

EAR Program website

www.fhwa.dot.gov/advancedresearch

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