EXPLORATORY ADVANCED **RESEARCH**

Presentation for the Research and Technology Coordinating Committee

December 11, 2019

U.S. Department of Transportation
Federal Highway Administration

Presentation Outline

I. Program Background

II. EAR Program Examples

III. Discussion

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Program Authority

"…Develop potentially transformational solutions to improve the durability, efficiency, environmental impact, productivity, and safety aspects of highway and intermodal transportation systems."

23 USC Sec. 502

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Program Processes

Initial stage investigations

Investing in new research

Transitioning results

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EAR Program Status

- 200+ Initial stage investigations
  - 35 resulted in research investments
- Nine solicitations
  - 97 projects (26 active); $96M federal, $28M match
  - 72 academic institutions, 47 businesses, 13 state/local agencies, 9 federal labs
- Five rounds of handoffs

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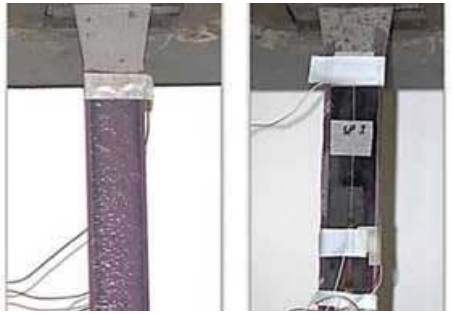
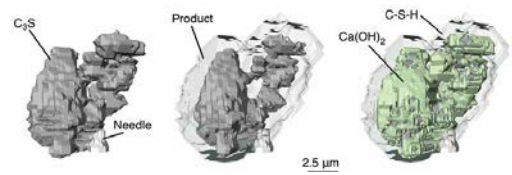
EAR Program Success Stories

Truck Platooning 	**Structural Sensors** 	**Computer Vision** 
Assistive Technology for Vulnerable Pedestrians 	**Supplementary, Alternative Cementitious Materials** 	**Hardware-in-the-Loop** 

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Falling Short of Success

- Misunderstood or miscommunicated potential
- Unable to overcome key research challenges
- Unable to transition results fully

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Discussion Questions

As part of **initial stage investigations**,

- How can the EAR Program become more effective at seeking the right set of topics and not miss important topics? How should the Program identify topics to be considered?
- How can the Program find and engage the right researchers?
- What ways can the Program improve the initial stage investigations process?

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As part of **investing in research**,

- How does the Program tell if it is funding the right projects?
- What are the right acquisition mechanisms to fund research?

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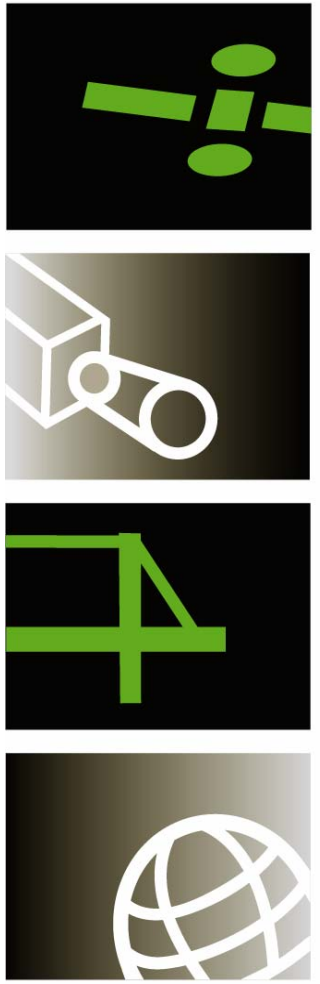
As part of **transitioning results**,

- How can the Program engage the right transition partners?
- What are the right methods for the Program to use to transition projects?
- What ways can the Program enhance how results are transitioned?



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As part of **communications**,

- How well is the Program identifying the critical audiences? Who should be the Program's critical audience?
- What are the right messages for the Program to present to critical audiences? What are the Program's three core messages?
- What are the right media for the Program to use to reach critical audiences?

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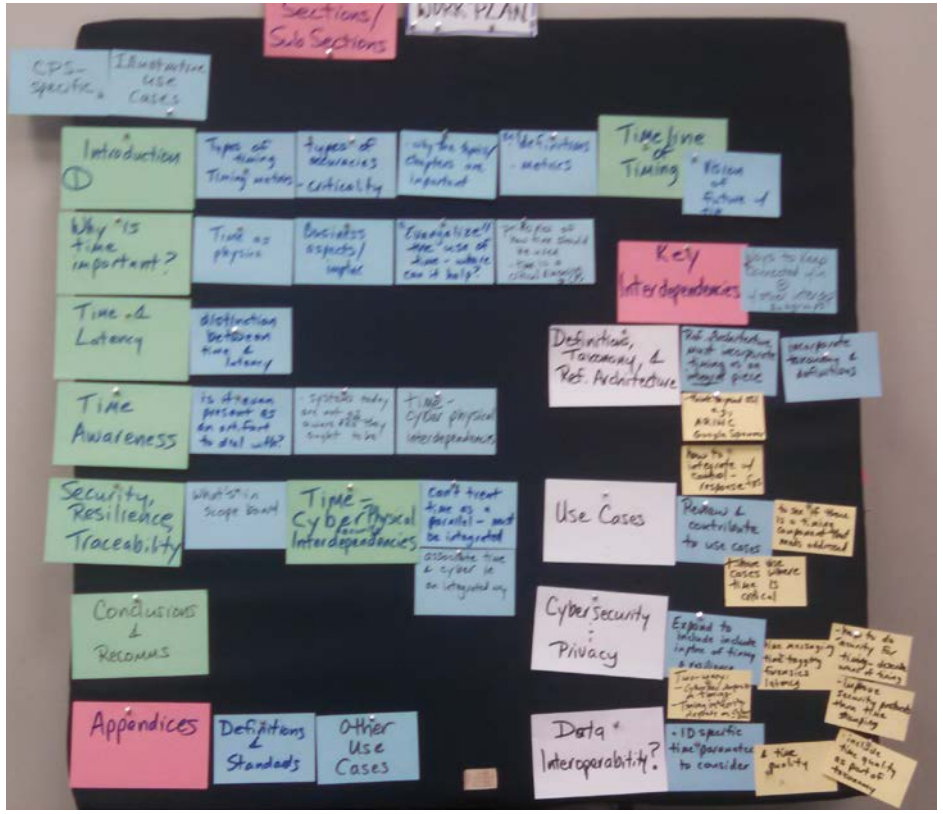
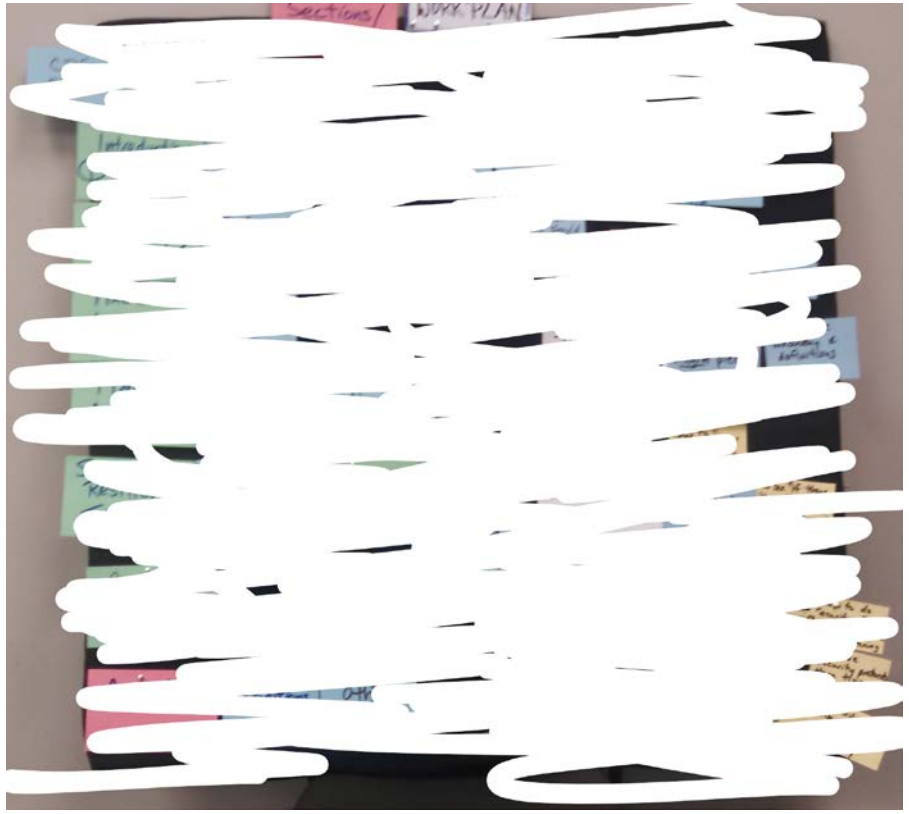
What if You Had a Clean Slate?





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Truck Platooning

- Why: Potential early adoption of connected vehicle technology
- Results: Demonstrated viability on I-66 in Virginia, track testing of fuel savings, simulation of improved mobility for all vehicles

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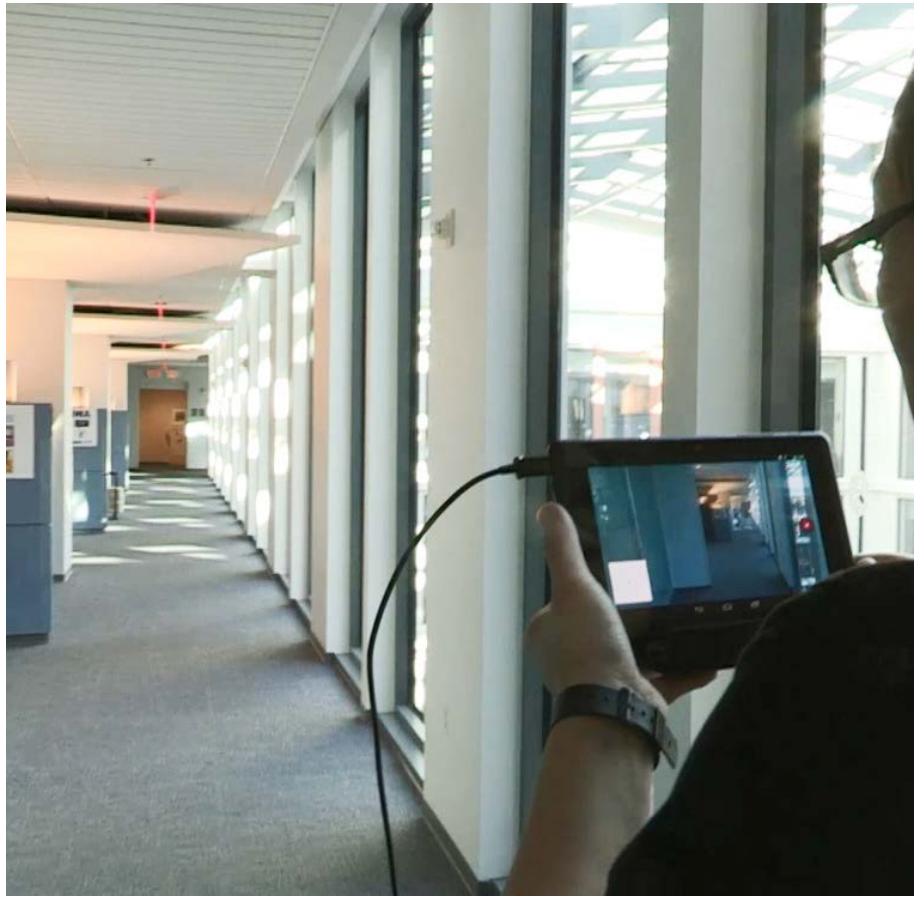
Assisting Vulnerable Pedestrians

- Why: Vulnerable pedestrians can benefit from new technology
- Results: Demonstrated ability for a blind pedestrian to navigate outdoors and indoors



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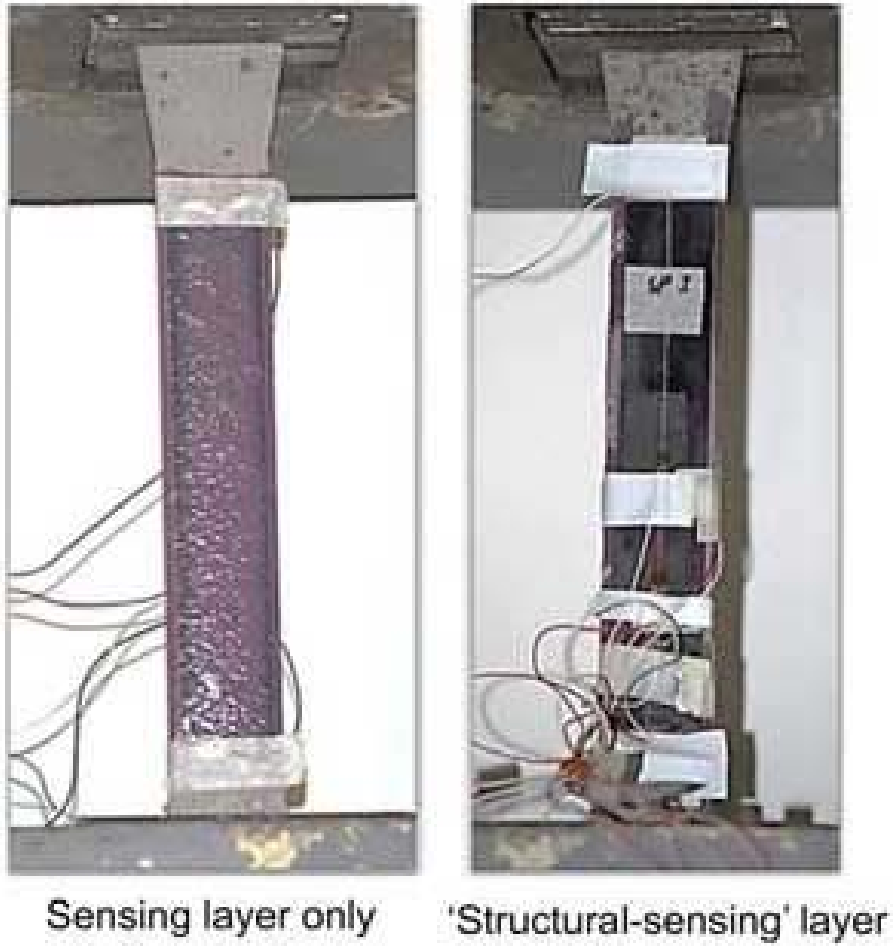
Structural Sensor Systems



- Why: Inspectors see what's on the surface; sensors can "see" inside but are hard to install
- Results: Demonstrated benefits from low power, wireless sensors in the lab then on bridges in DE, MI, NJ, PA

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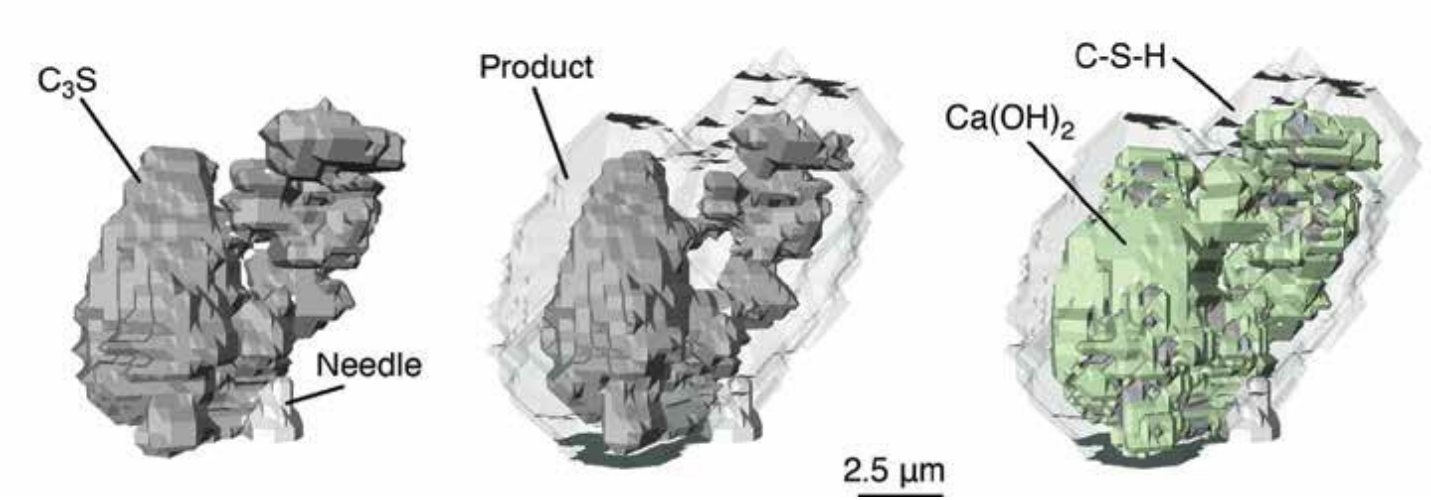
Access to New Materials



- Why: Traditional construction materials are a limited resource
- Results: Increase understanding and predictive reliability of a larger palette of materials for pavements, structures

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Wireless Camera Systems for Environmental Monitoring

- Why: Increase access to image data for wildlife management
- Results: System in use in CA, CO, NV

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Computer Vision Tools

- Why: Require new methods to study 1 million hours of naturalistic driving video images
- Results: Created tools now used in the FHWA Safety Training and Analysis Center (STAC)

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Hardware-in-the-Loop

- Why: Safer, lower-cost method for connected vehicle research
- Results: Demonstrated successful interaction of a physical vehicle with virtual vehicles in different scenarios

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