

Infrastructure of the Future

Structural Health Monitoring

National Transportation Security
Center of Excellence



Today's Talk...

- (Brief) introduction to the Mack-Blackwell center
- (Brief) overview of Year-1 work plan
- Initial work related to infrastructure protection
- Potential directions for the infrastructure of the future





PLANNING

MUCH WORK REMAINS TO BE DONE BEFORE WE CAN ANNOUNCE
OUR TOTAL FAILURE TO MAKE ANY PROGRESS.

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...serving rural America
MACK-BLACKWELL
Rural Transportation Center

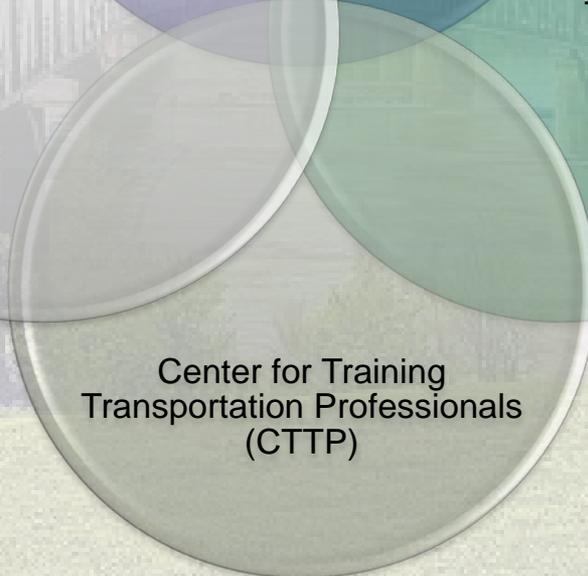




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Year 1 Work Plan

- Built on *existing* strengths/capabilities
- Seeks to leverage DOT-related work

Core Area:
Infrastructure Protection

Emerging Area:
Emergency Preparedness

Emerging Area:
Security Data Integration

Core Area:
Supply-Chain Security



Year 1 Work Plan

- **Infrastructure Protection**

- **Structural Health Monitoring and Assessment of Critical Intermodal Transportation Infrastructure Elements**

- **Supply-Chain Security**

- **Designing Resilient and Sustainable Supply Chain Networks**

- **Emergency Preparedness**

- **Simulating Transportation Modes in Large-Scale Evacuation Scenarios**
- **Emergency Response via Inland Waterways**

- **Security Data Integration**

- **Information Enhancement among Aviation Security Partners**
- **Automated Real-Time Object Detection and Recognition on Transportation Facilities**



Structural Health Monitoring and Assessment of Critical Intermodal Transportation Infrastructure Elements

- **Paradigm that overcomes many of the limitations associated with condition assessment and evaluation by visual inspection**
- **Instrumentation and measurements used to quantify the condition and performance of constructed systems**
 - ***Real-time* assessment and evaluation**
 - **Permits *continuous* evaluation of transportation infrastructure assets**
 - **Can be implemented *remotely* and centrally administered**

Structural Health Monitoring: Experimental Methods

NDE	Geometry Monitoring	Short-Term Structural Testing				
		Load Testing (Static or Quasi-Static Testing)			Vibration Analysis (Dynamic Testing)	
	Surveying	Controlled	Uncontrolled		Controlled	Uncontrolled
Material Testing	GPS	Measure Input & Outputs	Measure Outputs Only	Measure Input by WIM & Outputs	Measure Input & Outputs	Measure Outputs Only
Thermal						
Magnetic	Laser	Static Trucks	Input by Traffic	Input by Traffic	Impact	Input by Traffic, Wind, Seismic
Ultrasonic						
Acoustic	Remote Sensing	Crawling Trucks	Input by Traffic	Input by Traffic	Forced-Vibration by Exciter	Input by Traffic, Wind, Seismic
Electrical						
Electro-Chem	Photo Methods	Special Loading Devices	Input by Traffic	Input by Traffic	Forced-Vibration by Exciter	Input by Traffic, Wind, Seismic
Optical						
Nuclear						



Structural Health Monitoring: Remote Methods

Low-Bandwidth Measurements

Construction Effects

Wind/Ambient Weather Conditions

Temperature

Movements or Displacements

Mechanical Variables (Force, Stress, Strain, etc)

Deterioration/Damage Effects

Changes in: Geometry, Electro-chemical Properties

High-Bandwidth Measurements

Vibrations

Traffic Loads

Operations

Incidents or Accidents

Impacts

Earthquake

Security Monitoring

Structural Health Monitoring

- **Research approach**



Design



**Lab-Scale
Prototype(s)**



**Field
Installation(s)**

- **Projected Deliverable(s)**

- Optimum instrumentation packaged solution
- Field deployment specifications
- Guidelines for data analysis

THANK YOU !

