



Current Automation and Human Factors Research at USDOT

Jane Lappin

U.S. Department of Transportation

November 18, 2014

USDOT Automation Program

Enabling Technologies

Digital Infrastructure

Communications

Technology Research

Safety Assurance

Electronic Control Systems

Software Assurance & Reliability

Cybersecurity

Human Factors

Application Development

CACC, Speed Harmonization, and Platooning

Lateral Control

First/Last Mile and Transit Operations

Testing and Evaluation

Interoperability

Testing Methods

Benefits Assessment

Policy and Planning

Standards

Analysis & Federal Role

Program Mgmt & Outreach

Transportation Planning

SAFETY, MOBILITY,
& ENVIRONMENTAL
BENEFITS AHEAD



NHTSA Major Goals

Improve motor vehicle safety by defining the requirements for automation assisted driving that is:

- Functionally safe and electronically reliable.
- Secure from malicious external control and tampering.
- Precise in vehicle steering, braking, and acceleration.
- Compatible with driver abilities and expectations.
 - Operationally intuitive for drivers under diverse driving conditions.
 - Supportive of improving driver awareness in traffic.
 - Operational only to the extent granted by the driver.

Key Areas of NHTSA's Automation Research



Human Factors Research

- Human factors evaluation of Level 2 and Level 3 automated driving concepts
- Initial human factors design principles for L2/L3



Electronic Control Systems Safety (including Cybersecurity)

- Functional safety of safety-critical automotive systems and extensions to L2-L4
- Cybersecurity threats, vulnerabilities, countermeasure assessment



System Performance Requirements

- System performance requirements framework
- Objective test procedures



Benefits Assessment

- Target crash population estimation for automated vehicles L2-L4
- Multi-modal benefits framework development

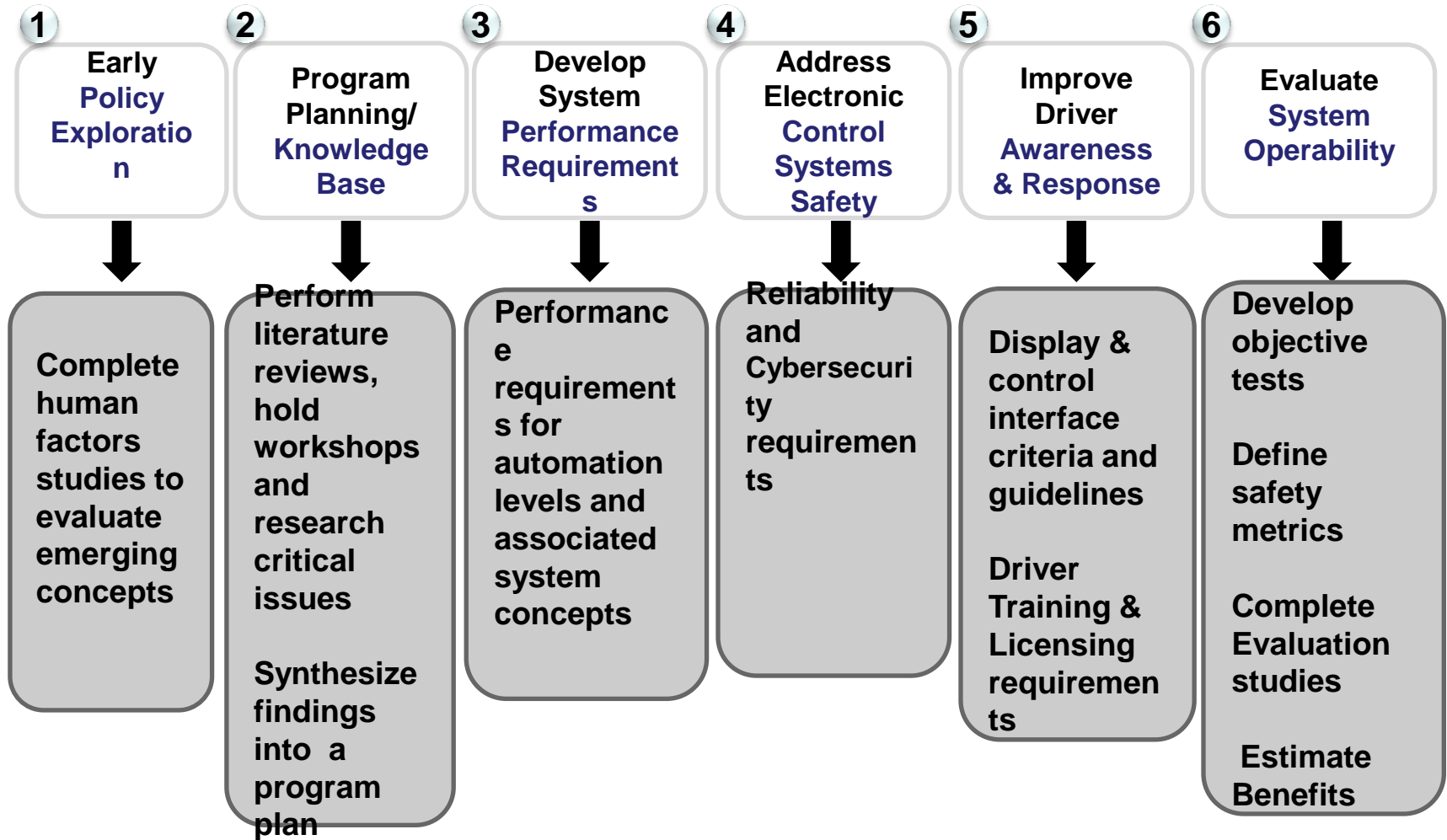


Testing and Evaluation

- Controlled test track studies
- Field operational tests

Motor Vehicle Automation Research Roadmap

Efforts



Current Research Highlight

Functional Safety of Automated Lane Centering Controls

Lead Agency	National Highway Traffic Safety Administration
Summary	Lane centering is an essential function that enables vehicle automation when integrated with longitudinal vehicle control systems. It is implemented through shared braking and steering services in combination with longitudinal control systems including adaptive cruise control, crash-imminent braking, and forward collision avoidance. This project investigates functional safety of this emerging technology.
Deliverables	<ul style="list-style-type: none">• Functional safety assessment of emerging lateral control system(s) that can enable operations for Levels 2 to 4 automated vehicles;• Hazard analysis report;• Draft functional safety requirements; and• Draft driver-vehicle interface requirements.
Duration	<ul style="list-style-type: none">• 21 months from award (July 2014)



Current Research Highlight

Target Crash Populations for Automated Vehicles

Lead Agency	National Highway Traffic Safety Administration
Summary	Preliminary analyses to estimate the potential crash populations that can be addressed by the deployment of concept automation technologies.
Deliverables	<ul style="list-style-type: none">• Method for estimating target crash populations addressable with automated vehicle technology & concepts;• Development of a base estimation model for the subsequent integration of effectiveness data from emerging system concepts, system performance testing, naturalistic studies, early adopter evaluations, to establish safety benefits.
Duration	12 months from award (July 2014)



Upcoming Research Highlight

Driver Acceptance of Vehicle Automation for Function-Specific Automation (Level 1) Applications

Lead Agency Federal Highway Administration

Summary Examine critical human factors issues such as workload, situational awareness, and distraction for Level 1 automation applications.

- Create virtual simulation environment on Level 1 automation applications and conduct human factors experiments;
- Utilize research vehicles to conduct test track or closed course experiments for additional data to complement/validate simulation data.

Objectives

- Increased understanding of human factors related issues for vehicle automation
- Data and results to support Office of Operations' vehicle automation application research activities
- Information for standards development (e.g., SAE) and potential NHTSA performance requirements activities

Deliverables

- Research plans
- Technical finding briefs and reports
- Videos from driving simulation experiments



Thank you!
