USDOT-CRASH AVOIDANCE METRICS PARTNERSHIP AUTOMATION RESEARCH PROJECT OVERVIEW

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NHTSA Preliminary Statement of Policy Concerning Automated Vehicles (Released May 30, 2013)

Provides guidance to states permitting testing of emerging vehicle technology

Policy addresses:

- An explanation of the many areas of vehicle innovation and types of automation that offer significant potential for enormous reductions in highway crashes and deaths

- A summary of the research NHTSA has planned or has begun to help ensure that all safety issues related to vehicle automation are explored and addressed

- Recommendations to states that have authorized operation of self-driving vehicles (Levels 3 and 4), for test purposes, on how best to ensure safe operation as these new concepts are being tested on highways

http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf

NHTSA Levels of Automation

No-Automation (Level 0)

- **The driver is in complete and sole control of the primary vehicle controls – brake, steering, throttle, and motive power – at all times.**

Function-specific Automation (Level 1)

- **Automation at this level involves one or more specific control functions. Examples include electronic stability control or pre-charged brakes, where the vehicle automatically assists with braking to enable the driver to regain control of the vehicle or stop faster than possible by acting alone.**

Combined Function Automation (Level 2)

- **This level involves automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions. An example of combined functions enabling a Level 2 system is adaptive cruise control in combination with lane centering.**

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NHTSA Levels of Automation (Continued)

Limited Self-Driving Automation (Level 3)

- **Vehicles at this level of automation enable the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time.**

Full Self-Driving Automation (Level 4)

- **The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles.**

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Planned NHTSA Research for Automated Vehicles

Human Factors Research

- Driver Vehicle Interaction
- Proper allocation of vehicle control functions between the driver and vehicle
- Driver acceptance
- Driver Training

Electronic Control Systems Safety

- Safe Reliability – Functional safety, failure modes and probability, diagnostics/prognostics, redundancy, availability, and certification
- Cybersecurity – Security, risks, performance, unintended consequences, certification

Develop System Performance Requirements

- Develop functional descriptions for emerging Level 2, 3, and 4 operational concepts
- Data analysis from past field data to develop use cases
- Develop test and evaluation methods
- Leverage results from the Human Factors and Electronic Control Systems research

Automated Vehicle Research for Enhanced Safety Project

Cooperative Agreement with the Collision Avoidance Metrics Partnership (CAMP).

- **Ford**
- **General Motors**
- **Mercedes-Benz**
- **Nissan**
- **Toyota**
- **Volkswagen/Audi**

Period of Performance through April 2015.

Project Objectives

- **Develop potential objective test methods that can be used as a framework for evaluating automated vehicles.**
- **Develop a short, mid, and long-term list of potential automated vehicle applications**
- **Develop detailed functional descriptions for operational concepts identified as automation Levels 2, 3, and 4**
- **Evaluate naturalistic and crash data, determine real-world scenarios (use cases), and top-level safety requirements that match to the functional descriptions of emerging automated concepts.**
- **Coordinate with other NHTSA efforts (e.g., human factors, electronic control systems, cybersecurity, and policy programs)**

Project Scope

- **The project will focus on operational concepts that are defined as Level 2, 3, or 4.**
- **Concepts considered will include a wide range of driving (e.g., interstate operations, urban/city operations, low speed maneuverings, stop and go traffic, emergency stopping, platooning, and self-parking).**
- **Analyses to develop real-world scenarios (use cases) will be limited to existing data sets. No new data will be collected during the project.**
- **Assessments of preliminary objective test methods to identify issues with respect to test repeatability and implementation will be limited to expert judgment of the technical team. No physical testing will be conducted.**

Technical Tasks

TASK 3: DEVELOP DETAILED FUNCTIONAL DESCRIPTIONS OF EMERGING SYSTEM CONCEPTS

TASK 4: DETERMINE CONCEPT ROADMAPS FOR FUTURE AUTOMATED APPLICATIONS

TASK 5: DEVELOP REAL-WORLD "USE CASES" FROM THE FUNCTIONAL DESCRIPTIONS

TASK 6: DEVELOP TOP-LEVEL SAFETY REQUIREMENTS

TASK 7: DEVELOP PRELIMINARY OBJECTIVE TEST METHODS

Final Report – FY15; Quarter 4

NOTE: Tasks 1, 2, 8, and 9 are not technical and deal with project management areas.

QUESTIONS?

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