**Project Title** | Drivers Reactions to Autopilot’s Disengagements, and Regulatory Implications for Semi-Autonomous Vehicles  
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Mineta Consortium for Transportation Mobility  
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**Brief Description of Research Project** | Autonomous Vehicle (AV) technology is quickly expanding its market. Manufacturers are targeting different levels of autonomy, with semi-autonomous vehicles currently in the lead. In semi-autonomous vehicles, a human driver collaborates with the software that acts as “brain” of the vehicle and serves as back-up whenever the Autonomous Technology (AT) disengages after a failure. Current regulations for the State of California, a forerunner for the deployment of AV technology, only allow semi-autonomous collaborative vehicles to be deployed on public roads, with the requirement for the human driver to “monitor the safe operation of the vehicle at all times”, and that of being “capable of taking over immediate control in the event of an autonomous technology failure”.  

In the safety-critical situation of an AT disengagement, it is
important to ensure that the human driver has enough time to react and respond effectively to the request to control the vehicle. This study thus analyzes reaction times of human drivers placed in simulated AT disengagement scenarios.

The study here proposed can be broken down into two main phases: I) the examination of drivers’ responses to AT disengagements, with driver-in-the-loop simulation of AT failure scenarios and measurement of reaction times and study of situational awareness; II) inference and synthesis of the results in relation to existing AV policies, to better inform regulatory agencies, policy makers, and the general public of how the analyzed situations relate to drivers’ distraction/inattentiveness and translate in terms of safety of the semi-autonomous vehicle.

A population of 40 individuals will be tested within an integrated car simulator rented from FKA Prospect Silicon Valley in San Jose. The simulator features a 220° multi-screen surround view for high fidelity, and a BMW 6 series, and is capable of handling both autonomous and manual control. AT disengagements will be simulated by suddenly reverting control of the car motion from the autonomous software to the test driver in the car and estimating: i) reaction time of the test subject; ii) the number of successful recoveries after the disengagement (where successful recovery will be measured as a function of lane drift). Variables that are expected to affect the recovery success and the reaction time are the age of the driver, speed at the time of disengagement, and time at which the disengagement occurs (i.e., how soon after the beginning of the test, an effect due to tiredness and distraction).

The results of the proposed activities will provide important insight to abstract recommendations on whether semi-autonomous designs are a viable and safe option, which is the core issue examined in Phase II. The regulatory, ethical, and legal implications of the proposed research contribute to advance the safe deployment of a technology that can revolutionize society’s transportation. The following are examples of questions this study will preliminary answer in relation to Phase II:

Deployment on the market: Will there be constraints on the maximum speed the systems can be operated at? Will there be constraints on the maximum time the system can be operated for? Should semi-AVs be sold only to people that pass certain medical qualifications? Will prospective buyers be required to pass a DMV licensing exam before being authorized to purchase a semi-AV?

Licensing issues: Should the DMVs issue a different type of license for semi-AVs? Should a specific test be devised to test owners and
drivers of semi-AVs reactions to disengagement? Will age play a role in the issuance of a license?

To answer these questions, the PI will also draw from her extensive knowledge of the Aviation Industry world, where clear guidelines and policies are in place for the safe operation of highly automated systems such as modern aircraft.

Describe
Implementation of Research Outcomes
(or why not implemented)

Place Any Photos Here

Impacts/Benefits of Implementation
(actual, not anticipated)

Web Links
- Reports
- Project website