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## **Interrelations Between Crash Rates, Signal Yellow Times, and Vehicle Performance Characteristics: Phase II**

### **Problem**

Over the past several decades, a tremendous amount of resources has been invested in projects and programs to improve the safety and efficiency of our transportation systems. However, despite the significant progress of these programs, traffic-signal related crashes have not been significantly reduced in a number of states.

To explore this issue, Phase I of this project studied driver responses during the traffic-signal yellow phase. Based on field observations at nine intersections in five counties in Maryland, the study concluded that with a sufficient number of field observations, one can develop an integrated intersection model for safety evaluation and performance improvement. Such a model would enable the classification of the driving population at a target intersection into several distinct groups and allow one to estimate the distribution of their dilemma zones (the segment of roadway approaching an intersection where a driver must make a decision to stop abruptly to obey the changing signal or run the red light), based on their estimated speeds and acceleration/deceleration rates.

### **Objectives**

The following objectives were established for the Phase II study:

- Substantiate the Phase I research findings with additional field data to be collected at intersections selected by SHA;
- Develop a set of systematic procedures for analyzing the distribution of dilemma zones, based on both the driver behavioral and speed variance components calibrated from an enriched empirical data set; and
- Identify operational strategies for contending with the existence of dynamic dilemma zones, and investigate their potential for field demonstration.

### **Description**

The following tasks were completed as a part of this project:

- Designed a reliable data collection system and operational guidelines to capture the critical data needed for driver classification and analysis of dilemma zone dynamics;
- Developed a set of behavioral models to classify the driving population based on their responses during the yellow phase;

## **Description Continued:**

- Extracted key characteristics among driving groups to explore the interrelations between the average traffic characteristics and each group of drivers;
- Analyzed different dilemma zones for different driver groups at target intersections;
- based on an enriched dataset, tested the hypotheses presented in the Phase I study; and
- Identified potential ITS technologies for field demonstration.

## **Results**

The Phase II study included field observations on the behavior of 1,123 drivers at six signalized intersections. The study also developed an image-based system that enables researchers to track the speed and acceleration rates of a target vehicle at an increment of approximately every 30 feet before reaching an intersection. The field data obtained with this system offered the basis for analyzing the impacts of behavioral and environmental factors (such as traffic volume, traffic speed, and vehicle lane position) on the distribution of intersection dilemma zones.

Based on the research findings, the following recommendations were made:

- Conduct a comprehensive speed profile analysis with appropriate traffic sensors at major intersections plagued by accidents to help understand the distribution of driving populations;
- Perform an in-depth driving population classification for intersections experiencing a high accident frequency with the image-based approach developed in this study;
- Identify the spatial distribution of dilemma zones for each driving population group at target intersections; and
- Examine various ITS technologies for improving intersection traffic safety.

A Phase III study is expected to begin in early 2007.

## **Report Information**

For more information about this project or report please contact:

Dr. Gang-Len Chang  
Department of Civil and Environmental Engineering  
University of Maryland  
College Park, MD 20742  
Email: [gang@eng.umd.edu](mailto:gang@eng.umd.edu)  
Phone: 301-405-1953