MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

RESEARCH SUMMARY

Analyzing Travelers' Response to Different Active Traffic Management (ATM) Technologies

WHAT WAS THE NEED?

Active traffic management (ATM) has the potential to allow the Maryland Department of Transportation State Highway Administration (MDOT SHA) to better manage increasing travel demand and improve travel time reliability. However, appropriate modeling and simulation tools were needed to evaluate different ATM strategies.

WHAT WAS THE GOAL?

MDOT SHA has successfully developed several effective modeling tools for traffic operations, planning, and travel demand forecasting. The Coordinated Highway Action Response Team (CHART) has integrated traffic monitoring, traveler information, and agency updates into their real-time operations and incident/emergency responses. The goal of this project was to develop suitable models based on those existing efforts and facilitate the evaluation of ATM.

WHAT DID THE RESEARCH TEAM DO?

This project deploys an innovative modeling framework that tightly integrates travel behavior, dynamic traffic assignment, and ATM control algorithms. The model was applied to the D.C.-Baltimore regional network. Ramp metering, variable speed limit (VSL), and several roadway improvements proposed for a commuting corridor

AUGUST 2018

REPORT NUMBER:
MD-18-SHA/UM/4-40

START DATE:
February 23, 2017

COMPLETION DATE:
June 30, 2018

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were evaluated. In addition, the project collected vehicle fleet data to evaluate driving behavior and its space-time interrelationship with traffic and incidents.

WHAT WAS THE OUTCOME?

The integrated model developed in this project has the capability of analyzing traffic pattern, travel demand, and traveling/driving behavior responses along the most critical corridors in Maryland, allowing MDOT SHA to evaluate different ATM strategies, as well as other planning and operational scenarios.

By applying the modeling tool, significant departure time behavioral changes were found in response to ATM and the subsequent changes in traffic conditions. At the aggregate level, a "peak concentration" phenomenon was identified in the AM peak. Due to the mitigated peak congestion, current travelers were more willing to switch back to peak-hour departure times to avoid too early or late schedule.

With these analysis tools, it was found that implementing ATM strategies, including VSL, ramp metering, and roadway improvements, could reduce the AM peak average travel time by 21%, and the delay by 32.8%. The PM peak average travel time was reduced by 14% while the delay was reduced by 15.2%.

HOW WILL THE RESULTS BE USED?

As previously mentioned, the research indicated that behavioral changes were observed as a driver-response to different ATM applications. The agency will use the results received to influence the planning and preliminary engineering design for the placement and application of ATM technology and strategies, respectively. In addition, the simulation model could also be further developed as a real-time and data-driven modeling suite for TSM&O applications and decision-support in Maryland.

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