



# UTC Spotlight

## University Transportation Centers Program

This month: The University of Maryland | October 2015

### Solving Nationally Significant Transportation Problems by Integrating Basic Research, Applied Research, and Technology Transfer

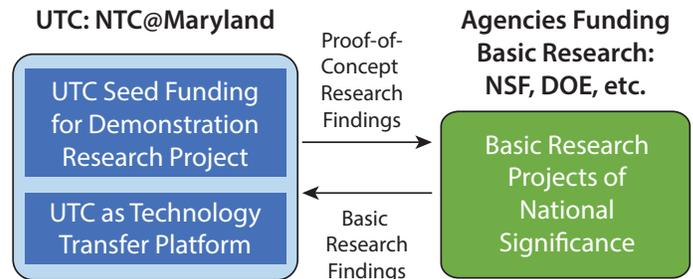
The USDOT University Transportation Center (UTC) Program has established itself as a champion for promoting university-based transportation research and technology transfer. Over the past 28 years, the focus of the UTC program on advanced and applied research with real-world relevance has produced numerous products that are being used by a number of end users in the public and private sectors.

For instance, since establishment of the National Transportation Center at the University of Maryland (NTC@Maryland, <http://ntc.umd.edu>) in October 2013, talented researchers and students have produced a national travel demand model that agencies use to analyze travel patterns beyond state and metropolitan borders, developed performance measures on the broader economic impact of transportation investment in more than 300 metropolitan areas, and delivered multimodal sustainable corridor planning tools with socioeconomic impact indicators to state transportation agencies.

A topic less frequently discussed is the role of the UTC Program in integrating basic research, applied research, and technology transfer to solve nationally significant transportation problems. Emerging transportation system priorities, such as disaster resilience of the transportation network and mobile computing technologies for transportation sustainability, are critical issues across the Nation that require multimillion dollars of investments in related basic research. However, it is not practical for any UTC to invest its entire annual budget on a single, basic research project. The question worth asking is – How can the UTC Program play a meaningful role in addressing nationally significant transportation research topics that require basic research?

This *Spotlight* highlights one approach for integrating and streamlining basic research, applied research, and technology transfer within a UTC setting with two recent success stories at the NTC@Maryland.

The process begins with our researchers first identifying a basic research need consistent with the Center theme of economic competitiveness and then proposing a related proof-of-concept research project with direct real-world

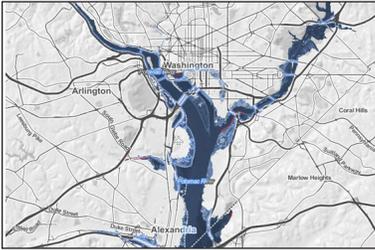
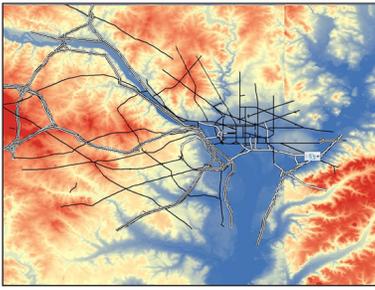


relevance suitable for UTC funding. Through a competitive process involving external peer review, NTC@Maryland provides seed funds to the relatively low budget applied demonstration project. This funding allows for research concepts to materialize into demonstrable results illustrating the potential broad impact. Results from these UTC-funded studies are then employed to pursue much larger amounts of basic research funding from sources such as the National Science Foundation (NSF) and the U.S. Department of Energy (DOE). If our researchers are successful in winning basic research grants, NTC@Maryland, with strong partnerships with federal, state, and local transportation agencies and the private sector, could again serve as a platform for technology transfer during and after the project period. This model for leveraging UTC resources to meet basic and applied research needs and to promote technology transfer is presented in the flowchart and is illustrated through two project examples.

#### Project Example 1: Transportation Network Resilience with Respect to Disasters and Climate Change



In 2013 NTC@Maryland funded a seed research project led by Elise Miller-Hooks, Ph.D. (NTC@Maryland PI, <http://millerhooks.umd.edu>) and titled, "Objective Decision-Making Tools for Transportation Infrastructure Investments to Combat the Impacts of Sea Level Rise." This project developed tools to aid



Impact of sea level rise on the transportation network in Washington, D.C.

governments and infrastructure owners and operators in effectively addressing the threats from potential sea level rise and significant, sustained flooding events. In 2014, this project experience contributed to NSF awarding Dr. Miller-Hooks a \$2.5 Million basic research project. Her NSF project focuses on developing a broader theoretical and modeling framework for “Disaster Resilience of Critical Infrastructure” that

considers interdependencies between transportation systems and related cyber, power, natural gas, water, waste water, and societal systems. Results from this pioneering NSF research will help agencies integrate public policy, organizational policy, emergent organizational behaviors, and risk communication considerations into a comprehensive quantitative framework for disaster resiliency analysis. During and upon completion of this project, Dr. Miller-Hooks plans to take advantage of the outreach and technology transfer resources at the NTC@Maryland to disperse her research findings in the form of workshops, webinars, and conferences.

## Project Example 2: Mitigating Congestion and Reducing Transportation Energy Use with Personalized Economic and Social Incentives

In 2014 Lei Zhang, Ph.D. (NTC@Maryland Director and PI, <http://lei.umd.edu>), through an applied research project jointly funded by NTC@Maryland and one of its agency partners—the Maryland State Highway Administration

(SHA)—developed an innovative personalized traveler information and incentive concept and successfully demonstrated its effectiveness in mitigating congestion and reducing fuel use along the heavily congested Baltimore-Washington commuting corridor. While the full development of this concept into practice-ready technology is beyond the scope of UTC-based research, this early success led to a full proposal to the U.S. DOE Advanced Research Project Agency – Energy’s (ARPA-E) TRANSNET Program. In August 2015



Dr. Zhang’s team, which involves three NTC@Maryland consortium universities (UMD, NCST, ASU), was awarded a \$4.5 million ARPA-E grant to fully develop their proposed *iPretii* (Integrated, Personalized, REal-time Traveler Information and Incentive) technology. *iPretii* uses extensive basic behavior research data to

simulate the effects of traveler choices on congestion mitigation and energy use. NTC@Maryland researchers will identify and optimize personalized incentives to encourage drivers to alter routes, departure times, and driving styles, or take mass transit or ride-sharing services. Incentives will include both economic and social rewards that are personalized based on individual preference, behavior history, and real-time traffic conditions. For technology transfer, NTC@Maryland is again providing support for this DOE ARPA-E research to enable real-world demonstration and future deployment by connecting researchers with potential technology users (e.g., government agencies, private sector).



Smartphone apps incentivize travelers with customized rewards to make system-optimal decisions.

### About This Project

The National Transportation Center at the University of Maryland (NTC@Maryland) is the only National University Transportation Center with a focus on the U.S. Department of Transportation’s strategic goal of “Economic Competitiveness”. The Center theme is “Strategic Transportation Policies, Investments and Decisions for Economic Competitiveness”. Its research, education and technology transfer activities focus on: (1) Freight efficiency and reliability; (2) Congestion mitigation with multimodal strategies; and (3) National-level transportation economics and policy analysis.

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*This newsletter highlights some recent accomplishments and products from one University Transportation Center (UTC). The views presented are those of the authors and not necessarily the views of the Office of the Assistant Secretary for Research and Technology or the U.S. Department of Transportation.*

