The University of Massachusetts Transportation Center (UMTC) is located within the College of Engineering at the University of Massachusetts in Amherst, Massachusetts. The UMTC conducts cutting-edge research on all aspects of transportation including Operations and Management, Safety, Traveler Demand and Behavior, Sustainability, Autonomous Vehicles, Freight, Transit, Intelligent Transportation Systems, Transportation Finance and Policy, Emission Estimation and Modeling, Commercial Motor Vehicles, Human Factors, Climate Change, and Economic Development.

The Center also includes a strong outreach section, to disseminate research findings, promote important MassDOT initiatives, and address the broad range of municipal highway and public works departments state-wide.

The UMTC is funded in part by agreements with the Massachusetts Department of Transportation (MassDOT), the New England Transportation Consortium (NETC) and other U.S. Department of Transportation, University Transportation Center (UTC) Consortiums.

The current focus of the Center’s research, education, and training efforts encompasses the following major program activities:

- Baystate Roads (Transportation Training & Outreach)
- UMass Transportation Center Research & Affiliate Researcher Network
- U.S. Department of Transportation University Transportation Center Program
- UMass Traffic Research Safety Program (UMassSafe)
- UMTC Aviation Program & UMassAir
- And more!
About Baystate Roads

Baystate Roads, the Massachusetts Local Technical Assistance Program (LTAP), established in 1986. LTAP is a national effort of the Federal Highway Administration (FHWA) to improve access to roadway technology for local agencies. The LTAP structure employs a national network of technology transfer centers, established in partnership with the state highway agencies and staffed with personnel skilled in providing services to their local constituents.

By developing innovative approaches to achieve technical advancements, and coordinating federal, state, local, and private industry resources, LTAP centers have become an invaluable and indispensable asset to the program. Local capabilities and needs differ, and it is this recognition and accommodation that has been primarily responsible for the program's success. Flexibility in the delivery of technology is a key factor when responding to the variety of needs and diversity of local agencies. The Baystate Roads team has a variety of training options and approaches available, including: self-paced on-line classes, for independent learners, virtual training, blended classes that combine self-paced modules with virtual or live classroom meetings, and face-to-face training in the classroom and field. Videos on a variety of transportation topics and links to numerous additional resources round out this multifaceted program.

Baystate Roads also provides support for hosting MassDOT’s annual Moving Together Conference and Transportation Innovation Conference. The Moving Together Conference draws nearly 1,000 professionals from the bicycle, transit and pedestrian transportation sectors. The Transportation Innovation Conference draws over 1,000 professionals from all sectors of transportation looking for the latest innovations and transportation technology.

Training

Baystate Roads provides workshops and other training in the areas of Design, Construction, Maintenance & Operations, and Safety. The typical target audience for workshops are municipal highway personnel and consultants who work with cities and towns.

Baystate Roads identifies and develops training with input from workshop participants, advisory meeting attendees, annual needs surveys, and other sources.

Complete Streets

Complete Streets benefits all communities - rural, suburban and urban! These workshops provide, local leaders, decision makers, and consultants with a solid framework for planning and delivering inclusive local Complete Streets projects.
UMass and MassDOT Research

The UMTC supports the Massachusetts Transportation Research Program and facilitates the use of the resources of the multiple campus system of UMass and other state colleges for transportation research, technology transfer, and technology implementation. This work is carried out under an Interdepartmental Service Agreement (ISA) between MassDOT and UMass. These resources include the service and expertise of our Affiliate Researcher Network, staff, managers, coordinators, and students, as well as the physical facilities including laboratories, and real world field installations.

Administratively, the UMTC Research Section provides a mechanism for MassDOT to quickly and efficiently contract and execute research projects.

The UMTC Research Section provides a wide variety of services for MassDOT including literature searches, problem statement review support, assistance on identifying researchers with unique expertise in needed subjects of potential research, research project administration support, and publication and distribution of final research reports.
Network of Affiliate Researchers

The UMTC Research Affiliate Network is currently comprised of over 135 researchers. The Network spans multi-state with researchers from the: University of Maine; University of Connecticut; Salem, Bridgewater, and Westfield State; University of Massachusetts Amherst, Boston, Lowell, and Dartmouth; as well as other public and private universities.

About the Affiliates

The UMTC developed the Affiliate Researcher Network to provide a mechanism to link funding organizations with innovative researchers in diverse areas of expertise. The collective expertise across the affiliate network encompasses all facets of transportation. In addition, the network provides a platform through which the UMTC helps shape the research needs across the Commonwealth.

The UMTC Research Affiliate Network provides think tank capabilities for transportation stakeholders across the Commonwealth.

Benefits

- Streamlined Access to Research Support Services
- Statewide Research Roundtables
- Opportunities to collaborate with MassDOT on innovative research needs/ideas
- Input of Ideas into Future Research Programming
- Funding Opportunities
- On Demand Literature Searches in Areas of Expertise
- Network of Peer Reviewers for Report Review
- Ability to Tackle Hot Topic (On Demand) Research
- Network of Collaborators
Evaluating the Safety Impacts of Flashing Yellow Permissive Left-Turn Indications in Massachusetts

A before/after implementation safety impact analysis was conducted, including a thorough benefit-to-cost analysis. The analysis evaluated the economic benefits of installing FYA signals, yielding a range of benefit-to-cost ratios across the three FYA treatment intersections (3-way with one FYA, 4-way with one FYA, and 4-way with two-or-more FYAs).

Construction & Materials Best Practice for Concrete

This research incorporates outdoor experimentation, lab testing, and quantitative analyses to determine the key factors impacting the performance and durability of sidewalks. The primary variables being considered include concrete mixture design (aggregate/paste optimization, air content, and cementitious material replacements), workmanship (delivery, placement, finishing, curing), and deicing treatment. This research includes two related studies. The first study focused on cold-weather sidewalk performance. The second study, currently underway, focuses on sidewalk concreting best practices in hot weather, and the long-term performance of concrete sidewalks placed during summer months.

Future of the Commonwealth’s Curb

This study explored the current and projected future competing demands of community curb space (curbside lanes and the adjacent sidewalk space), including for deliveries, parking, bicycling, walking, emergency access, transit, and trips provided by transportation network companies. This research involved a review of the latest research literature, stakeholder interviews, and concluded with curb management findings and recommendations that are applicable to a range of Massachusetts communities, from large cities to small towns.
State-of-the-Art Research Capabilities

Safety Research Using Simulation

Safer-SIM is a collaborative research center to support advancements in the application of simulation to transportation research in the areas of safety, operations, and roadway design. Within the context of the collaboration we employ cutting edge technology such as driving simulator, virtual reality, and instrumented vehicles to study transportation issues.

Our research, technology transfer, and educational efforts are directed toward rapidly advancing and expanding the use of driving simulation to include:

- Performance of model roadway engineering safety evaluations as example case studies of how to evaluate the safety of advances in infrastructure, and reduce the time it takes to move a concept from the drawing board to the road

- Integration with microscopic traffic simulation to determine the impact on safety of technological advances that allow vehicles and the infrastructure to communicate with each other

- Incorporation of 3D roadway design tools that greatly reduce the time that it takes to build exact replicas of roadway hot spots and identify infrastructure contributions to crashes

- Visualization in transportation planning and public outreach as a tool to put users on new roads before they are built and as a way to bring safety into the very start of the planning process

- Utilization of driving simulator to study the safety impacts associated with autonomous vehicles and the human factor aspects of vehicle and roadway design
UMassSafe

UMassSafe is a multidisciplinary traffic safety research program housed in the University of Massachusetts Transportation Center in the College of Engineering at the University of Massachusetts Amherst.

At UMassSafe, we seek to reduce the frequency and severity of crashes through the rigorous examination of safety-related data – both traditional and nontraditional – to better understand crashes, driver behavior, and related factors.

As part of the University we have access to unique resources. We are supported by state-of-the-art computer facilities including the Advanced Transportation Lab with full GIS capabilities and a full-driving simulator and instrumented vehicle at the Arbella Human Performance Laboratory. Additionally, the University environment provides an ideal arena for an interdisciplinary approach to traffic safety research. We draw on resources from Mechanical Engineering, Statistics, Public Health, Computer Science and Public Policy.

Complementary to the opportunity for an interdisciplinary approach afforded by the University environment is the interdisciplinary nature of the UMassSafe team. We have the unique ability to examine highway safety problems simultaneously from research and programming perspectives, allowing us to develop distinctive solutions to transportation safety problems. Idea exchange across disciplines – transportation engineering, public policy, public health, traffic safety education and enforcement – is combined with the application of a rigorous scientific structure of problem identification, program development and program evaluation. Our core function continues to be reducing the frequency and severity of crashes by methodically applying the best of research and the practical knowhow of community practice.

Sample of Current Projects

Understanding highway safety requires a critical look at the data available to us as highway safety professionals. It is our job to collect, store, provide access to, and analyze data so policy makers, program specialists, and other decision makers understand exactly what they are up against, how to address it most effectively, and figure out how successful they have been. At UMassSafe, we’re committed to making sure that high quality, in-depth data analysis remains a key component of every project we are working on.

UMassSafe projects are strong in their scientific and statistical basis AND translated into something meaningful for the final users.

- Safety Data Warehousing and Online Data Access
- Data Sharing, Security, and Data Transfer
- Data Analysis and Technical Assistance
- Field Data Collection and Analysis
- Data Analysis Training
- Enforcement Training and Assistance
- Community Education and Feedback
UMassSafe maintains the Commercial Vehicle-Safety Technical Assistance Center (CV-STAC). The purpose of CV-STAC is to guide state drivers licensing agencies, law enforcement, truck and bus companies, as well as universities within the Federal Motor Carrier Safety Administration's Eastern Service Center (ESC) region, in the development and expansion of partnerships and programs promoting commercial motor vehicle safety and commercial driver's license compliance. Building off the momentum from UMassSafe's Commercial Vehicle Safety Summits, CV-STAC highlights projects and programs implemented by states, culls best practice information on safety countermeasures and current safety research findings, and provides blogs on relevant topics. The CV-STAC website includes:

**Highlights:**
We collect the newest and most exciting developments in commercial motor vehicle safety and commercial driver’s licensing compliance, as well as details on upcoming events and summits. Past highlights have included a presentation on the culture of impaired driving, predictive analytics for roadway safety and enforcement, the Western States Commercial Vehicle Safety and CDL Compliance Summit, and the 2018 Southeast CMV Safety Research Summit.

**Best Practices:**
We cull best practice information on safety countermeasures and current safety research findings. These include a collection of presentations from the Commercial Vehicle Safety Summits, Best Practice Guides, Past Webinars and Blogs. Blog articles cover establishing effective partnerships, driver health, vehicle automation and fatigued driving, trucking companies looking to hire military veterans to address truck driver shortages, and efforts to combat truck stop sex trafficking.

**Webinars:**
The CV-STAC website is also a hub for useful webinars on topics including Innovative Initiatives, Best Practices for Crash Data Tools, CMV Safety Risks Associated with Marijuana Decriminalization, and Emerging Trends in Commercial Motor Vehicle Safety and Commercial Drivers Licensing Compliance.
UMTC Opens New Aviation Research and Training Center at Westover Municipal Airport

The UMass Transportation Center has opened a new Aviation Research and Training Center at Westover Municipal Airport in Chicopee, Massachusetts where the Center will conduct advanced aeronautical research and provide training for air traffic controllers, pilots, and other aviation professionals.

The new center is equipped with a high-fidelity 360-degree air traffic control tower simulator that can be modified for three-dimensional views of a variety of operational environments.

Key goals of the center are to create a Massachusetts-based training center for advanced aeronautical research to improve aviation safety and efficiency. The center will also develop and apply advanced training methods to ensure air traffic controllers, pilots and airline operators are able to leverage the benefits of newly developed technologies capable of improving aviation safety and efficiency. The center will also encourage and support economic development in the region.

The simulator will also provide a valuable resources for faculty who want to research and address critical questions such as how to integrate unmanned aircraft safely into the national airspace with manned aircraft.
UMassAir

UMassAir is a University of Massachusetts multi-campus and interdisciplinary team of faculty, scientists, students, and professionals.

At UMassAir, we:
1. Conduct Unoccupied Aviation Systems (UAS)-based research;

2. Educate the next generation of scientists, engineers, and professionals on safe UAS practices; and,

3. Offer UAS contract services, including aerial image capture and data processing.

UMassAir complements and leverages the Aviation Research and Training Center at the Westover Metropolitan Airport run by the UMass Transportation Center. As a member of FAA’s northeast unmanned aircraft test site, the Aviation Research and Training Center will provide infrastructure and logistical support.

UMassAir Research Projects

UMassAir is comprised of an interdisciplinary and multi-campus team of core scientists, professional staff and research fellows conducting UAS-related research.

A Sample of Current and Recent Research Projects

The Application of Unmanned Aerial Systems in Surface Transportation Projects
Principal Investigator Mike Knodler (UMass Amherst), along with co-PIs Lance Fiondella (UMass Dartmouth), Walaa Mogawer (UMass Dartmouth), Yuanchang Xie (UMass Lowell), Cole Fitzpatrick (UMass Amherst), Daiheng Ni (UMass Amherst) and Michael Plotnikov (UMass Amherst), Danjue Chen (UMass Lowell), and Tricia Chigan (UMass Lowell) received a grant from the Massachusetts Department of Transportation to investigate the utility of UASs to address surface transportation needs in the Commonwealth. The project had several tasks, including: (1) Assessing roadway pavement condition with UASs; (2) Evaluating speed sensing using UAS; (3) Investigating the development of an emergency service drone network to support surface transportation; (4) Assessing situational awareness technology to support surface transportation; (5) Evaluation of cybersecurity threats and countermeasures to surface transportation; and (6) Implementation, outreach and technology transfer coordination and management.

UAS Salt Marsh Assessment Project
UMassAir Fellow Scott Jackson, Charlie Schweik and Kevin McGarigal (UMass Amherst) have received a grant from the US Environmental Protection Agency to investigate the utility of UAS and various types of sensors (e.g., true color, multi-spectral, thermal) for assessing vegetation health/stress and the physical characteristics of salt marshes.

Unmanned Aircraft Vehicles for Mobile Sensing in Full Scale Structural Testing
UMassAir Fellow Kara Peterman is investigating the utility of UAS to, in real-time and safely, monitor and visualize structural behavior during full scale tests of steel structures (for example).
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