

New England
**University
Transportation
Center**

ANNUAL REPORT
2007-2008 / Year 20



LETTER FROM THE DIRECTOR

The joy of research is often in the doing; but the real objective of research and a focused passion of the task should be how the work will improve the nation's quality of life.

Transportation systems are facing disruptive changes in technology, demographics and the environment. One of the challenges of disruptive change is increased complexity and difficulty in making accurate predictions of outcomes. We need powerful new tools to analyze the key elements—large and small—of the transportation system in today's more complex environment.

At the same time, in a disruptive world, solutions are often found by stepping back from the micro toward a broader vision. We need integrated solutions that can lead to fundamental changes in the way that transportation systems are managed.

In the New England Center, researchers are addressing these challenges through innovative research projects.

- We are leading the way in developing and implementing advanced microscopic simulation tools to help analyze and predict driver behavior—leading to solutions that can reduce congestion and increase safety.
- Researchers are discovering that an aging society affects transportation in unpredictable ways. Millions of Americans provide unpaid care for another adult. In the course of that care, caregivers alter their use of transportation systems. Can transit services change to improve caregivers' mobility?
- Drivers are getting older. Cars are more technologically complex. New England Center research is challenging assumptions about older drivers' responses to these changes.
- Despite the enormous amount of attention paid to emergency preparedness in this decade, there is still much to do. How do we build on the work that has been done and fill the gaps in response readiness?
- Many crucial transportation functions—like shipments of hazardous material—are under the control of private industry. When emergencies arise, how can we improve coordination between government agencies and operators of privately owned infrastructure?
- Road safety goes beyond highway design. It involves a complex range of community decisions. The results of our work will inform policy for community and network design that can reduce in road fatalities.

In this issue we proudly report on the research that we have been engaged in.

Joseph F. Coughlin

Director,

New England University Transportation Center

UNDERSTANDING AND MANAGING DISRUPTIVE CHANGE

Change is a constant in every area of human endeavor, but no other area of activity affects each of us so completely as transportation. Take a quick look at some events in transportation over the last 12 months:

- This past year marked the first flight of the enormous Airbus A380 and the introduction by Tata, the Indian car company, of their diminutive, ultra-cheap “Nano”—a car priced at about \$2,500.
- The largest highway construction project in US history, Boston’s “Big Dig” finally opened, while the New York City Department of Transportation announced a 35% increase in commuter bicycling.
- The I35 bridge over the Mississippi near Minneapolis collapsed, wildfires in Southern California closed dozens of interstate highways and forced the evacuation of upwards of one million people, in a year when, on any given day, we could read headlines of terrorist attacks in Iraq and around the world.

- The oldest members of the Baby Boom Generation were becoming eligible for Social Security, while debates raged on how to determine under what circumstances older drivers should lose their driving privileges.

The New England Center’s theme is understanding and managing disruptive change. Why are the changes affecting transportation today “disruptive?” Disruptive change is change that calls into question the assumptions of existing policies, systems and the use of selected technologies—and is quite often transformative, focusing public attention on the reallocation of resources or modification of how selected technologies are used. Simply put, disruptive change is game changing. While change is everywhere we look in transportation, we focus on three categories.



DISRUPTIVE DEMOGRAPHICS

1 IN 5 AMERICANS OVER THE AGE OF 65.

Imagine driving down the street in Florida—a traditional retirement destination. Notice that a disproportionate number of your fellow drivers are older. In Florida today, every fifth car—20%—is driven by an older person.

Nationwide, in 2006 just over 12% of Americans were over 65. Over the next 20 years or so, that number zooms to 20%. In just a few short years, when you drive down the highway, the entire US will look just like Florida is today. Every fifth car will be driven by an older person. How will the aging of the nation's largest generation impact highway design and safety, the introduction of new vehicle technologies, public transportation and the costs and capacities of an older transportation workforce?



DISRUPTIVE TECHNOLOGIES

UBIQUITOUS COMPUTING= INFORMATION OVERLOAD?

More than 60% of Americans now have cell phones, and with today's cell phones doing more than just make phone calls, drivers are beginning to text, surf the Web and check email. At the same time, vehicles are offering more and more technology. Accidents caused by multi-tasking drivers is becoming a serious concern.

Meanwhile, the entire transportation system is rapidly growing more complex, with advanced sensors and simulation tools. In addition to the effects on individual drivers or operators, how will these changes impact the transportation infrastructure and the system as a whole, including congestion management, safety, efficiency and intermodal activities?



DISRUPTIVE ENVIRONMENTS CLIMATE CHANGE, TERRORISM & \$100/BARREL OIL.

While it is difficult to predict the impact of global warming on transportation systems, the consensus points to a rising number of more violent and unpredictable storms, perhaps like the unprecedented winter storms in the Pacific Northwest this year, that closed vital transportation routes for several days. While there have been no terror strikes on the US since 9/11, huge sums are being spent to protect transportation infrastructure. Globalization is changing the ways we receive the goods we depend upon every day. For the first time, oil prices have hit \$100 a barrel. All of these: Economic development, globalization, energy efficiency, environmental impact, security needs and increased system congestion are demanding new approaches to leading the transportation enterprise.

The New England Center's research takes a look at these issues, and more. Our goals are to increase awareness of today's transportation issues, in order to develop tomorrow's transportation leaders and foster positive dialogue that will lead to solutions for the nation's transportation goals.

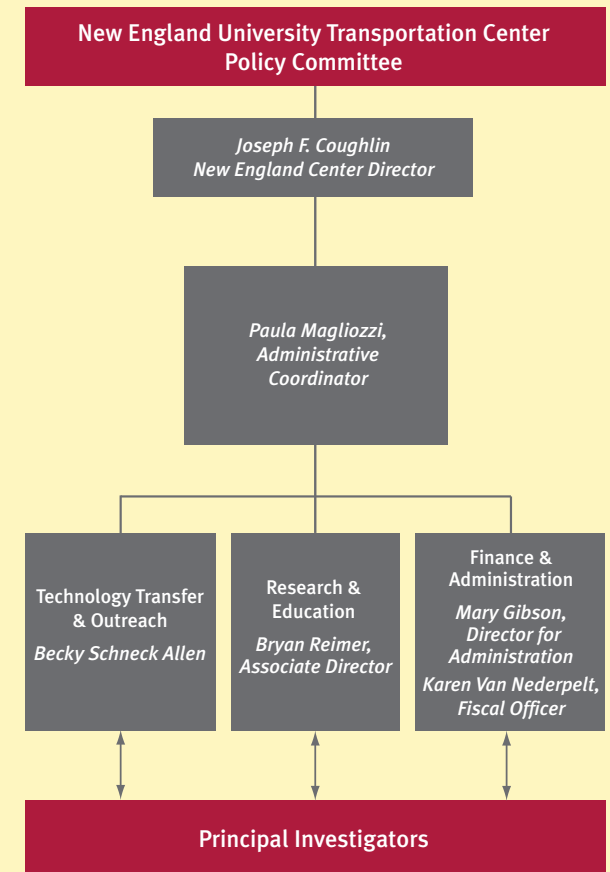


CENTER MANAGEMENT

The New England Center's Policy Committee establishes themes and direction, and approves all research funded by the Center. The member universities of the New England Center are each represented on the committee and meet regularly to make decisions affecting the Center as a whole.

Policy Committee

- **Dr. Joseph F. Coughlin**, *Chairman*
Center Director & Policy Committee Chair, MIT
- **Bryan Reimer**, Associate Director, MIT
- **Lisa Aultman-Hall**, University of Vermont
- **John Collura**, University of Massachusetts
- **Per Garder**, University of Maine
- **John Ivan**, University of Connecticut
- **David Gress**, University of New Hampshire
- **Arnold Howitt**, Harvard University
- **Wayne Lee**, University of Rhode Island



THANK YOU, ARN HOWITT.

Arnold Howitt has served on the Policy Committee since the inception of the New England Center in 1987. He is one of the nation's foremost researchers on and resources for disaster preparedness in transportation systems. His work on the Policy Committee has helped establish the context for research around the themes of disruptive change in the political, social and environmental spheres, and how those changes impact transportation. David Luberoff of Harvard University will be taking Arn's place on the Policy Committee.



Management & Administration

Dr. Joseph F. Coughlin is the New England Center Director. As a researcher, Joe concentrates on how the aging population is affecting transportation. He represents the Center at DOT meetings and regional events and actively engages multiple transportation stakeholders in the New England region. Dr. Coughlin also serves on the Assumption College University Transportation Center Board of Advisors providing insight into the New England Center Program and serving as a conduit to transportation research expertise resident in the Region I New England UTC. Moreover, he serves as the primary point-of-contact for public and private transportation organizations in the six-state area seeking technology assistance, information or the desire to participate in Center activities.

Dr. Bryan Reimer is the New England Center Associate Director for Research. Dr. Reimer is responsible for all internal and administrative reporting requirements, e.g., performance metrics, web site content, annual report generation, etc. Dr. Reimer spends up to 20 percent of his time on New England Center-related work in addition to his research in human factors and the use of information systems in transit and automobiles.

Dr. Lisa D' Ambrosio studies the social aspects of aging, looking at how to enhance and improve the quality of life, and to enable elders to live independently longer. Her focus is on not what products and services will be technologically feasible over the coming decades, but rather what will be socially and personally acceptable to this population, with its changing demands for transportation, need

for re-design of physical spaces (including the home and workplace) and power in the consumer and employment markets.

Ms. Paula Magliozzi is the key staff administrative person for the New England Center Program. She is responsible for the administration of the education, research and technology transfer activities, the DOT reporting requirements, our web and database management, and our publications. Ms. Magliozzi is uniquely qualified for the position as she has 28 years of experience at MIT and nearly 15 years experience in administering the New England Center's program. She has developed close relationships with the cognizant MIT support offices and each of the member schools affording her an understanding of the processes and workings at each of the consortium institutions.

Mary Gibson serves as the Chief Administrative Officer of MIT's Center for Transportation & Logistics (CTL). The CTL provides budgeting, contracts and related assistance to the New England Center Program and the member schools. Ms. Gibson joined the MIT School of Engineering as administrative officer for Project Athena, MIT's campus-wide computer network system.

Ms Karen Van Nederpelt functions as the New England Center Financial Administrator. Karen is the Fiscal Officer in CTL. She has been with CTL and has been managing the Region 1 UTC budgeting and financial reporting since 1991.

RESEARCH

When change comes, the natural reaction is a scramble to react. When disruptive change occurs, a reactive posture can quickly lead to more serious troubles down the line.

While we may never be able to fully anticipate changes, the strategic management of disruptive change requires us to project our thoughts and our planning into the future. In a very real sense, the research we support at The New England Center is all about inventing the future. Our underlying philosophy is to find ways to use research to look ahead and imagine how change will affect us, and therefore begin to influence policy so that it, too, can be more forward-looking.

When it comes to transportation, this approach is critically important. In our economy and in our culture, transportation is more than an aggregation of modalities, different ways of moving people and things that interact only occasionally. It is a fundamental force in modern life, like electricity or clean water. Like those life-giving utilities, when our transportation system falters, it very quickly affects virtually every aspect of our lives. To the extent that our transportation systems are less safe, less efficient, less effective, they are like an electric grid that only supplies energy for a limited number of hours each day.

Our transportation systems will never be perfect. But at The New England Center we believe our research supports positive actions and policy, and most importantly, helps to prepare the future leaders who will plan, deploy and operate the transportation systems of the future.

A significant amount of the support for The New England Center's work—74%—comes from private sector sources. This demonstrates two unique features of the Center: the focus on real-world, practical applications of the research and the recognition by both private sector and government funding sources of the fundamental importance of that research.

OUR RESEARCH IS USED BY PROFESSIONALS AND POLICY MAKERS TO LITERALLY “INVENT THE FUTURE” TO BETTER PREPARE FOR CHANGE.

The eight universities in the region have been able to leverage their relationships with corporate, foundation and local, regional and even international funders. As a group these schools have a long history of making effective and efficient use of these funds, with solid results.

On the funders side, there is a recognition of the value of the research supported by the Center. Among the funders are traditional, transportation-related companies, and others whose business may not be “transportation” per se, but who see the interconnectedness with the broader world and marketplace of the research we do.





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Massachusetts
Institute of
Technology

MITR20-1

Principal Investigator: Moshe Ben-Akiva,
Massachusetts Institute of Technology

Title: Modeling Cooperative Driving Behavior
in Freeway Merges

Freeway merging is a major source of bottlenecks, caused by countless interactions and responses.

Merging locations are major sources of freeway bottlenecks. Moshe Ben-Akiva is leading a New England Center study using advanced microscopic simulation tools to analyze merging patterns and lead transportation engineers to design optimum geometric configurations and control strategies for these critical areas.

In congested situations, acceptable gaps for merging often do not exist, but the study shows that freeway mainline drivers tend to decelerate or change to inner lanes to create spaces for the merges. Traditional approaches to analyzing bottlenecks have not accounted for this driver cooperation and, as a result, they often over-predict congestion.

As part of the Next Generation Simulation Project, or NGSIM, the New England Center previously developed a model for the decisions of the merging driver that captures normal, courtesy and forced merges of the driver in a single decision framework. The study in Year 20 extends the model to include the driving decisions of the freeway mainline drivers in the merging area.

The developed approach will be an integrated driving behavior model for lane-changing and acceleration decisions of freeway mainline drivers approaching a

merging on-ramp. It explicitly captures courtesy and cooperative actions of the driver. Parameters of the model will be estimated with vehicle trajectory data collected by NGSIM at Interstate 80 in California during congested periods.

The models are implemented in the microscopic traffic simulator MITSIMLab, to improve performance in congested merge locations. The enhanced MITSIMLab will be open-sourced and can serve as an excellent tool for transport professionals to test different congestion management mechanisms. The improvements in the simulation capability are being demonstrated through a validation case study.

NGSIM is playing a key role in developing new behavioral models to fill the gaps in traffic simulation. When combined with “real world” research and measurement, investigators are better able to understand and predict driver behavior. The goal is to help transportation professionals implement solutions that will reduce traffic congestions and accidents in critical highway merging areas.



➤ **Using advanced microscopic simulation tools, investigators are better able to understand and predict driver behavior.**



Massachusetts
Institute of
Technology

MITR20-2


Principal Investigator: Joseph Coughlin,
Massachusetts Institute of Technology
Title: Assessing the Transportation Readiness
of an Aging America

Is the American Transportation System Age Ready?

The demographic shift of the nation's population from a young nation to an older nation is now a reality and not just a projection. The first of the nearly 80 million baby boomers is turning 61 in 2007. Is the nation's transportation system anticipating the mobility needs of this population? This study proposes to conduct a survey of the nation's Metropolitan Planning Organizations (MPO) to identify their placement of aging on the transportation agenda. Where previous work (Coughlin, 2004) looked exclusively at MPOs, this examination will also survey key legislative decision makers as well as state transportation officials to provide a comprehensive baseline of where aging is on the nation's transportation agenda as well as to see if there has been movement since the passage of SAFETEA-LU.



➤ Tomorrow's needs of older adults must be reflected in today's regional planning.

	<p>MITR20-4</p>
	<p><i>Principal Investigator:</i> Lisa D’Ambrosio, Massachusetts Institute of Technology</p> <p><i>Title:</i> Caregiving and Travel Patterns</p>

An aging society affects transportation in unpredictable ways. Millions of Americans provide unpaid care for another adult. In the course of that care, these caregivers significantly alter use of transportation systems.

Unpaid caregiving is becoming increasingly common as the population ages. A 2004 survey by the National Alliance for Caregiving and AARP estimated that nearly 44.4 million people were providing unpaid care for another adult. That number was, and is, expected to grow.

An unexpected consequence for the transportation field is that caregivers often have to adjust their lives to include time for their loved ones—and trips on their behalf—around already busy schedules.

For example, caregivers are more likely to be women than men. For many older couples where the husband long had been the primary driver, if the woman assumes the caregiving role, it also can mean a change in driving roles and in travel patterns.

Despite the current and anticipated growth in caregiving, we know relatively little about the impact of caregiving on travel behavior. MIT researcher Lisa D’Ambrosio is studying how caring for older

adults affects mobility and travel patterns. This project focuses on the trips that those caring for people with Alzheimer’s or other dementias make on their charges’ behalf, and takes a look at how caregivers adjust their travel patterns to accommodate the additional needs they must satisfy.

The study looks at the nature of the relationship between caregivers and those who receive care, the types of trips caregivers make for their loved ones, and how caregivers carry out these trips—either by trip chaining, making additional trips, foregoing the trip (or having someone else make the trip) or having the goods or services brought to the home.

The study’s findings will result in greater recognition of the impact that caregiving has on travel behaviors, prompting changes in transportation practice or services in order to improve caregivers’ mobility.



➤ **How can we change transportation services to improve caregivers’ mobility?**



MITR20-5

Principal Investigator: Bryan Reimer,
Massachusetts Institute of Technology

Title: Age-Related Changes in Cognitive
Response Style in the Driving Task (Phase II)

Drivers are getting older. Cars are more technologically complex. New England Center research is challenging assumptions about older drivers' responses to these changes.

Drivers have different response styles that affect driving performance. In a continuation of previous research, New England University Transportation Center Associate Director Bryan Reimer is investigating the potential for differences in physiological responses between younger and older drivers while they're performing a complex cognitive task. The goal is to further elucidate the effect of secondary tasks on driving performance.

In the first phase of this research, different patterns of physiological response between younger and older drivers were observed during a simulated cellular telephone conversation. Not surprisingly, results of the study indicate younger drivers showed heart rate acceleration during the cell phone task. However, older adult drivers, as a group, showed no change.

Questioning the apparent lack of reaction in the older drivers, and considering the literature on sensory intake and rejection that suggests that heart rate can increase or decrease depending on how individuals attend to cognitive processing demands,

Reimer then examined the data for the presence of subgroups of heart rate response among each age group. This analysis revealed that in both age groups some individuals showed heart rate acceleration and some showed non-acceleration or deceleration reactions. Reimer concluded that these findings demonstrated the overall difference in heart rate response was not a fixed pattern associated with aging, but instead a difference in the relative percentage of individuals displaying each response style.

In the current study, Reimer is investigating interactions between response style and age on simulated driving performance. These interactions would suggest that in addition to age, response style is a major contributor to driving performance.

The increasing presence of complex secondary tasks in the automobile suggests that outcomes of this research could significantly inform the development of regulation and education on the use of in-vehicle technology among different operators.



➤ **It's not simply a matter of years. An individual's response style — regardless of physical age — is a major contributor to driving performance.**

	<p>HVDR20-6</p>	<p>Despite attention paid to emergency preparedness, there is still much to do. How do we build on the work that has been done and fill the gaps in response readiness?</p>
	<p><i>Principal Investigator: Arn Howitt, Harvard University</i></p> <p><i>Title: Improving Emergency Preparedness and Crisis Management Capabilities in Transportation (Phase II)</i></p>	

While disaster preparedness and emergency management capabilities have had a high public profile during the current decade, Hurricane Katrina in late 2005 revealed serious weaknesses in the United States’ emergency response capabilities.

There is much left to do. Harvard University’s Arnold Howitt is examining whether surface transportation is developing the capabilities necessary to fit effectively into the comprehensive, integrated emergency management system that the United States is committed to developing.

Following earlier work on terrorism preparedness and emergency evacuation in the Houston area, with matching funds from the Association of State and Territorial Health Officials, this study is focusing specifically on implementation in transportation of the National Incident Management System (NIMS), a Congress-mandated national template for coordinated organization, operational command, and implementation of response. Howitt is conducting empirical research of several major metropolitan areas and of the federal government, thus looking at this issue from national, state and local perspectives, with concentration on the links between these levels of government.

This research is examining whether and how one significant functional area—surface transportation—is developing the capabilities necessary to fit effectively into the comprehensive, integrated emergency management system the US is committed to developing. Following earlier work on terrorism preparedness and emergency evacuation, the focus is specifically on implementation in transportation of the National Incident Management System (NIMS), a Congressionally-mandated national template for coordinated organization, operational command, and implementation of response.

This system is designed to address emergency management situations that because of scale must cut across work group, agency or functional boundaries. The project is conducting empirical research in several major metropolitan areas and includes federal actions, thus looking at this issue from national, state and local perspectives, with significant concentration on the linkages between these levels of government.

The results of this study are being rolled out to directly to state transportation and health officials, raising their awareness of the need for, and potential value of, coordinated planning and action.



➤ **Coordination is key to response readiness.**



HVDR20-7

Principal Investigator: Lewis Branscomb,
Harvard University

Title: Hazardous Material Transportation and the Security Externality: What Should Be Done?

When a serious emergency involves transportation, we think first of government responses. But many crucial functions—like shipments of hazardous material—are under the control of private industry.

The combination of terrorist attacks, natural disasters and human error has brought increased attention to the vulnerability of our infrastructure and population resulting from the transportation of hazardous materials. In this decade, most critical infrastructure protection has focused on the responsibilities and actions of government. But in our society, the vast majority of hazardous shipments are carried out by the private sector.

For example, the derailment of a chlorine tank car in South Carolina resulted in deaths and dislocation. The private transportation companies involved rely on their internal economics to make marketing and operating decisions. This is known as a “security externality” – the private decision making process has spillover impact on others that may go far beyond what the company experiencing a disaster must face.

With Congress and government agencies actively considering regulatory and legislative actions, this study is examining the nature and extent of these “security externalities”—potential transportation disruptions that are not under direct federal or state control. The railroad tank car of chlorine gas in South Carolina traveled through an urban area rather than around it. The urban routing is more efficient,


but clearly has a potential negative impact on the urban society because of the health risk of a tank car rupture—from whatever cause.

The goal of this study is to identify alternative mitigation strategies to help avoid these disruptions. Effective coordination between government agencies and operators of privately owned critical infrastructure is a vital part of efforts to avoid disruptions, and to improve responses to natural disasters and potential terror strikes.

This project documents the scope and characteristics of such externalities. The focus is primarily on rail transport of highly hazardous materials, such as chlorine, but because of intermodal transfers, truck transport is included in the study. Alternative models to internalize the costs and risk of the externality, like rural routing, modal shifts, risk premiums and local production are being defined and assessed. The analysis will focus on representative transportation corridors to enable a micro-level analysis. Quantification of the impact of alternative models on private sector economics and social welfare is being undertaken, where possible, taking into account the fact that the proprietary nature of the data required may limit such quantification.



➤ **Effective coordination between government agencies and operators of privately owned critical infrastructure is vital to improving responses to emergencies.**

 University of Connecticut	UCNR20-8
	<i>Principal Investigator:</i> Norman Garrick, University of Connecticut
	<i>Title:</i> Community Design and Transportation Safety: Towards a "Vision Zero" Road Fatalities Plan

Road safety goes beyond highway design. It involves a complex range of community decisions.

How does the relationship between transportation infrastructure and community design affect road safety? In the conventional approach, the focus is on specific road segment design—and not the overall context or network.

For this project, Norman Garrick and his research colleagues at Connecticut are taking a new approach, by focusing their investigation on street network configuration and street character and design.

The foundation for this research is an ongoing study of 150 California cities, which show a wide variation in road safety among the different cities. Trying to learn the underlying cause of this pattern could be a very fruitful approach to understanding the factors of community and street design that affect road safety.

Our analysis of the data shows that cities with very low fatality rates have many characteristics in common. For example, all cities with high bicycle use for commuting have low to medium fatality rates. Why? Other researchers have reported on this connection and have speculated that the reason is that cities with high bicycle use may also have

streets that encourage low travel speed. The data from this study showing lower severity level for crashes in the high bicycle use cities seems to support this viewpoint.

This project will allow us to build on the findings from this previous research and provide definitive answers as to the factors contributing to differences in safety outcome in different cities.

We will focus on investigating the effect on safety of two main factors: street network configuration and street character and design. This is different from the conventional approach to road safety, which tends to look at the design of a particular stretch of road, as opposed to the overall context.

The results of this study could inform the crafting of policy for community and network design that reduces road fatalities for all road users, particularly older drivers, who are disproportionately involved in traffic fatalities.



❖ The results of this study will inform policy for community and network design that could lead to a reduction in road fatalities.



UMAR20-9 / UMAR20-10

Principal Investigator: Michael Knodler,
University of Massachusetts, Amherst

Title: Development of a Crash Prediction
Model for Older Drivers

One of the challenges of disruptive change is increased complexity—and difficulty in making accurate predictions of outcomes.

Michael Knodler and John Collura, both of the University of Massachusetts, have begun developing a crash prediction model for older drivers sponsored by the New England University Transportation Center. The study uses historical data from Massachusetts’ statewide crash, driver licensing and citation datasets to derive and validate a crash prediction model that will identify a subgroup of older drivers who are at a high risk for a near-term injury-causing crash.

As the driving population ages, jurisdictions are seeking ways to reassess older driver competency in an equitable, cost-effective manner. The researchers contend that because crash prediction modeling will allow drivers to be identified as high-risk based on objective criteria—recent driving performance—it is a logical mechanism.

While simple in concept, sophisticated approaches are needed to acquire meaningful data. To reduce the high cost and repeated investment in calibration, new principles are proposed for the development of next generation transportation modeling and simulation tools.

A fundamental explanatory principle is postulated in this research. Unlike the conventional descriptive principle which tries to describe the subject system by fitting observed data, the explanatory principle

captures the essential mechanisms that drive the behavior of the subject system. As a first step, this project will develop a rational driver model. The driver will be modeled as an autonomous intelligent agent that is motivated by goals that drive the agent’s behavior. Inputs to the driver model include information from the driving environment and vehicle feedback. Outputs of the driver model include the desired level of acceleration/deceleration and steering. The behavior exhibited by the driver is modeled as decisions at three levels: the global-level decision concerns navigation (i.e. choice of route to reach the destination, anticipated travel times, and level of desired safety), the local-level decision concerns operation (i.e. selection of lanes, interaction with neighboring vehicles, and response to road geometry and traffic control devices), and the vehicle-level decision concerns control (i.e. the desired acceleration, deceleration, and steering).

The results of this research can be adopted by existing transportation simulators to improve their performance or be used as the basis to develop a new generation of transportation simulators. This will be particularly useful for developing powerful tools to study performance characteristics of older drivers, as well as to develop innovative safety and mobility solutions for them.



➤ The study will help develop powerful tools to analyze driver performance in today’s more complex environment.



UMAR20-10

Principal Investigator: Nathan H. Gartner,
University of Massachusetts, Lowell

Title: Development of a Conceptual Framework
toward an Integrated Transportation System

In disruptive world, solutions are often found by stepping back from the micro toward a broader, integrated vision.

Our country relies on an efficient and safe transportation system. However, the system today faces many critical issues, congestion and safety being the foremost ones.

No single solution can respond to all transportation problems. There is a growing demand for integrated solutions that could address the problems in new ways, leading to fundamental changes in the way that transportation systems will be managed and operated in the decades to come.

This research envisions an integrated transportation system based on simulation and sensor technology. Global-level traffic control will be proactive, local-level traffic control will be cooperative, and

vehicle-level control will be attentive. Underlying this research are sensor technology which enables ubiquitous situation-awareness and transportation simulation which assists decision-making at these three levels.

Recognizing that such an integrated transportation system is not feasible in a single step, this research intends to advance the current state-of-the-practice towards such a system in three ways: developing a conceptual framework of the integrated transportation system, identifying enabling technologies for the framework, and designing a prototype application under the framework.



➤ We need integrated solutions that can lead to fundamental changes in the way that transportation systems are managed.



UMER20-11

Principal Investigator: Per Garder,
University of Maine

Title: Clear Roads' Safety Effect
on Elderly Drivers

Does the method used for clearing icy highways change the way drivers behave—and affect accident rates?

Over the last five years, the Maine Department of Transportation, along with other states, have shifted to an anti-icing strategy to keep the state's highways clear of snow and ice, rather than a de-icing approach. This is known as the "Clear Roads Strategy." In the de-icing past, drivers regularly faced sloppy, visibly dangerous roads during the de-icing process. Under good circumstances, the Clear Roads Strategy keeps roads from becoming snow or ice covered in the first place. It meets the general public's demand for high-speed highways in all but the worst storms.

But there are instances when icy spots remain. The ice can be hard to see, especially for elderly drivers with poor eye-sight, and particularly when it is dark.

The influence of different anti-icing and de-icing techniques on crash statistics during storms have not been analyzed in Maine or in any other state. The objective with this project is to study the safety of the Clear Roads Strategy. In particular, has the strategy led to higher-speed injury crashes, as over-confident drivers increase their speed on the "clear" roads? Are these types of crashes substituting for low-speed property-damage-only crashes that took place on snow-packed roads? If it is concluded that there is a safety problem, one solution may be to reduce speeds by making the variable advisory speed limits on Maine highways enforceable.



➤ The study gives authorities the ability to implement potentially life-saving speed limits.



UVMR20-12

Principal Investigator: Lisa Aultman-Hall,
University of Vermont

Title: Characterizing Older Driver Behavior for
Traffic Simulation and Emissions Modeling

It's "common knowledge"—as drivers age, their reactions to driving stimuli evolve. But do their behaviors change in the ways we think they do?

How much does the behavior of older drivers differ from the norm? The objective of this project is to compare the second-by-second driver behavior of older and middle aged drivers to determine if the aging population should be accounted for in traffic simulation and emission models.

The researchers are particularly interested in examining data from instances when drivers are not constrained by vehicles in front of them, since this is the situation when the drivers' individual reactions and decision making is most apparent.

Field data for velocity, acceleration and global positioning system (GPS) location will be collected on actual routes using in-vehicle instrumentation from

60 drivers in Burlington VT. The vehicles specific power will be calculated. Trends and differences in cruise, acceleration and deceleration data while drivers are not constrained by a vehicle in front of them will be explored.

The objective of this proposal is to compare the second-by-second driver behavior of older and middle aged drivers to determine if the aging population should be accounted for in traffic simulation and emission models.



❖ How should the aging population be taken into account in traffic simulation and emission models?

EDUCATION – EMPOWERING TOMORROW’S LEADERS

Almost by definition, disruptive change is unpredictable, and managing those changes will require leaders of insight, courage and imagination.

As disruptive change continue—and accelerates—who will be the next generation of leaders? Who will design, deploy and operate the increasingly complex transportation systems of the future?

The New England Center has as key part of its mission the education of future transportation professionals and leaders responsible for tackling transportation challenges of today and tomorrow.

The eight schools of the New England Center have added 76 undergraduate and graduate transportation-related courses, with 192 students participating in transportation research projects. Four master's level and four doctoral level degree programs have been added, and 71 students have received advanced degrees.

- Political science can help develop a better understanding of the dynamic relationship between public and private sectors.
- Mathematics is needed to give clarity to modeling the complex future of transportation.
- Psychology provides a context for how each of use interacts with both systems, and other users and operators.
- Civil Engineering is crucial to managing and creating infrastructure.
- Marketing can help increase ridership on public transportation.
- Environmental science will measure of the impact of climate change or transportation systems—and vice versa.



Management of disruptive change requires a skilled workforce and a knowledgeable public.

This year the New England Center supported two key education projects:

MITE20-13

Teaching Transportation Systems Thinking Concepts to Undergraduates

Prof. Joseph Sussman,
Massachusetts Institute of Technology

This curriculum development project aims to expand transportation systems knowledge in undergraduate engineering students that will prepare them for the broad systemic manner of thinking essential to such management in an era of what is certainly disruptive change in technology and institutional structure in the transportation field. A key component of this subject is case materials. Two additional cases in transportation application settings plus lecture material is being developed.

HVDE20-14

Teaching Case Studies on Emergency Evacuation

Dr. Arn Howitt,
Harvard University

This project is developing two teaching case studies on the policy and institutional dimensions of emergency evacuation planning and/or implementation. One case will focus on the actual experience of the metropolitan area of Houston during Hurricanes Katrina and Rita in 2005. The other case will deal with evacuation planning in Los Angeles. Each case study developed for this project will inform the student about a specific situation, providing background data, information about events, and policy dilemmas still confronting the area. It will then place the student in the position of devising and assessing policy and implementation options to evacuation capabilities.

The experience of Hurricanes Katrina, Rita, and Wilma in 2005 dramatized the need for better planning for emergency evacuation in major metropolitan areas in the United States and has spurred planning efforts in many locales. The case studies in this project will be used as curriculum materials for training transportation, planning, and public policy/administration students at the graduate level, as well as in-service professionals, to deal with this issue more effectively.

The case studies will place the student in the position of devising and assessing policy and implementation options to evacuation capabilities.



HONORING TOMORROW'S LEADERS

Many of the students in the New England Center schools have already exhibited leadership in their fields. Each year the New England Center presents its Student of the Year Award, honoring the most outstanding student for his or her achievements and promise for future contributions to transportation.

Students of the Year are selected based on their accomplishments in such areas as technical merit and research, academic performance, professionalism and leadership. Nominations are welcomed from faculty at each of the Region One schools and must follow the current Student of the Year Guidelines.



The New England Center's Outstanding Student of the Year

MEGAN BRETT GAUDET



Megan has been a leader in aerospace and transportation, working as management consultant at McKinsey and Company, serving a variety of clients in those fields. Now a Masters student at MIT, pursuing degrees in Transportation and Operations Research, Megan will graduate in June 2008.

While at MIT, Megan's main research activities have been in the areas of air transportation and airport infrastructure. Her primary research focuses on air navigation user fees. She is working with the FAA and North Atlantic Economic Finance Group in exploring the harmonization of fee structures in the North Atlantic airspace. She has also conducted research on airline revenue management for a consortium of airlines and performed a study of aviation infrastructure costs in the United States.

Megan received a B.S. in Aerospace Engineering from MIT in 2004. She competes in triathlons, plays soccer, and enjoys traveling. Megan has also served as the President of the MIT chapters of both the Society of Women Engineers and the American Institute of Aeronautics and Astronautics.

The depth and breadth of Megan's research activities and her professional experience all contributed to the basis for her selection. Clearly, Megan has demonstrated clear promise of future leadership and contribution to the transportation profession.

UConn's Marshall Garners Eisenhower Transportation Fellowship

University of Connecticut transportation engineering doctoral candidate Wesley Marshall was awarded a nationally competitive 2007 Eisenhower Graduate Transportation Fellowship by the National Highway Institute (NHI).

Marshall received the award for his research involving community design, road safety, and transportation sustainability. Marshall is providing key research on the New England Center's UCNR20-8 study on Community Design and Transportation Safety.



The two-year fellowship conferred \$61,500 in funding and a stipend that allowed Marshall to attend the 2008 Transportation Research Board Annual Meeting, where he presented his proposed research and an overview of previously conducted research involving the benefits of on-street parking to urban development.

The Dwight David Eisenhower Transportation Fellowship Program (DDETFP) was initiated in 1991 and is administered by NHI for the U.S. Department of Transportation. Graduate Transportation Fellowships, one of six award categories, are bestowed to top students nationwide enabling them to pursue masters and doctoral degrees in transportation-related disciplines at universities of their choice.

Developing Tomorrow's Leaders—From Communications Consultant to Transportations Planner.



Emily Stebbins was a communications consultant before beginning graduate study at the University of Vermont in the Department of Community Development & Applied Economics. Stebbins conducted public relations for the Regional Public Transportation Initiative, a task

force seeking to change the way public transportation in Vermont is funded and governed. She pursued her interests in transportation through an internship with the Snelling Center for Government, where she conducted research on community visioning and scenario planning best practices that support integrated long-range transportation and land-use planning. Stebbins' interests center on key policy issues facing Vermont related to land use, transportation, agriculture and energy, as well as how communities and citizens engage to negotiate change and conflict. She was named an outstanding student for the UTC, recognizing her accomplishment in transportation-related fields.

Stebbins serves on the City of Burlington Planning Commission and holds an A.B. cum laude in English and American Literature and Language from Harvard University.

New England Center supports peer-exchange programs between member universities.



❖ Managing disruptive change will require leaders of insight, courage and imagination.

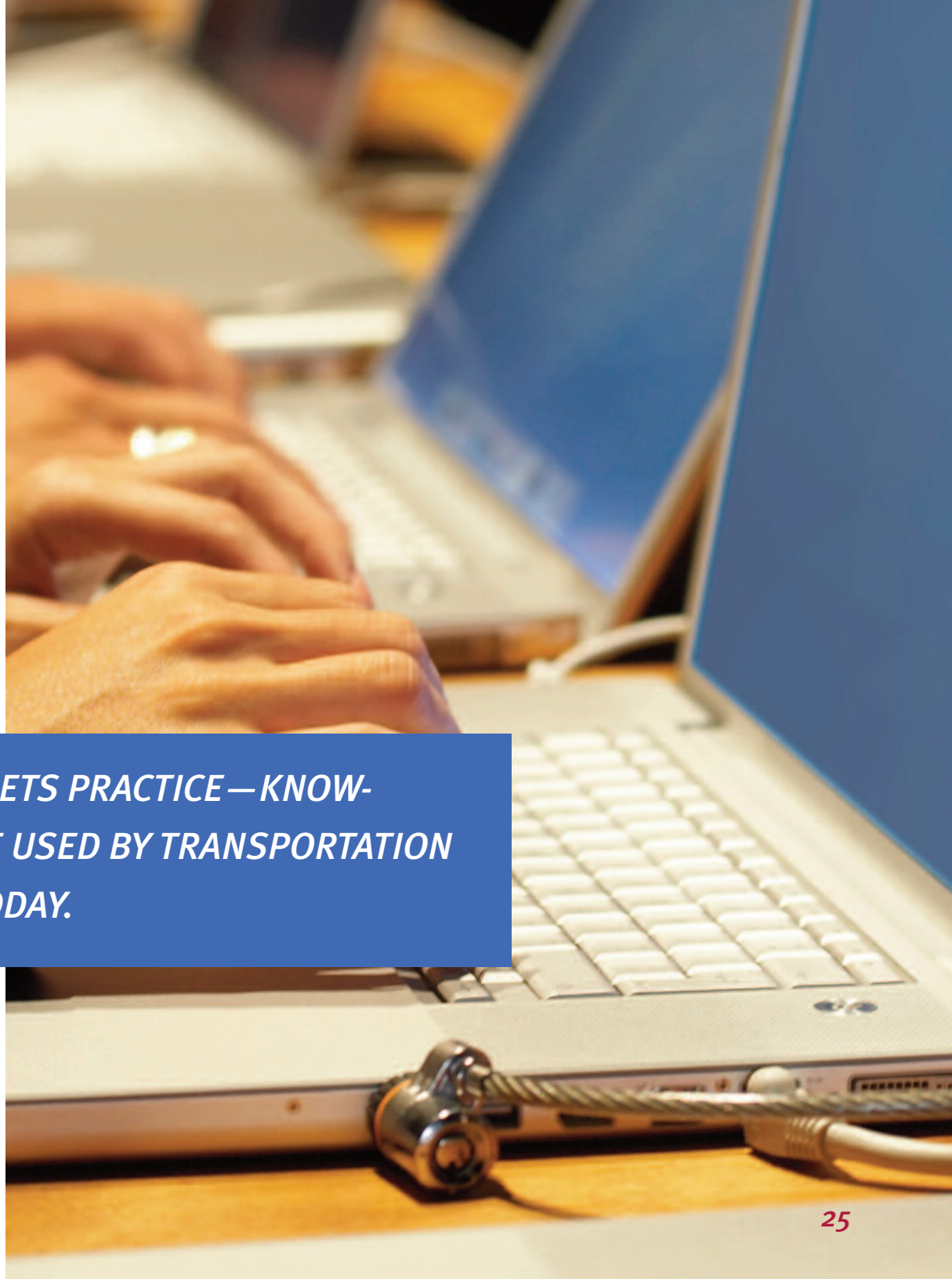
TECHNOLOGY TRANSFER & OUTREACH

Getting the word out. Only by communicating our ideas, our discoveries and the results of our research can we begin to positively influence the decision making process—and better manage the changes facing all of us.

Technology Transfers programs at The New England Center are helping today's professionals keep current, combining theory and practice. Our programs are the practical impact point for research, developing and disseminating new methodology and tactics for strategic change.

Outreach programs included 128 transportation seminars, symposia, distance-learning classes, etc., attended by 7,927 transportation professionals.

WHERE THEORY MEETS PRACTICE—KNOWLEDGE THAT CAN BE USED BY TRANSPORTATION PROFESSIONALS TODAY.



Disruptive Changes Can Lead to Conflict. Face To Face Symposia & Presentations Can Help Foster Understanding and Consensus.

The eight schools of the New England Center held outreach events, on average, nearly every other week throughout the year. These include speaker series and symposia.

Individual researchers at the Center schools presented their work in regional, national and even international settings.

The goal, always, is to move the results of research into the hands of transportation professionals, so positive, proactive changes can be put into action.

Selected activities include:

DISTINGUISHED SPEAKER SERIES

- **Yossi Sheffi**, Professor, Engineering Systems Division Director, MIT
- **Astrid Glynn**, NYSDOT Commissioner
- **Jeff Zupan**, Regional Plan Association
- **William G. Brunger**, Senior Vice President, Network, Continental Airlines
- **Randall Crane**, Associate Director, UCLA Transportation Studies Institute
- **Jane Garvey**, Executive Vice Present and Chairman, APCO World-wide Transportation Practice
- **Ian Savage**, Professor, Economics Department, Northwestern University
- **Michael Dukakis**, former governor of Massachusetts

CONFERENCES AND SYMPOSIA

- October 3-4, 2007
German Rail Workshop
- October 10, 2007
Symposium—RFID
Beyond Data Acquisition
- October 21-24, 2007
CSCMP Annual Conference.
- November 6, 2007
Supply Chain Club Talk:
Building Supply Chain
Leverage
- December 11, 2007
Demand Management
Interest Group (DMIG)
Annual Networking
Retreat
- January 14-24, 2008
Supply Chain Innovation
and Leadership Series
(SCILS)
- February 20, 2008
Supply Chain Interventions
for Improving Access to
Malaria Medicines.
- March 2, 2008
Crossroads 2008: The
Next Ten Years

- March 26, 2008
Annual Alumni Event—
MLOG/ZLOG Reconnect
2008
- May 21, 2008
MEHD Group Semiannual
Research Meeting

EXECUTIVE COURSES & COMMUNITY OUTREACH

- January 8-10, 2008
Supply Chains Driving
Strategic Advantage
- June 10-13, 2008
Supply Chains Driving
Strategic Advantage

PARTNER ROUNDTABLES

- November 28, 2007
CTL Roundtable. Freight
Resilience & Economic
Recovery Roundtable
- February 11-12, 2008
CTL Roundtable. CTL
Supply Chain Roundtable,
Chennai, India
- June 18, 2008
CTL Roundtable. Freight
Lab's Innovation in Trans-
portation Roundtable



PUBLICATIONS

Getting the word out. Only by communicating our ideas, our discoveries and the solid results of our research can we begin to positively influence the decision making process—and better manage the changes facing all of us.

This year, New England Center researchers and students published 34 reports, peer-reviewed articles and in articles in industry publications.

YEAR 20 / FUNDING SOURCES AND EXPENDITURES

Total Annual Budget:

\$11 million

Revenue Sources:

Industry 74%
 University 7%
 Government 19%

Expenditures:

Research 69%
 Education 11%
 Technology
 Transfer 6%
 Administration 15%

Research Sponsors

AARP Services, Inc,
 BMW
 Cambridge Systematics
 Chicago Transit Authority
 Daegu Gyeongbuk Institute
 of Science and Technology
 East Japan Railway Company
 Finpiemonte S.P.A.
 Ford Motor Company
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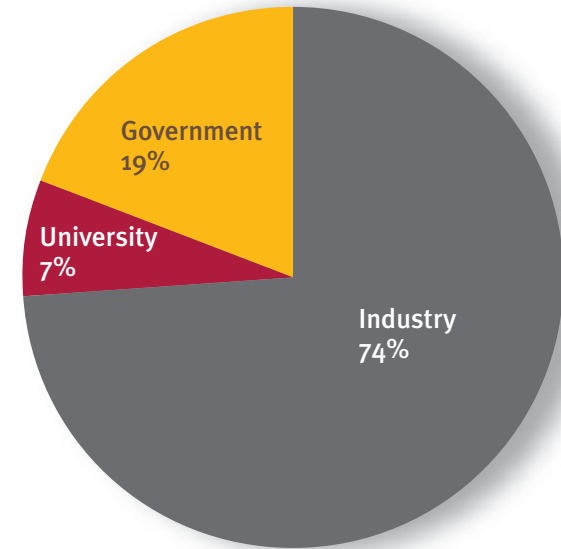
APL
 Adidas
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 Chiquita
 CH Robinson
 CSX Transportation
 CVS
 DHL
 EMC2
 Fairchild Semi-Conductor
 General Mills
 General Motors
 Goodyear
 Intel Corporation
 Johnson & Johnson
 Limited Brands
 Leveraged Execution Providers
 Masterfoods USA
 Monsanto
 Nokia
 NYK Line (North America), Inc.
 Pepsi
 Pfizer

Philips Healthcare
 Procter & Gamble
 Schlumberger
 Schwan Food Company
 Sealed Air Corp
 Shaw's
 Shell
 Siam Cement
 Solutia
 Staples
 Texas Instruments
 The Michelin Group
 Tyco Healthcare
 Unilever
 UPS

Education Partners

Cardinal Health
 General Mills
 CH Robinson
 Chiquita
 Armada
 Unilever
 General Motors
 Schwans
 Caterpillar
 Monsanto
 Shell
 Intel
 Procter & Gamble
 CVS

REVENUE SOURCES





About the New England University Transportation Center

The New England University Transportation Center employs research and innovative technology to improve transportation system management. Its research and technology transfer serve as groundwork for progressive safety measures and for increasing the efficiency of the nation's roads and mass transit systems. The center's research investigates how changes in the age distribution of the nation's population and changes in technology, infrastructure, global climate, economics and politics affect transportation systems. The New England Center will use this research to educate future transportation professionals and leaders responsible for tackling transportation challenges of today and tomorrow. In addition to these education goals, the New England Center has a mission to influence the transportation agenda and develop and disseminate new methodology and tactics for strategic change. The New England Center is part of the national UTC program. Massachusetts Institute of Technology is the lead university in the consortium, which also includes Harvard University and the state universities of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

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University Transportation Center

