



Semi-Annual Progress Report for University Transportation Centers #4
October 1, 2024 – March 31, 2025

Federal Agency: U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology

Federal Grant #: 69A3552348331

Project Title: Maritime Transportation Research and Education Center (MarTREC)

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DUNS: 1914297450000

EIN: 71-6003252

Recipient Organization: University of Arkansas
800 W. Dickson St.
Fayetteville, AR 72701

Project/Grant Period: Start Date: June 1, 2023
End Date: May 31, 2029

Reporting Period End Date: March 31, 2025

Report Term or Frequency: Semi-annual

Signature: 

INTRODUCTION

Maritime Transportation Research and Education Center (MarTREC) is a U.S. Department of Transportation (USDOT) Tier 1 University Transportation Center funded through the Office of the Assistant Secretary for Research and Technology. MarTREC was competitively awarded under MAP-21, the FAST Act, and now through funding of the Bipartisan Infrastructure Law. MarTREC's vision is to be recognized as the nation's premier source for expertise on maritime and multimodal transportation research and education.

The MarTREC consortium consists of renowned maritime transportation researchers dedicated to transferrable research and innovative education and workforce development. Our consortium consists of the University of Arkansas, Jackson State University, Louisiana State University, Texas A&M University/Texas Transportation Institute, University of New Orleans, and Vanderbilt University.

This semi-annual progress report is submitted as per our UTC grant reporting requirements.

1. ACCOMPLISHMENTS

What are the major goals of the program?

MarTREC will contribute primarily to the USDOT strategic goal of Economic Strength and Global Competitiveness by addressing resilient supply chains and system reliability and connectivity. The following performance metrics are used to evaluate the effectiveness of our research, leadership, education and workforce development, and technology transfer and collaboration and assess our progress towards meeting our semi-annual goals.

Research Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of peer-reviewed journal articles (published, accepted, submitted)	10 / 6 month	8
# of conference presentations given	10 / 6 month	5
# of students participating in transportation research projects funded by UTC	10 / 6 month	23
Leadership Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of national and regional leadership positions held	5 / 6 month	43
# of invited talks given	5 / 6 month	2
# of leadership and research awards received	1-2 / 6 month	5
Education and Workforce Development Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of transportation-related degrees conferred to supported students	7 / 6 month	5
# of technician certification programs offered	4 / 6 month	7
# K-12 outreach programs offered	2-3 / 6 month	0
Technology Transfer and Collaboration Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of existing collaborative partnerships	10 / 6 month	41
# of new collaborative partnerships formed	2-3 / 6 month	16
# of project deliverables submitted	2-3 / 6 month	0
# of collaborative research/tech transfer agreements	1-2 / 6 month	1

What was accomplished under these goals?

- MarTREC’s progress towards our semi-annual goals is presented above.
- Six new research projects were started during this reporting cycle as presented below.

New Project Title	Lead Institution
A Simulation and Decision-Support Tool for Vulnerability Reduction in Hazardous Material Transportation via the U.S. Inland Waterway Transportation System	University of Arkansas
Bracing for Impact: Developing Steel-Concrete Sandwich Panel Retrofits for Increased Bridge Pier Protection	University of Arkansas
An Elementary School STEMusical: Exciting the Future of STEM	University of Arkansas
Synthesis and Analysis of Maritime Supply Chain and Freight Indicators	University of Arkansas
Developing Optimization Methods for Maritime Escort Strategies for Littoral and Chokepoint Shipping Lanes	University of Arkansas
Vulnerability Assessment of Bridges Crossing Major US Rivers in Support of a Safe and Resilient Transportation System	Texas A&M Transportation Institute (TTI)

- Eleven ongoing research projects continued during this reporting cycle as presented below.

Ongoing Project Title	Lead Institution
Evaluation of Employment Options in the Inland Waterways Sector	Texas A&M Transportation Institute (TTI)
Analyzing the Economic Development Impacts of Truck Parking in Louisiana	University of New Orleans
Economic Impact Analysis of Artificial Draft Restriction on the Lower Mississippi River Port Complex	University of New Orleans
Climate Financing for Marine Transport: Analyzing the Impact of Climate Adaptation Investments in Inland Waterways (Part II)	Vanderbilt University
Modeling Drivers’ En-route Diversion Behavior During Congestion: A Pilot Study	Louisiana State University
Continuous Decision Plan for Optimizing Budget Allocation for Dredging Projects Considering Shoaling Effect within a Multi-year Horizon	Texas A&M University
Strategies for Potential Emissions Reductions for Commercial Maritime Vessels at Ports	Texas A&M Transportation University (TTI)
Deploying Smart Watch Technology to Measure and Mitigate Heat Stress Among Maritime Transportation Workers	Vanderbilt University
An Automated Training Model for Selecting Maritime Traffic Monitoring and Tracking Model Types using AIS Data with Missing Information	Jackson State University
Pathways for a Future-Ready Maritime Transportation Workforce	Jackson State University
AI-Driven Preventive Maintenance for Coastal Bridges in Marine Environments	Jackson State University

The MarTREC consortium leadership team is as follows:

Center Personnel	Title	Organization
Heather Nachtmann	Center Director	University of Arkansas
Michelle Barry	Center Associate Director	University of Arkansas
Stacy Williams	Center Associate Director	University of Arkansas
Amy Shell	Center Manager	University of Arkansas
Peggy Anderson	Research Advancement Specialist	University of Arkansas
Hiba Baroud	Site Director	Vanderbilt University
Jim Kruse	Site Director	Texas A&M Transportation Institute
Bethany Stich	Site Director	University of New Orleans
Bruce Wang	Site Director	Texas A&M University
Robert Whalin	Site Director	Jackson State University
Brian Wolshon	Site Director	Louisiana State University

How have the results been disseminated (submitted, accepted, published)?

- Eight journal articles
- Five presentations
- Three conference papers
- One book

What do you plan to do during the next reporting period to accomplish the goals?

- Continue work on ongoing research projects and begin new research projects
- Work on contributions to the Smart Rivers Conference in Memphis TN in September 2025
- Work on contributions to TRB Annual Meeting in January 2026
- Continue preparations to host 2025 Summer CUTC meeting on June 24-26, 2025
- Continue preparations to host our annual Professional Advisory Board meeting at the University of Arkansas on October 2 and 3, 2025
- Continue building collaborations to ensure MarTREC contributes use-inspired research serving USDOT and its associated constituents

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

What organizations have been involved as partners?

Advisory Board Member	Title	Organization
Harold Beaver	District Engineer, (Retired)	Arkansas Department of Transportation
Reese Brewer	Director	Frontier Metropolitan Planning Organization
Jack Buffington	Director, (Retired)	Mack Blackwell Transportation Center
Cassandra Caldwell	Executive Director	Arkansas Waterways Commission
Bryan Day	Executive Director	Port of Little Rock
Dan Flowers	Director, (Retired)	Arkansas Department of Transportation
Gary Hunt	Vice President, (Retired)	ABF Freight System, Inc.
Mike Johnson	Associate Vice Chancellor, Facilities (Retired)	University of Arkansas

Caren Kraska	President/Chairman	Arkansas & Missouri Railroad
Glenn Moore	Advisor, Cyber Security and Infrastructure Security Agency	U.S. Dept. of Homeland Security
Ned Mitchell	Research Civil Engineer	U.S. Army Corps of Engineers
Shannon Newton	President	Arkansas Trucking Association
Craig Philip	Professor, Civil Engineering	Vanderbilt University
Matthew Smith	Technical Director, Water Resources Infrastructure	U.S. Army Corps of Engineers
Melissa Tooley	Director, External Initiatives	Texas A&M Transportation Institute
Lorie Tudor	Director	Arkansas Department of Transportation

Have other collaborators or contacts been involved?

Existing Collaborators

1. Aaron Brantly, Virginia Tech, Blacksburg, VA, research collaboration
2. Amy Hopper Swan, Arkansas Research Alliance, Little Rock, AR, research collaboration
3. Bill Anderson, Transportation Research Board, research
4. Brenda Dix, ICF Inc., research
5. Charles Colen, University of Arkansas at Pine Bluff, Pine Bluff, AR, research collaboration
6. Charles Doktycz, Argonne National Laboratory, research
7. Cheryl Keymer, North Arkansas College, Harrison, AR, research collaboration
8. Christine Titus, Greater New Orleans Port Safety Council, outreach
9. Connie Porter Betts, Louisiana Department of Transportation, board service
10. Craig Woolsey, Virginia Tech, Blacksburg, VA, research collaboration
11. Daniel Capparella, Greater Nashville Regional Council, outreach
12. David Lee and Andrea Noel, Tennessee Department of Transportation, research
13. David Scoggin, Global Logistics Expert, board service
14. Dawn Lopez, Turn Services, outreach
15. Donghoon Kim, Arkansas State University, Jonesboro, AR, research collaboration
16. Douglas Grubbs, Crescent Port Pilots Association (retired), board service and outreach
17. Dwight Norton, Chief of Planning and Infrastructure, New Orleans Regional Transit Authority, board service
18. Eric Jacques, Virginia Tech, Blacksburg, VA, research collaboration
19. Greg Harris, New Orleans Public Belt Railroad, board service and outreach
20. Harrison Crabtree, Director, World Trade Center Greater New Orleans, board service
21. Jack Mays, Virginia Tech, Blacksburg, VA, research collaboration
22. James Davis, US Army Corps of Engineers, Vicksburg, MS, research collaboration
23. Jeff Roesel, New Orleans Regional Planning Commission, board service and adjunct instructor
24. Joannis Koutromanos, Virginia Tech, Blacksburg, VA, research collaboration
25. Joel Whitehead, Retired Admiral, Propeller Club of New Orleans, board service
26. Kristi App, International Freight Forwarders & Customs Brokers Association of New Orleans, research
27. Laura Berry, North Arkansas College, Harrison, AR, research collaboration
28. Laura Bryan, Principal Planner, City of New Orleans, board service
29. Magdalena Asborn, USACE, research
30. Max Baker, Greater Nashville Regional Council, outreach
31. Michael Roth, US Army Corps of Engineers, Vicksburg, MS, research collaboration

32. Paul Matthews, Port of South LA, research, outreach, board service
33. Randy Guillot, President, Triple G. Express, Inc., research and board service
34. Renee Amar, Executive Director, Louisiana Motor Transport Association, board service
35. Robin Barnes, Resilience Solutions, board service
36. Sarah Porteous, Port of New Orleans, research and board service
37. Scott Parr, Embry-Riddle Aeronautical University, research
38. Sharon Leader, S.W. Leader, Inc., research and board service
39. Steve Olmsted, Arizona Department of Transportation, research
40. Tom Wall, Argonne National Laboratory, research collaboration
41. William App, President, J. W. Allen & Co., Inc., board service

New Collaborations

1. Bradnado Turnquest, Mississippi Department of Transportation, research collaboration
2. Clinton Spieck, Annette Burger & Jo Tuccillo, Oakridge National Laboratory, research collaboration
3. Diane Litman, University of Pittsburgh, research collaboration
4. Doug Hutchings, Arkansas Research Alliance, research collaboration
5. Emad Habib, University of Louisiana Co-PI NSF project, research collaboration
6. Gulf of Mexico Green Shipping Corridor Stakeholders Committee, board service
7. Jing-Ru Cheng, Engineer Research and Development Center, U.S. Army Corps of Engineers, research collaboration
8. Kollin Napier, NSF EPSCoR program, research collaboration
9. LCDR Casey Rayburg, U.S. Navy, research collaboration
10. LCDR Dan Wright, U.S. Navy, research collaboration
11. LCDR Ian Johnston, U.S. Navy (retired), research collaboration
12. Louisiana Disaster Resilience Initiative, board service
13. Louisiana Ports and Waterways Investment Commission, board service
14. Shan Jiang, University of Mississippi, research collaboration
15. University of Louisiana, Maritime Academy Advisory Committee, board service
16. WTCNO International Trade Council, board service

3. OUTPUTS

Journal publications, presentations, conference papers, and books

Journal Publications

1. Bu, Fan, and Heather Nachtmann, "Value-Focused Thinking Assessment of Container on Barge Maritime Transportation Readiness," *Engineering Management Journal*, published October 2024.
2. Johnson, P. M., C. Wehbe, and H. Baroud, "How Flood-Resilient Port Infrastructure Can Reduce Economic Impacts of Climate Change: A Case Study of the US Inland Waterways," *Civil Engineering and Environmental Systems*, 1-19, published February 2025.
3. Kondolf, G. M., B Herbert, A. Dodd, and A. Serra-Llobet, "Flood Control in Jackson, Mississippi: A Missed Opportunity to Reduce Inequitable Flooding Impacts," *Water*, 17(4), 497, published February 2025. <https://doi.org/10.3390/w17040497>
4. Mallum, Faisal and Bethany Stich, "Examining the Impact of International Trade Policy, Corona Virus, and the Russia-Ukraine War on Key Maritime Hub," *Journal of Transport Economics and Policy*, under review 2025.

5. Shapouri, M., J.D. Fuller, B. Wolshon, and J. Harman, "Understanding and Modeling Drivers' Diversion Behavior During Congestion," ASCE Journal of Transportation Engineering, Part A: Systems, Vol. 151, No. 3, published January 2025.
6. Sultana, T., H. Hassan, and B. Wolshon, "Toward the Integration of Vehicle-to-Infrastructure (V2I) Communication in Transportation System: An Investigation of Drivers' Perceptions and Preferences for V2I Messages," Journal of Intelligent Transportation Systems, in press November 2024.
7. Wolshon, B., S. Parr, S. Parida, and S. Wong, "Roadway Traffic Assessment of the 2023 Maui Wildfires," ASCE Natural Hazards Review, accepted 2025.
8. Wolshon, B., S. Parr, S. Parida, and S. Wong, "Roadway Traffic Assessment of the 2023 Maui Wildfires," Journal of Transport Geography, under review February 2025.

Presentations

1. Ahmadreza Mahmoudzadeh, Parham Atoofi, Kenneth Ned Mitchell, and Xiubin Bruce Wang, "Optimizing Waterway Maintenance Using Stochastic Models for Effective Dredging," TRB, presented January 2025.
2. Amelia Lawson, "Investigating Traffic Safety during Hurricane Evacuations: Analyzing Crash Rates and Contributing Factors in Florida," Association of Transportation Safety Information Professionals (ATSIP) at the 50th Traffic Records Forum (TRF), accepted March 2025.
3. Berneece Hebert and D. Polk, "Fragile, Invisible and at a Crossroads: Navigating Maritime Labor Dynamics, Workforce Development and Advancing Economic Mobility in the Maritime Industry," 2025 Market & Society Conference, submitted for October 2025.
4. Bethany Stich, "Intermodal Miracles and Maladies," The Dan Flowers Distinguished Lecture (MBTC Annual Advisory Board Meeting), invited presentation October 2024.
5. James David Fuller, "Utilizing International Travel Survey Data to Better Understand the Diversion Behavior of Commuting Drivers," 13th International Conference on Transport Survey Methods, invited presentation March 2025.

Conference Papers

1. Ahmadreza Mahmoudzadeh, Parham Atoofi, Kenneth Ned Mitchell, and Xiubin Bruce Wang, "Optimizing Waterway Maintenance Using Stochastic Models for Effective Dredging," No. TRB AM-25-02679, accepted January 2025.
2. Madhusudhan Venugopal, "Strategies for Potential Emissions Reductions for Commercial Maritime Vessels at Ports," 2025 Smart Rivers Conference, accepted for September 2025.
3. P. Johnson, C. Wehbe, and H. Baroud, "A Holistic Approach for Evaluating Investments in Climate-Resilient Infrastructure Projects along U.S. Inland Waterways," Society for Risk Analysis Annual Meeting, accepted December 2024.

Books

1. Wolshon, B. and V.V Dixit, "Planning and Management of Transportation Systems for Evacuation," Handbook of Emergency Response: A Human Factors and Systems Engineering Approach," Second Edition, Taylor & Francis Publishing Inc., New York, in press 2025.

Website(s) or other Internet site(s)

<https://martrec.uark.edu/>
<https://www.uno.edu/academics/colaehd/la/centers-institutes-affiliates/transportation>
<https://tti.tamu.edu/>
<https://www.vanderbilt.edu/vector/>

Technologies or techniques

- Collaboration in the development and submission of a new proposal to the Marine Transportation Research Center, focused on physically informed machine learning methods that embed physical laws into deterioration prediction.

Inventions, patent applications, and/or licenses

- Nothing to report

Other products

- Nothing to report

4. OUTCOMES

MarTREC faculty have increased the body of knowledge through courses they teach at their universities:

Undergraduate Courses

1. Advanced Techniques in GIS
2. Case Studies in Risk and Reliability
3. Data Analytics for Engineers
4. Decision support tools in supply chain and logistics
5. Design of Reinforced Concrete Structures
6. Design of Steel Structures
7. Dynamics
8. Engineering Economic Analysis
9. Enterprise Risk Management
10. Geometric Design of Highways and Airports
11. GIS for the Planning Profession
12. Globalization & Mobility
13. Introduction to Transportation Engineering
14. Network optimization models
15. Principles of Highway and Traffic Engineering
16. Risk, Reliability, Resilience Engineering
17. Structural and Materials Lab
18. Suburbs and Car Culture

Graduate Courses

1. Advanced Highway Design and Traffic Safety
2. Advanced Techniques in GIS
3. Applied Techniques for Transportation Professionals
4. Case Studies in Risk and Reliability
5. Coastal Structures
6. Computational Data Enabled Science and Engineering Methods
7. Data Analytics for Engineers
8. Data clustering analysis methods with AIS data and HNTSA Data
9. Enterprise Risk Management
10. Environment & Energy
11. GIS for the Planning Profession
12. Intermodal Freight Transportation

13. Introduction to Transportation Planning
14. Quantitative Exploration of Data- Uses AIS and NHTSA data
15. Risk, Reliability, Resilience Engineering
16. Statistics Linear Regression Methods
17. Traffic Operations and Control
18. Transportation Policy and Administration
19. Transportation Seminar

Short Courses

1. An aging workforce and the difficulty of attracting younger workers into the maritime industry.
2. Effects of global supply chain disruptions and impact on the maritime work force, MARAD's Center of Excellence for Domestic Maritime Workforce Training and Education and the American Association of Port Authority.
3. Shift to autonomous shipping and impact on demand for workers with new skill sets related to technology and data analysis.

5. IMPACTS

What is the impact on the effectiveness of the transportation system?

MarTREC faculty have impacted the transportation system by holding **leadership positions** that engage with external transportation organizations and individuals:

1. Board Member and Past Chairman, Cumberland River Compact
2. Board Member, NASEM Governing
3. Board Member, National Waterways Foundation
4. Board Member, Southeastern Conference of Public Administration
5. Board of Directors, IISE Operations Research Division
6. Chair, TRB Standing Committee on Extreme Weather and Climate Adaptation
7. Chairman, Marine Board
8. Chairperson, Research panel, Louisiana Transportation Research
9. Co-Chair, Committee, U.S. Gulf Coast, National Academies of Science, Engineering & Medicine (NASEM) Gulf Research Program
10. Co-chair, New Orleans RPC Regional Traffic Safety Coalition User Emphasis Area
11. Co-chair, Risk and Resilience Measurement Committee Member in ASCE Infrastructure Resilience Division
12. Committee Chair, Transportation Research Board, Executive Committee and NRC Division
13. Committee Member, Green Shipping Corridor Stakeholders
14. Committee Member, IISE Scholarship
15. Committee Member, INFORMS Scholarship
16. Committee Member, Louisiana Disaster Resilience Initiative
17. Committee Member, NASEM Report Review
18. Committee Member, SmartRivers 2025 Conference
19. Committee Member, Transportation Research Board: Critical Infrastructure Protection
20. Committee Member, Transportation Research Board: Intermodal Freight Transport
21. Committee Member, Transportation Research Board: International Trade and Transportation
22. Committee Member, TRB Resilience Section
23. Committee Member, University of Louisiana, Maritime Academy Advisory

24. Community Liaison, State-of-the-Science and the Future of Cumulative Impact Assessment Board on Environmental Studies and Toxicology, NASEM
25. Executive Board Member, Transportation Research Board: Logistics of Disaster Response and Business Continuity
26. Executive Committee Member, ASA Transportation Statistics Interest Group
27. Executive Committee Member, Global Young Academy
28. Executive Committee Member, Section of Public Administration Research
29. Faculty Liaison/Coordinator, HBCU, SCI Fellowship Program
30. Lead Track Chair, IISE Annual Meeting Operations Research
31. Member, AASHTO Bridge Task Force Advisory Group
32. Member, Advisory Council for Transportation Research, Arkansas Department of Transportation
33. Member, American Society for Public Administration Transportation Policy & Administration
34. Member, ERVA Standing Council, NSF Engineering Research Visioning Alliance
35. Member, Federal Demonstration Partnership/NAS, Truitt-Felbinger Award Committee American Society for Public Administration
36. Member, Louisiana Ports and Waterways Investment Commission
37. Member, WTCNO International Trade Council
38. Member-At-Large, Council of University Transportation Centers Executive Committee
39. Panel Member, National Evaluation of Truck Parking Demand and Rest Area Locations, National Academies of Sciences, Engineering, and Medicine
40. Senior INFORMS Member, IISE Annual Meeting Operations Research Track Chair
41. US representative, World Association for Waterborne Transport Infrastructure (PIANC) Task 193
42. Voting member, National Cooperative Highway Research Program Project 08-190
43. Voting member, The Louisiana Transportation Research Center

Awards bestowed upon MarTREC **faculty** as a result of their contributions to the understanding and awareness of transportation issues:

1. Gary Prinz, Ph.D, AISI Robert J. Dexter Memorial Award
2. Haitao Liao, Ph.D, Doug Ogden Award, Society of Reliability Engineers
3. Justin Chimka, Ph.D, John L. Imhoff Chair

Awards bestowed upon MarTREC **students** as a result of their contributions to the understanding and awareness of transportation issues:

1. Alexandra Holliday, MarTREC Student of the Year
2. Najma Thomas, Dwight David Eisenhower Transportation Fellow

What is the impact on the body of scientific knowledge?

Editorial journal positions currently held by MarTREC researchers:

1. Associate Editor, ASCE Journal of Bridge Engineering
2. Associate Editor, ASCE Journal of Structural Engineering
3. Associate Editor, INFORMS Journal
4. Associate Editor, Natural Hazards Review
5. Associate Editor, Stochastics and Quality Control
6. Co-Guest Editor, Special Issue “Geography on Human Mobility Resilience,” Journal of Transport Geography
7. Editorial Board, Quality Engineering
8. Editorial Member, ASCE Journal of Risk and Uncertainty
9. Editorial Member, Environment Systems and Decisions

10. Editorial Member, Journal of Infrastructure
11. Editor-In-Chief, The Engineering Economist
12. Guest Editor, Special issue "Bayesian Methods in Big Reliability Data Analysis", Reliability Engineering & System Safety
13. Review Editor, Frontiers in Water

What is the impact on transportation workforce development?

- MarTREC graduated five students into the transportation workforce, one master's student and four doctoral students.
- The Center for Training Transportation Professionals at the University of Arkansas executed workforce development training programs through 22 classes, certifying 404 participants in seven areas: asphalt, aggregates, concrete, pavement, soils, stormwater management, and unpaved roads.

6. CHANGES/PROBLEMS

- Nothing to Report

Changes in approach and reasons for change

- Nothing to Report

Actual or anticipated problems or delays and actions or plans to resolve them

- USDOT has informed us that there may be a delay in receiving the Year 3 UTC funding. We will continue to work via USDOT funding that was allocated in Years 1 and 2.

Changes that have a significant impact on expenditures

- Nothing to Report

Significant changes in use or care of animals, human subjects, and/or biohazards

- Nothing to Report

7. SPECIAL REPORTING REQUIREMENTS

- Nothing to Report