LEADING THE WAY

Maryland Universities Push Research and Deployment Forward

Maryland's leading research universities are advancing the future of connected and autonomous transportation through a wide range of innovative projects, testbeds, and real-world deployments. From developing reliable V2X systems and hands-on autonomous shuttle testing, to creating smarter intersections, accessible mobility tools, and safer driving strategies for complex environments; these institutions are shaping how emerging technologies move from the lab to the roadway. The following summaries highlight key efforts at Johns Hopkins University, Morgan State University, and the University of Maryland that are driving progress in safety, efficiency, and mobility across the region.

Johns Hopkins University

Most autonomous vehicle and robotics research at Johns Hopkins University (JHU) occurs within the Whiting School of Engineering and the Applied Physics Laboratory (APL), with the S4 Lab serving as the central hub for autonomous transportation research. Operated in partnership through the Institute for Assured Autonomy (IAA), the S4 Lab focuses on developing reliable V2X technologies and brings together six founding faculty members and more than 15 graduate students working on safe, scalable deployment of these systems.

To advance this work, the IAA acquired and customized two autonomous Olli shuttles, each equipped with six seats, human-machine interface screens, and joystick controls. These vehicles, housed on the JHU campus, provide researchers—including students across the university and APL—with hands-on opportunities to test and refine cutting-edge autonomous vehicle assurance technologies.

Morgan State University

The SMARTER Center, a USDOT Regional University Transportation Center led by Morgan State University, brings together eight universities to advance transportation safety, mobility, and technology across the Mid-Atlantic region. Its research focuses heavily on connected and autonomous systems, including the SMART Intersection—an infrastructure-based system that uses LiDAR and V2X communication to monitor real-time traffic conditions, identify crash risks, issue warnings to road users, and grant signal priority to transit and emergency vehicles. This system has progressed from concept to full deployment, with installations at Morgan State University and multiple intersections along Baltimore's West North Avenue corridor.

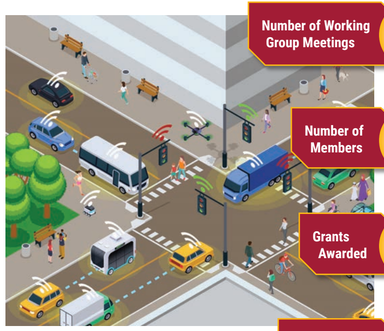
Beyond roadway applications, the SMARTER Center has expanded its innovations to support travelers with mobility challenges. Its autonomous wheelchair system, equipped with sensors and AI similar to those used in autonomous vehicles, allows users to request and navigate the chair via a mobile app. Currently in pilot testing at Baltimore-Washington International Airport, the system helps passengers travel independently from the terminal entrance to their gates. Through projects like these, the SMARTER Center has emerged as a national leader in transforming transportation research into real-world solutions that enhance safety, efficiency, and accessibility.

University of Maryland

University of Maryland's (UMD) M-TRAIL team is working on four main areas for autonomous vehicles (AV): First, they're designing "eco-driving" trajectories, which are fuel-efficient paths that also account for other cars and traffic signals. Second, they're figuring out how to bring self-driving cars to rural areas, where roads may be poorly marked and conditions can be less predictable. Third, they're studying high-risk edge cases, meaning rare or dangerous situations (like bad weather or unexpected obstacles), to make sure autonomous systems handle them safely. Finally, they are developing cooperative perception: cars and infrastructure (like roadside sensors) share what they "see" so each vehicle has a better understanding of its surroundings — even around corners or in blind spots.

Vision for CAV in Maryland

Maryland's Vision for CAV is to uphold and enhance a safe, equitable, convenient, and connected multimodal transportation system for all by delivering collaborative and leading-edge CAV solutions. Maryland is eager to realize the life-saving and economic benefits of CAV technology, while ensuring safety for all. We are embracing CAV technology and innovation through continuing collaboration with partners interested in researching, testing, and implementing CAVs in Maryland.



Partner with MDOT on CAV Technology

MDOT welcomes the opportunity to collaborate with companies that are interested in researching, testing, and supporting CAVs in Maryland by offering a streamlined, one-stop entry point for organizations interested in CAV efforts in Maryland. This process helps open conversations with potential partners—each with their own CAV needs—while ensuring safety remains the top priority. To get started, complete the Expression of Interest form at **MDOT.maryland.gov/MarylandCAV**, which connects you with all the relevant public-sector agencies involved.

To learn more, please visit **cav.mdot.maryland.gov/** or email us at **CAVMaryland@mdot.maryland.gov**

Want to help spread the word for National Autonomous Vehicle Day?

Use our digital toolkit for ready to use social media graphics and language:

https://bit.ly/49xGPIm

- Number of Working Group Meetings: 34
- Number of Members: 806
- Grants Awarded: 9
- Pilot Projects Launched: 8
- Webinars: 3
- Workshops: 10
- Conference Presentations: 17

Thank you to all of our partners throughout the years.

We look forward to working with you, and new partners as CAV technology continues to grow and is further utilized throughout the state, country, and world. For more information on what resources we have available, please use the QR code at right to visit:
News & Resources | Maryland's Connected and Automated Vehicle Program

As always, if you have anything to add or contribute, please let us know! We look forward to the next decade of CAV in Maryland.

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION

10 Years of CAV IN MARYLAND

Maryland is celebrating 10 years of work in Connected and Automated Vehicles!

In 2015, the Connected and Automated Vehicles (CAV) Working Group was formed as the central point of coordination for the development and deployment of emerging CAV technologies in Maryland. This inclusive collaboration provides an opportunity to develop plans for CAV in our State, positioning Maryland to identify opportunities and be responsive to this emerging technology.

Self-driving vehicles have the potential to transform how we live and work – to save lives by reducing traffic crashes, as well as providing more mobility options. To prepare for this changing transportation landscape, the Maryland Department of Transportation (MDOT) and its numerous partners are working together to communicate and coordinate as this technology moves forward. MDOT has been actively involved with developments in CAV technology for several years, engaging with groups on the national, regional, state, and local level to address issues and ensure CAVs will be safe and reliable.

Driving Innovation

A 10-YEAR JOURNEY IN CAV ADVANCEMENT

START

2015

- Formation of statewide CAV Working Group

2016

- Stakeholder engagement begins across Maryland and at federal level
- Maryland agencies begin to incorporate CAV in their agency plans

2017

- Establishment of Expression of Interest (EOI) and Highly Automated Vehicles (HAVs) permit process
- First company pilots CAV technology
- CAV Strategic Plans become ingrained within MDOT Modal Agencies
- Maryland commits to meet the national "challenge" to deploy Signal Phase and Timing at twenty signalized intersections

2018

- Finalization of CAV Vision for Maryland
- Working Group structures are re-formalized and continue to be led by MDOT
- Formation of New Maryland CAV Freight Sub-group to support freight CAV
- Maryland stakeholders investigate and begin to track national policy around CAV
- Maryland stakeholders partake more frequently in national committees and conferences related to CAV
- Second company completes HAV permit for CAV technology pilot at Baltimore Washington International Airport (BWI), a first of its kind for Maryland
- Production of educational flyers: Fast Facts and Open for Business
- Locations for Enabling Testing Sites application launched
- Maryland Port Administration helps convene conversations around autonomous vessels
- Maryland Transportation Authority (MDTA) installs Dedicated Short range Communications (DSRC) at tunnels in state's first connected vehicle (CV) technology pilot
- Maryland Transit Administration (MTA) pilots Advanced Driver Assistance System on core service buses
- MTA and Baltimore City discuss signal improvements for increased signal communications
- Maryland State Highway Administration (SHA) embeds CAV within key strategic plans, increases internal workforce education and awareness, and extends national presence in CAV groups
- Completed a full requirements document for a proposed connected-vehicle pilot on US 1
- US Army Aberdeen Test Center begins CAV discussions within Maryland

2019

- Maryland advances the Signal Phase and Timing national challenge along US 1 with DSRC and arterial management strategies
- Agencies consider workforce impacts
- Awarded two grants to advance CAV pilot programs (MDOT)
- Maryland was a key catalyst to the creation of the Eastern Transportation Coalition CAV group (formerly I-95 Corridor Coalition)
- Three companies issued permits for HAV demonstration testing on public roadways
- MDOT fosters workforce education, including development of training modules and other tools for staff to better understand the impacts of CAV on their work
- Maryland Aviation Administration (MAA) ran the first "indoor" trials in GPS denied areas at the BWI Airport to help support AV positioning MDTA pilot to study Emergency Response
- Awarded first-ever CAV pilot under the TRB IDEA Transit Program (MTA)
- MTA executed the first AV test trials at two commuter train stations with passenger feedback
- MDTA continues DSRC pilot testing – Onboard Units (OBUs) and Roadside Units (RSUs)

EOIs 21

2020

- Maryland develops and adopts its Maryland CAV Strategic Framework with state and national input
- BWI considers CAV parking technology as a service for customers
- Launch of Annual Maryland Emerging Technology survey deployed to local jurisdictions to identify their needs relating to emerging technologies
- Piloted HAAS Alert Connected Vehicle Technology on three types of fleet vehicles
- Kick-started the investigation of roadway automation readiness and lead contributor to The Eastern Transportation Coalition AV readiness project
- Maryland is no longer just a fly on the wall, team members become active subject matter experts in national CAV initiatives, including the American Association of State Highway and Transportation Officials (AASHTO) National Strategy and USDOT Concept of Operations for roadway automation
- Developed and piloted the first AASHTO TRAC CAV module for nationwide use in middle and high schools.
- Recommended and secured approval of CAV solutions for vulnerable road users in the 2021–2025 Maryland Strategic Highway Safety Plan
- Launched 2019 State Transportation Innovation Council grant project for I2V crosswalk safety in Prince George's County
- Conducted first responder AV safety training for emergency, fire, EMR, and airport security personnel at BWI with a Maryland AV tech partner

Expression of Interest (EOI)

EOI Form | Maryland's Connected and Automated Vehicle Program

https://cav.mdot.maryland.gov/eoi-form/

2021

- MDOT joined the PAVE's Public Sector Advisory Council
- Incorporated CAV into recurring and long-range Maryland plans
- Maryland Highway Safety Office recorded a public webinar on CAV pedestrian safety efforts
- Launched Westminster's Autonomous Corridor planning
- MDOT and Maryland Department of Planning released the CAV Toolkit for Local Jurisdictions
- Maryland now has over 40 connected vehicle roadside units across three infrastructure owner operators
- Developed and launched a statewide security credential management system for connected vehicle security

EOIs 38

2022

- First ever CAV Awareness Day (Oct. 8)
- Maryland recognized by American Association of Motor Vehicle Administrators with Public Affairs and Consumer Education Award
- Maryland became the first state to include substantial Advanced Driver Assistance Systems guidance for novice drivers in the Driver's Manual
- Kiwibot launched Maryland's first Personal Delivery Device at Morgan State University with MDOT and Baltimore City
- MTA's CAV Work Plan considers adopting CAVs over short, medium, and long term
- MTA partnered with local jurisdictions to fund CAV technology projects via the Statewide Transit Innovation Grant
- Became a contributor and active stakeholder in the national Pooled Fund Study on Automated Vehicles
- Created the Robotics Research Collaboration Campus by the Army Research Laboratory

EOIs 46

2023

- Awarded $11.9 million Advanced Transportation Technology and Innovation grant for CAV technology along the Eastern Shore
- Freight AV Feasibility Assessment identified challenges and opportunities for AV deployment
- Baltimore Metropolitan Council publishes CAV Planning Guide: Recommended Actions for Local Agencies to Prepare for CAVs and supporting User Guide
- MDOT helped guide a study by the Eastern Transportation Coalition with J.D. Power on consumer use and knowledge of ADAS
- MDOT installed CV technology on the US 1 Innovative Technology Deployment Corridor
- MDOT partnered with the University of Washington on a Transportation Data Equity Initiative
- Prince George's County expanded use of CV with a Vulnerable Road User detection system

EOIs 53

2024

- Maryland CAV Strategic Framework updated
- Sixteen jurisdictions have CAV-related information and policies
- Awarded four Strengthening Mobility and Revolutionizing Transportation (SMART) grants for MTA transit signal priority (TSP), MD Dept of Planning for Eastern Shore drone medical delivery, and SHA work zone speed investigations with drones
- BMC held two regional CAV meetings to review 2023 work, identify coordination opportunities, and support local preparations
- Maryland participated in National Autonomous Vehicle Day on May 31
- MDOT developed a video on ADAS for Law Enforcement
- SHA now monitors major arterial corridors and more than 1,000 signalized intersections statewide using third-party CV data
- MDOT facilitated a Maryland Foundational V2X Training by USDOT, in partnership with Morgan State University and the Intelligent Transportation Society of Maryland

EOIs 60

2025

- Maryland facilitated an Introduction to CV Technology Processes Workshop on framework, standards, certification, and procurement
- BMC convened a joint meeting of regional CAV stakeholders, MD CAV Emergency Response Subgroup, and MD CAV Policy Subgroup to continue discussions on regional CAV preparedness and coordination, with a focus on policy and emergency response
- Finalization of the MD Strategic Highway Safety Plan for 2026-2030, to include CAV considerations
- Maryland awarded or a participant in two of the USDOT's 2025 rounds of SMART grant and Rural AV grants related to CAV