Missouri Department of Transportation

CONNECTED AND AUTOMATED VEHICLE ACTION PLAN

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS PROGRAM
CAV TEAM

APRIL 2025

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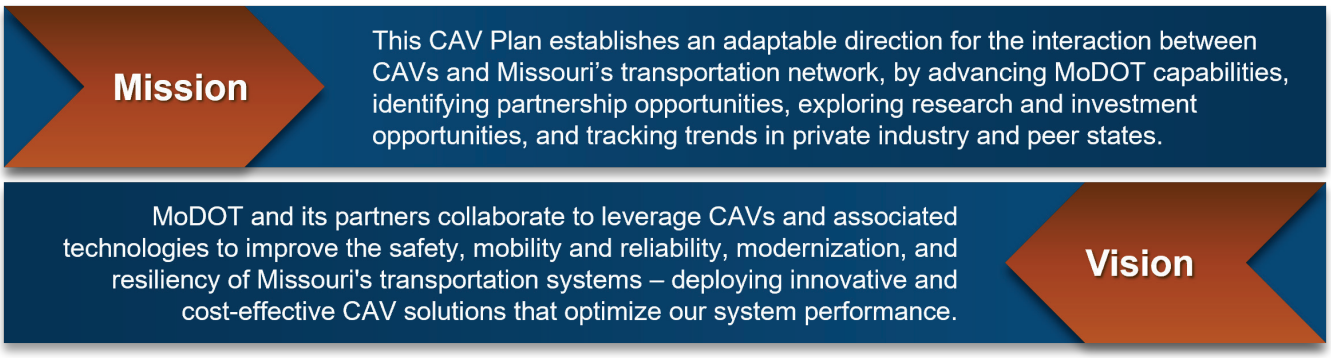
EXECUTIVE SUMMARY

Similar to the space race of the 1960s which spurred a constant pursuit of innovation, the development of Connected and Automated Vehicle (CAV) technologies are accessible to improve today's transportation system. State Departments of Transportation must be knowledgeable and current on these coming technologies to prepare for CAVs and shape CAV deployment for public benefit. CAVs offer improvements in safety, mobility and reliability, modernization, and resiliency—all of which are central to Missouri DOT's (MoDOT) mission and activities. Early planning and programming for CAVs will enable MoDOT to best capture these benefits for Missouri's transportation system and the traveling public.

This CAV Action Plan provides a **framework and initial actions for the MoDOT Transportation Systems Management and Operations (TSMO) program's CAV Team** to advance and prepare for CAVs. The plan focuses on MoDOT's role, activities, and internal processes, with a goal of involving broader internal and external partners as a next step. The plan's framework includes a mission and vision for the MoDOT TSMO CAV team's work, as well as focus areas for action (more on this below).

Figure 1. | MoDOT CAV Plan Mission and Vision



The plan recommends initial actions in **five, strategic focus areas for MoDOT** (Figure 2). Three focus areas: Institutional Capabilities; Outreach and Education; and Partnerships; strike a balance between advancing foundational, programmatic areas. More applied or tactical focus areas, Projects to Advance CAV and CAV Applications, round out the list. The objectives and actions for each focus area are detailed in the plan. Table 2 on the following page provides a summary of all actions across focus areas.

Figure 2. | The MoDOT CAV Plan's Actions are Grouped into Five Focus Areas

Table 1. | Summary of All CAV Plan Actions

FOCUS AREAS		ACTION	PRIORITY
1. Institutional Capabilities	1.1	Develop, implement, and maintain a MoDOT CAV plan.	**High**
	1.2	Develop performance metrics for MoDOT's CAV readiness with an emphasis on infrastructure (physical and digital), operations, and safety.	**High**
	1.3	Identify staff liaisons for internal and external collaboration.	**Medium**
	1.4	Establish CAV working group for ongoing coordination.	**Medium**
	1.5	Map out MoDOT plans that should coordinate with CAV.	**Medium**
	1.6	Explore a Capability Maturity Model (CMM) for CAV workshop.	**Medium**
	1.7	Identify pathways/opportunities to integrate CAV into MoDOT business processes.	**Medium**
2. Outreach and Education	2.1	Inventory relevant resources on CAV—especially from Missouri.	**Medium**
	2.2	Create a MoDOT CAV website to share resources, etc.	**Low**
	2.3	Develop CAV communications materials to promote understanding and buy-in.	**Low**
	2.4	Continue tracking Missouri and Federal legislation and initiatives related to CAV. Add relevant MoDOT staff to distribution lists for legislative information.	**High**
	2.5	Review existing Missouri legislation relevant to CAV.	**Medium**
	2.6	Conduct scan of peer state legislation related to CAV to identify best practices and recommendations for Missouri.	**High**
	2.7	Conduct outreach and develop communications materials for MoDOT staff and legislators.	**High**
3. Partnerships	3.1	Identify strategies for building partnerships and connecting with new partners.	**Medium**
	3.2	Track partnership opportunities (within and beyond Missouri).	**Medium**
	3.3	Lead the Transportation Pooled Fund for Establishment of a Public-Private Transportation Data Exchange Center.	**High**
4. Projects to Advance CAV	4.1	Track project and funding opportunities related to CAVs (including BIL/IIJA).	**High**
	4.2	Define a strategy and priorities for CAV projects and pilots in Missouri.	**Medium**
	4.3	Review relevant peer projects for best practices and lessons learned.	**Medium**
	4.4	Support existing MoDOT CAV research and projects, such as the Autonomous TMA pilots.	**Medium**
5. CAV Applications	5.1	Research synergies in CAV and EV deployment.	**Medium**
	5.2	Define MoDOT roles for advancing synergies between CAVs and EVs.	**Medium**
	5.3	Coordinate CAV and EV advancement within MoDOT.	**Medium**
	5.4	Create a MoDOT vision for the future of CAV technology in freight.	**High**
	5.5	Establish CAV leads and liaisons to integrate freight in all CAV work.	**Medium**
	5.6	Review MoDOT and Missouri policies related to CAV and freight.	**High**

1.0 PLAN PURPOSE AND SCOPE

This CAV Action Plan provides a **framework and initial actions for the MoDOT Transportation Systems Management and Operations (TSMO) program's CAV Team** to advance and prepare for CAVs. The focus is on **MoDOT's role, activities, and internal processes**, with the goal to bring in broader internal and external partners as a next step. Where the plan does touch on partnerships and outreach, the aim is to identify initial actions for MoDOT to foster and grow collaboration with partners and stakeholders. Overall, this plan is **action-oriented** and lays out next steps to advance, leverage, and shape CAV deployment for the benefit of Missouri's traveling public.

The CAV Plan, developed by MoDOT staff as part of the department's TSMO program implementation, is intended to be a living document capturing the TSMO CAV team's efforts. CAV technology is a critical tool with the potential to advance MoDOT's TSMO mission to optimize the performance of existing infrastructure and preserve and improve the safety, reliability and modernization of the transportation system (see MoDOT TSMO mission in adjacent call-out box).

As noted in the MoDOT TSMO Program and Action Plan (2017), the MoDOT TSMO program is in direct support of and alignment with MoDOT's department-wide strategy and values, focused on safety, service, and stability. The TSMO program works to improve safety and reliability, and to use resources wisely to provide efficient, innovative operations solutions at a relatively low-cost.

MoDOT TSMO Mission

MoDOT's TSMO program applies integrated strategies to optimize the performance of existing infrastructure through the implementation of systems, services, real-time information, and programs designed to preserve capacity and improve safety and reliability of transportation systems. MoDOT's TSMO program helps get people safely where they want to go.

1.1 Audience

The primary audience for this plan is MoDOT staff. The focus is on MoDOT's role, activities, and internal processes. While this plan was developed by the MoDOT TSMO Program's CAV Team, the aim is that it will serve as a springboard for engaging broader MoDOT staff as well as external partners—leading to future iterations of planning and priority actions for advancing CAV in Missouri.

2.0 LEVERAGING CAVS FOR MISSOURI

2.1 Why Plan for CAVs?

CAV technologies are rapidly advancing in the private sector and research institutions. The public sector, including state Departments of Transportation (DOTs), needs to be knowledgeable and current on these coming technologies in order to best prepare for and shape CAV deployment for the benefit of the transportation system and the traveling public. CAVs offer potential benefits for safety, reliability, mobility, and environmental impacts—all of which are central to MoDOT goals and activities. Early planning and programming for CAVs will enable MoDOT to best capture and leverage these benefits.

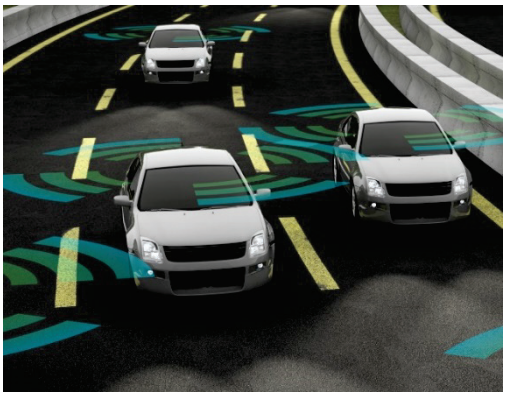
Below is a brief overview of CAV technology and its anticipated benefits.

2.2 CAV 101

Connected and Automated Vehicle technology is an umbrella term for emerging technologies that automate communication with, or driving of, vehicles. These technologies are largely expected to be deployed together or interoperable. Therefore, they are often considered together in transportation planning, programming, research, and pilot deployment. Another technology commonly associated with CAVs is electric vehicles (EVs)—as many CAVs are anticipated to also be EVs. Other acronyms used to describe these associated, cooperative technologies include Cooperative Automated Transportation (CAT), Cooperative Driving Automation (CDA), and CAVE (for: Connected / Automated Vehicles / Electric).

Connected Vehicles

The ecosystem of Connected Vehicle (CV) technology can be described as "wireless communications among vehicles (vehicle-to-vehicle, or V2V), infrastructure (vehicle-to-infrastructure, or V2I), and mobile devices. Vehicles include light vehicles, trucks, and transit vehicles. Pedestrians, bicyclists, or motorcyclists can carry mobile devices, allowing vehicles and infrastructure to communicate with other CV participants and vice versa (vehicle-to-anything, or V2X)."[1] Wireless communications media include Dedicated Short-Range Communications (DSRC), which operates over the 5.9 gigahertz band of wireless spectrum and provides fast and reliable communications over short distances, and cellular technology.



CV technology can greatly enhance Automated Vehicle (AV) technology (discussed below) by providing additional information on a vehicle's surroundings and path. CV messages would generally come from other vehicles, transportation users (e.g., connected bicyclists or pedestrians), and infrastructure (such as traffic signal controllers).

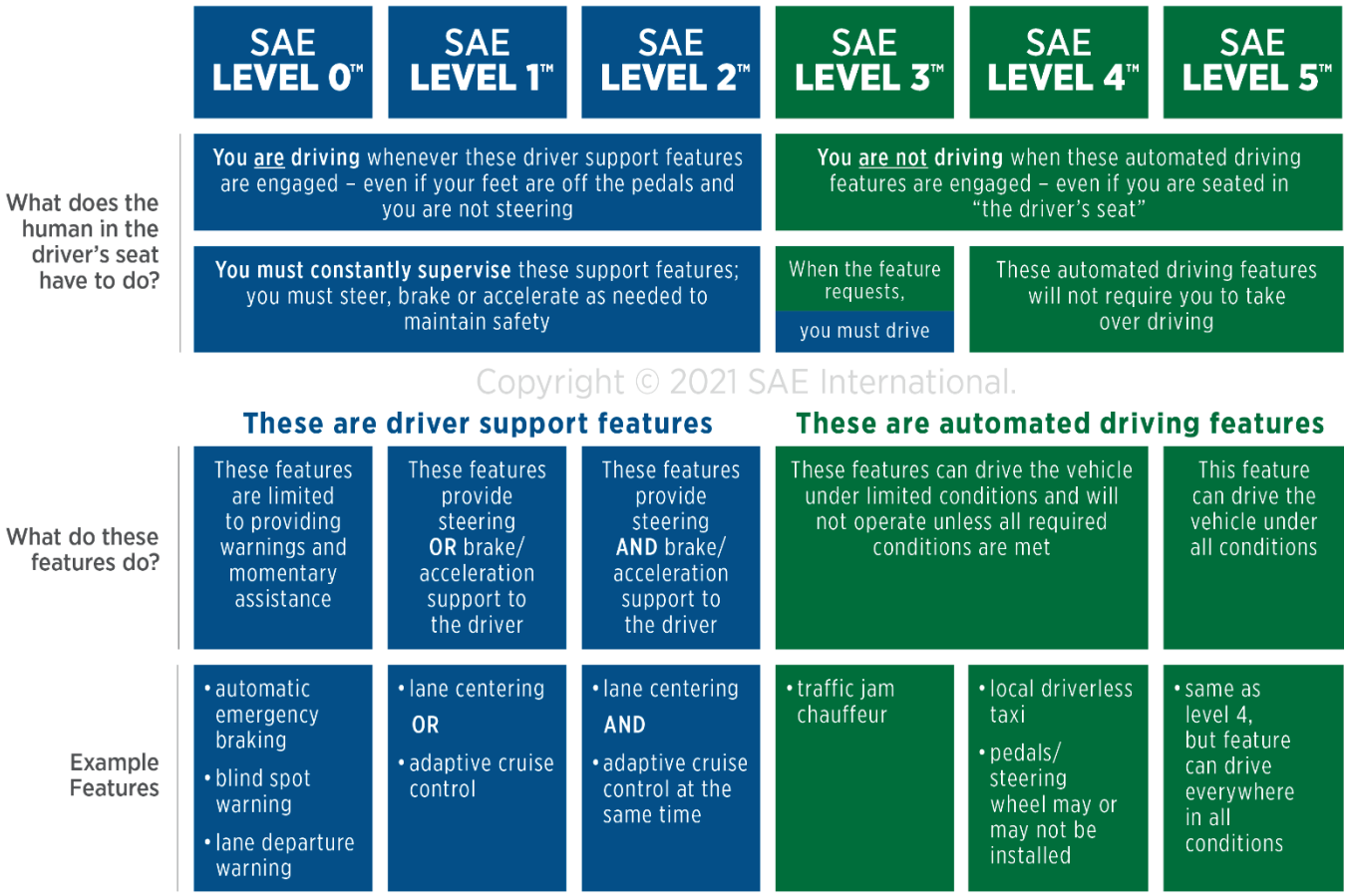
There are many CV applications that can improve safety, reliability, mobility, and environmental impacts—with or without AV technology. The U.S. DOT is exploring a wide range of CV applications, including safety, mobility, environmental, data, and road weather applications. The benefits derived from these applications can be increased by better collaboration between vehicle manufacturers and state transportation agencies, and the Partnership focus area makes a recommendation for MoDOT to lead this effort through a Transportation Pooled Fund (TPF). For more information please visit: https://www.its.dot.gov/pilots/cv_pilot_apps.htm.

Automated Vehicles

Automated Vehicle (AV) technology controls at least some function of safety-critical vehicle control (steering, throttle, and/or braking) without human driver input. AVs gather and process the information needed to assist with driving using onboard computers, software, and sensors (e.g., LIDAR, RADAR, GPS, Wi-Fi, cameras). AV technology is commonly defined using the SAE International automation levels of 0-5, with 0 being no automation and 5 being fully automated in all environments. AVs also have a range of growing multimodal applications to improve safety, reliability, mobility, and environmental impacts, with or without the addition of CV technology.

[1] U.S. DOT ITS JPO, "Connected Vehicle Impacts on Transportation Planning—Primer and Final Report." 2016, https://rosap.ntl.bts.gov/view/dot/31397.

Figure 3. | SAE International Automation Levels



(Source: Adapted from 2021 SAE International, https://www.sae.org/blog/sae-j3016-update.)

2.3 Benefits of CAV Technology

CAVs and CAV-enabling infrastructure offer potential benefits for safety, reliability and mobility, modernization, resiliency, and more for both people and goods movement. Some specific examples of these benefits are below, with references for additional information. The benefits all support MoDOT's commitment to safety, service, and stability.

Benefits of Connected Vehicle Technology[2]

- **Safety:** Fewer crashes due to more information on vehicle surroundings and warnings of hazardous situations (e.g., curve speed warnings, reduced speed warnings, and blind spot warnings).

- **Reliability and Mobility:** Improved reliability from enhanced traveler information for non-recurring events (e.g., Weather Responsive Traffic Information (WxTINFO), work zone reduced speed warnings, dynamic freight travel planning). Faster travel times from mobility applications such as speed harmonization, signal priority, and drayage optimization.

[2] Institute of Transportation Engineers, Quick Bites: Connected Vehicle Deployment Benefits, Dec 1, 2020, https://www.ite.org/pub/?id=3EA870BE-C5D7-8D1B-01D2-5096F5730BC4.

- **Modernization:** CAV-enabled transportation infrastructure that is ready for the next generation of technology, helping to "future-proof" investments.
- **Sustainability:** Reduced fuel consumption from technologies that limit idling and support more eco-friendly travel choices (e.g., eco-traffic signal timing, eco-approach and departure, dynamic eco-routing for freight, and transit signal priority).

Benefits of Automated Vehicle Technology[3]

- **Safety:** Fewer crashes due to Advanced Driver Assistance Systems (ADAS) and AV technologies that help prevent human error and aggressive driving.
- **Reliability and Mobility:** Decrease congestion and improved travel times from closer safe following distances. Expanded reach of transportation modes to underserved users, as well as providing "first mile, last mile" connectivity service for all users.
- **Modernization:** Increased efficiency and effectiveness of existing transportation infrastructure and systems.
- **Sustainability:** Reduced pollution associated with energy consumption for driving—many AVs are expected to come on the market as EVs. This can also help diversify energy sources for driving in the U.S.

There are a number of resources available to provide further benefit, and cost, information on CAV applications. The U.S. DOT Intelligent Transportation Systems Joint Program Office (ITS JPO) covers many CV and AV applications in the ITS Deployment Evaluation database that it maintains.[4] The ITS JPO also created a benefits estimate model for AV operations.[5]

3.0 STRATEGIC DIRECTION

This CAV Plan is guided by the following mission, vision, and focus areas. This strategic direction reflects the scope of the plan described in Section 1.1, focusing on MoDOT's roles, internal processes and supporting MoDOT's TSMO mission.

[3] U.S. DOT, Automated Vehicles Hub, https://www.transportation.gov/AV/hub.

[4] U.S. DOT ITS JPO, ITS Deployment Evaluation, https://www.itskrs.its.dot.gov/benefits.

[5] U.S. DOT ITS JPO, Benefits Estimation Model for Automated Vehicle Operations, 2018, https://rosap.ntl.bts.gov/view/dot/34458.

3.1 Mission

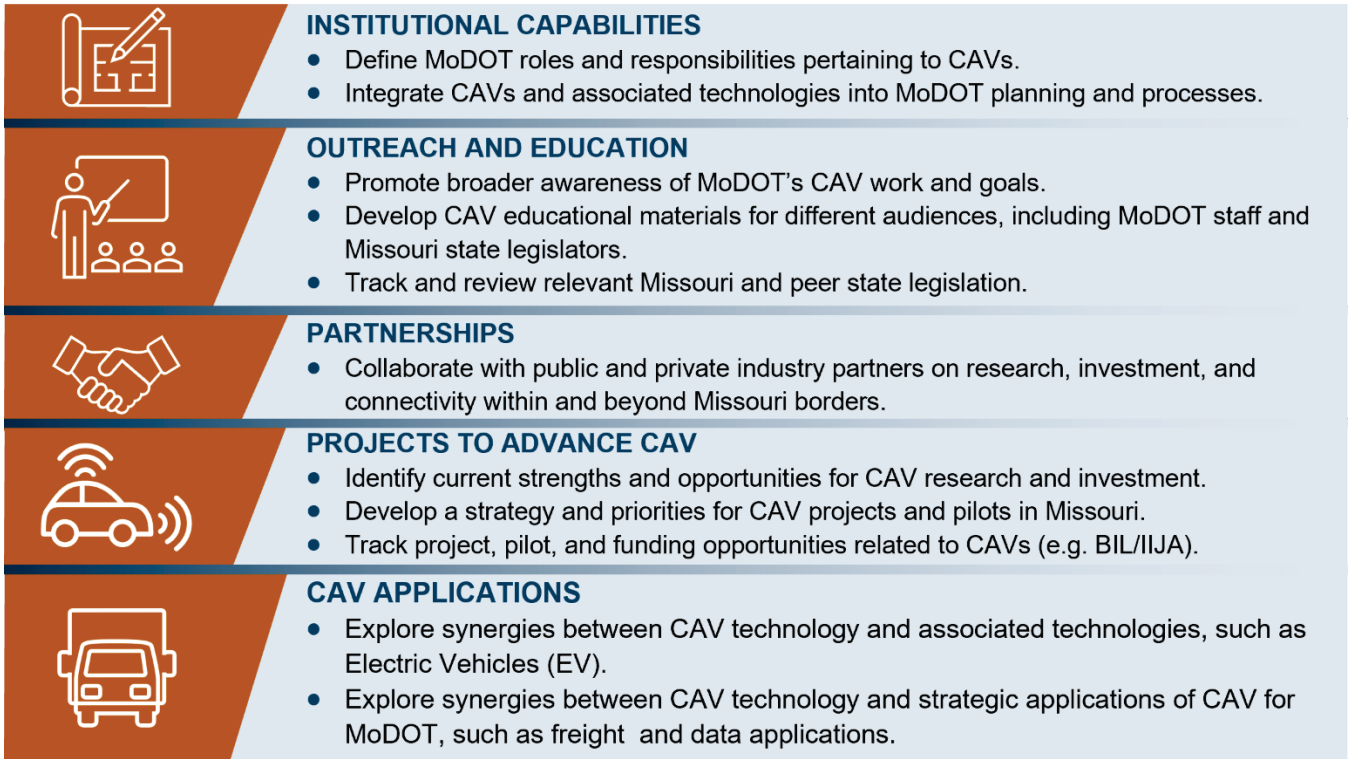
This CAV Plan establishes an adaptable direction for the interaction between CAVs and Missouri's transportation network, by advancing MoDOT capabilities, identifying partnership opportunities, exploring research and investment opportunities, and tracking trends in private industry and peer states.

3.2 Vision

MoDOT and its partners collaborate to leverage CAVs and associated technologies to improve the safety, mobility and reliability, modernization, and resiliency of Missouri's transportation systems—deploying innovative and cost-effective CAV solutions that optimize our system performance.

3.3 Focus Areas

This plan focuses on advancing MoDOT CAV capabilities in the following five areas:



4.0 MODOT CAV STRENGTHS AND OPPORTUNITIES

MoDOT has a range of CAV-related strengths and opportunities that the agency can leverage to advance CAV deployment. These include **programs, projects, infrastructure, devices, partnerships, and staff, as well as MoDOT-specific strengths and opportunities for CAV** such as Missouri's role in broader freight and logistical networks. These assets create a foundation for CAV on which MoDOT can build.

MoDOT's CAV Team will work towards a process for identifying and strategically building upon MoDOT's existing strengths and opportunities. This can aid in pursuing pilot projects, creating partnerships, and making investment decisions.

Examples of CAV-related strengths and opportunities for MoDOT are described below, as a starting point for identifying and leveraging these assets.

Figure 4. | Examples of CAV Strengths and Opportunities at MoDOT

4.1 MoDOT Autonomous Truck-Mounted Attenuator Pilots

MoDOT is committed to reducing Truck-Mounted Attenuator (TMA) crashes and, critically, the employee injuries and fatalities associated with these crashes. The ultimate goal is to eliminate TMA crashes and fatalities, with an initial goal of reducing TMA hits below the previous 4-year average. In pursuit of these goals, MoDOT launched an Autonomous TMA pilot project in 2018. This project endeavors to eliminate operator injuries when the rear protective vehicle is impacted by removing the operator from the vehicle.

The Autonomous TMA project kicked off in 2018 and, as of early 2023, is completing two pilot projects in the Kansas City (KC) region and Southwest (SW) District. The autonomous TMAs are designed as a leader-follower system, with the rear TMA unstaffed to remove human operators from this position where they are at the greatest risk of being hit. The rear TMAs can follow at various distances up to 1,500 feet and have a variety of functionalities to help them navigate on a highway. These include: the ability to pause and catch up, function in short duration GPS denied environments, sync turn signals with lead TMAs, and laterally offset from the lead TMA up to 12 feet. Notably, this pilot is not a platooning system, where CAV-enabled vehicles would travel closely together at highway speeds, following a lead vehicle. The autonomous TMAs operate at 8-10 miles per hour, primarily on four lane divided highways outside of urban areas (where higher vehicle speeds tend to result in more crashes with TMAs). The autonomous TMAs also are not designed to follow through signals and intersections, the focus is on highway travel.

The autonomous TMAs are designed with the following performance specifications to enhance safety and help the vehicles navigate common challenges:

- Frontal collision avoidance
- Seamless function in short duration GPS denied environments
- E-stop and failsafe systems
- Longitudinal accuracy of +/- 15 feet
- Lateral accuracy of +/- 6 feet
- Follow distance adjustment required
- Pause and catch up functionality
- Vehicle-to-vehicle non-line of sight functionality
- TMA impact recognition and brake application
- Arrow board and turn signal coordination
- Vehicle take over functionality
- Operator friendly user interface

This pilot project is part of larger MoDOT efforts to reduce and ultimately eliminate TMA crashes and employee injuries and fatalities. A MoDOT dashboard (https://www.modot.org/tma-crashes-and-associated-employee-injuries-1h) provides performance metrics on MoDOT's progress towards reducing the number of TMA crashes below the 4-year average. As of December 2023, MoDOT is on track to meet this goal for 2023.

Figure 5. | A TMA After a Crash

(Source: MoDOT.)

Figure 6. | User Interface in the MoDOT Autonomous TMA Pilot

(Source: MoDOT.)

Pending the successful implementation of the pilot project, continuing research and deployment of Autonomous TMA technology has significant potential to improve the safety of MoDOT workers.

5.0 ACTIONS

MoDOT has identified actions to advance each of this plan's five focus areas. These actions are detailed, by focus area, in the following pages along with any information relevant to advancing the actions. A summary table of all actions is included at the end of the section.

Figure 7. | The MoDOT CAV Plan's Actions are Grouped into Five Focus Areas

1 Integrate CAV and associated technologies into MoDOT planning, business processes, and roles and responsibilities

Description

Integrating CAV considerations into MoDOT's planning, business processes, and staff roles is critical to ensure a coordinated and holistic approach to preparing for and leveraging CAVs. Key objectives for actions in this group include:

- Integrate CAV into planning so that the anticipated impacts/benefits are reflected in investments.
- Adapt business processes and planning to include/consider CAV in both freeway and arterial applications so MoDOT is prepared to leverage this technology, and to improve internal coordination/resource efficiency.
- Identify leads for collaborating on CAV issues internally and externally.
- Ensure all relevant MoDOT stakeholders are involved in advancing CAV and associated technologies.

Actions

Table 2. | Actions to Advance Institutional Capabilities

	ACTION	PRIORITY
1.1	Develop, implement, and maintain a MoDOT CAV plan.	**High**
1.2	Develop performance metrics for MoDOT's CAV readiness with an emphasis on infrastructure (physical and digital), operations, and safety.	**High**
1.3	Identify staff liaisons for internal and external collaboration.	**Medium**
1.4	Establish CAV working group for ongoing coordination.	**Medium**
1.5	Map out related MoDOT plans that should coordinate with and integrate CAV.	**Medium**
1.6	Explore a Capability Maturity Model (CMM) for CAV workshop.	**Medium**
1.7	Identify pathways/opportunities to integrate CAV into MoDOT business processes.	**Medium**

2 Increase staff and partner knowledge of CAV technologies and MoDOT goals

Description

Outreach and education across MoDOT is essential for building a common understanding of CAV technology, potential benefits, and MoDOT goals. It will help MoDOT leverage CAV for improved safety, service, and stability. Key internal MoDOT partners include Design, Construction, Government Relations, Planning, Highway Safety and Traffic, Maintenance, Information Systems, Communications, and others. This outreach needs to be informed by tracking the latest CAV developments globally as well as progress in Missouri, peer states, and legislation. Outreach to external partners such as partner agencies and the Missouri legislature will also be a key upcoming step for MoDOT. Key objectives for actions in this group include:

- Inventorying relevant resources on CAV and associated technologies.
- Sharing MoDOT work and goals related to CAV.
- Creating outreach and education materials geared at a variety of audiences.
- Promoting understanding and buy-in of MoDOT CAV goals and activities.
- Providing information to MoDOT senior leaders and legislators on how legislation can facilitate the safe and beneficial deployment of CAVs.
- Education and tracking of key legislative initiatives and challenges (Missouri, peer state, Federal).

Actions

Table 3. | Actions to Advance Outreach and Education

	ACTION	PRIORITY
2.1	Inventory relevant resources on CAV—especially from Missouri.	**Medium**
2.2	Create a MoDOT CAV website to share resources, activities, and goals.	**Low**
2.3	Develop CAV communications materials to promote understanding and buy-in.	**Low**
2.4	Continue tracking Missouri and Federal legislation and initiatives related to CAV. Add relevant MoDOT staff to distribution lists for legislative information.	**High**
2.5	Review existing Missouri legislation relevant to CAV.	**Medium**
2.6	Conduct scan of peer state legislation related to CAV to identify best practices and recommendations for Missouri.	**High**
2.7	Conduct outreach and develop communications materials for MoDOT staff and legislators.	**High**

Tracking Legislation

The National Conference of State Legislatures (NCSL) maintains a database of CAV related legislative efforts in all 50 states and the District of Columbia, dating back to 2017.[6] The database includes past efforts (successful and failed) and pending efforts. The database contains 14 entries for Missouri (as of March 2022). A snapshot of what the database provides is below, clicking on the light blue text at the top of the entry (e.g., MO S 1038) provides the full text of the bill in its current state. This database is a useful tool for MoDOT to track and learn more about CAV legislative efforts in Missouri, as well as other recent or relevant efforts in peer states. The database has a number of criteria with which viewers can search for specific items.

Figure 8. | NCSL AV State Bill Tracking Database, Snapshot

Show All History Hide All History Print Results

RESULTS Total States: 1 Total Bills: 14

MISSOURI BILL TEXT LOOKUP

MO S 1038

2022

Operation of Platoons on Roads

Status: Pending - Senate Transportation, Infrastructure, and Public Safety Committee

Date of Last Action:* 1/10/2022

Author: Brown (R)

Topics: Definitions, Commercial

Summary: Relates to the operation of platoons on state roads.

History: Click for History

(Source: NCSL, https://www.ncsl.org/transportation/autonomous-vehicles-legislation-database.)

[6] National Conference of State Legislatures (NCSL), Autonomous Vehicles State Bill Tracking Database, https://www.ncsl.org/transportation/autonomous-vehicles-legislation-database.

3 Grow and establish relationships across sectors with CAV partners

Description

The successful deployment of CAVs and associated technologies requires an ecosystem of partners working together. As a state DOT, MoDOT plays a specific role and must collaborate with public, private, and research partners.

Data collected by original equipment manufacturers (OEMs) should be shared with DOTs, which helps lead to safer and more efficient travel by all users. However, there has historically been a reluctance by OEMs to share this information with agencies. Given MoDOT's expertise, they are best positioned to lead this effort.

Key objectives for actions in this group include:

- Identifying strategies for building existing partnerships and connecting with new partners, across sectors.
- Tracking partnership opportunities across sectors.
- Ensuring that all stakeholders have a seat at the table.
- Coordinating to increase efficiency and resource management.

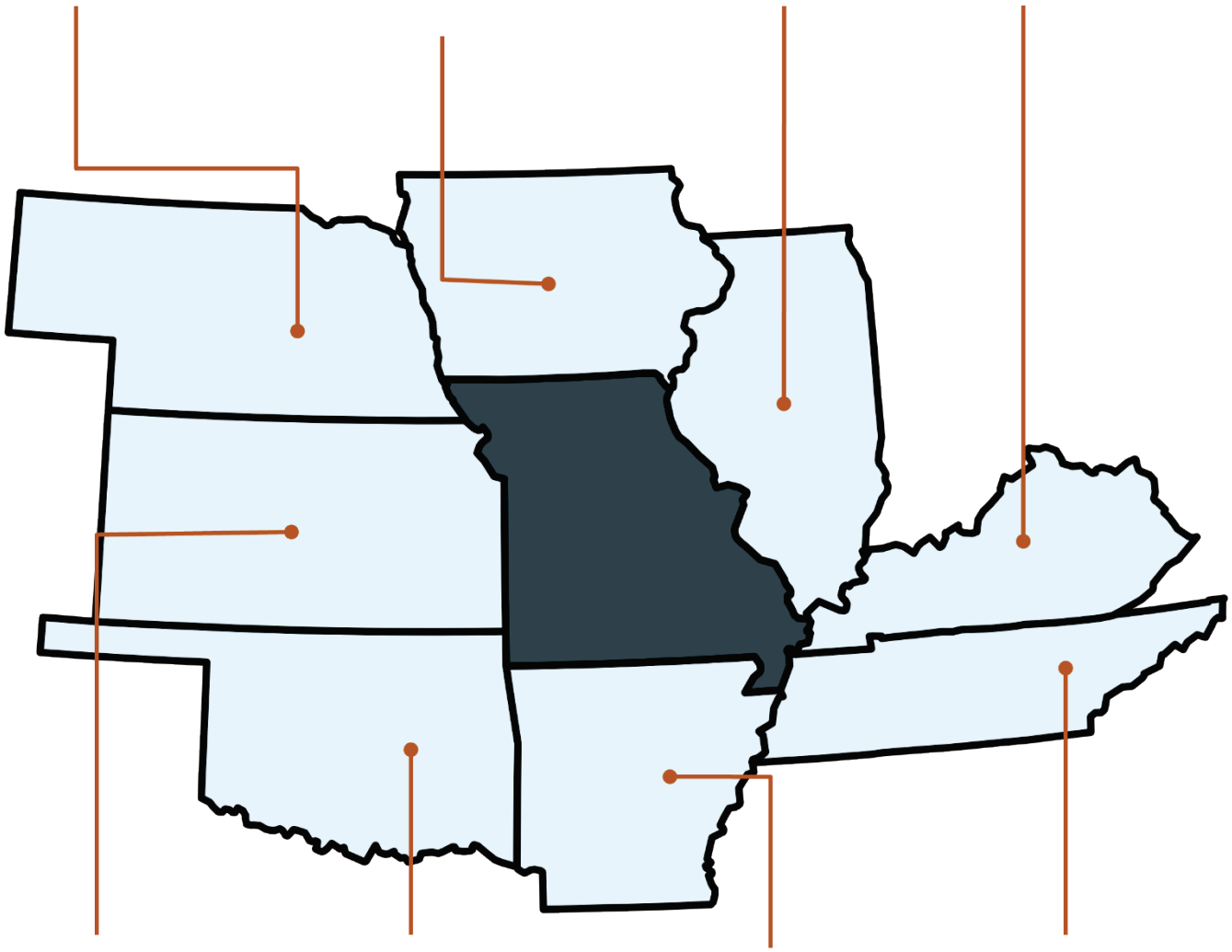
Actions

Table 4. | Actions to Advance Partnerships

	ACTION	PRIORITY
3.1	Identify strategies for building partnerships and connecting with new partners.	**Medium**
3.2	Track partnership opportunities (within and beyond Missouri).	**Medium**
3.3	Lead the Transportation Pooled Fund for Establishment of a Public-Private Transportation Data Exchange Center	**High**

MoDOT should also continue monitoring CAV work in neighboring state. The graphic below shows key CAV projects in neighboring states as of 2021.

Figure 9. | CAV Work in Missouri's Neighboring States



(Source: MoDOT.)

4 Create a strategy for advancing projects/pilots that increase Missouri's readiness for CAV and associated technologies

Description

Advancing projects and pilots that field-test CAVs and associated technologies is an important initial step in preparing Missouri for these technologies. There are a growing number of opportunities—including the recent Federal Bipartisan Infrastructure Law (BIL) (or Infrastructure Investment and Jobs Act (IIJA))—for MoDOT and its partners to get involved in such projects. Key objectives for actions in this group include:

- Develop a MoDOT strategy and priorities for advancing CAV projects and pilots (e.g., strategic areas or applications of focus).
- Position MoDOT and Missouri to take advantage of external funding opportunities.
- Continue supporting existing MoDOT research and projects relevant to advancing CAV technology, such as the Autonomous TMA pilots.

CAV Pilots and Public Perception

A recent poll found that 58% of Americans say they would have greater trust of AVs if they "had a chance to experience an AV ride" firsthand.

– PAVE Campaign, https://pavecampaign.org/

Actions

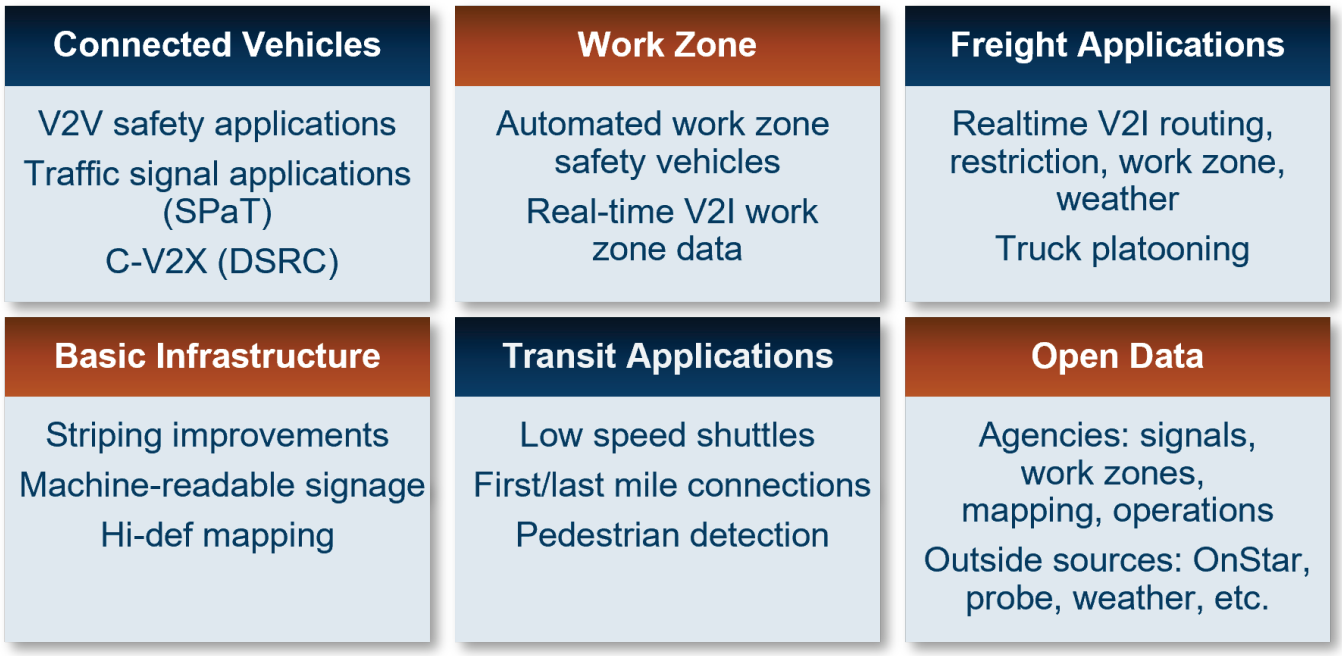
Table 5. | Actions for Projects to Advance CAV

	ACTION	PRIORITY
4.1	Track project and funding opportunities related to CAVs (including BIL/IIJA).	**High**
4.2	Define a strategy and priorities for CAV projects and pilots in Missouri.	**Medium**
4.3	Review relevant peer project/pilot materials for best practices and lessons learned.	**Medium**
4.4	Support existing MoDOT CAV research and projects, such as the Autonomous TMA pilots.	**Medium**

CAV Pilot and Project Strategy

A key action in this focus area is to define a strategy and priorities for CAV pilots and projects in Missouri. As a starting point, MoDOT previously developed the following typography of CAV pilot types, which may serve as a good foundation for this action.

Figure 10. | Potential Framework for MoDOT CAV Pilots



5 Advance MoDOT's CAV work on strategic CAV applications, use cases, or synergistic areas

Description

CAV technology has a wide-ranging set of applications for DOTs and transportation in general. The MoDOT CAV will focus on advancing MoDOT's CAV work on strategic CAV applications for the agency. Initial applications include electric vehicles and freight. Additional focus areas may include arterial roadway applications as technology advances in this area.

Electric Vehicles

CAVs are expected to be largely electric vehicles (EVs), connecting the deployment of these two emerging technologies and their associated infrastructure. EV infrastructure is a priority, tactical area to promote the synergistic deployment of CAV technologies. Key objectives for actions in this group include: explore synergies and resource-sharing between CAV and EV planning and deployment; coordinate CAV and EV work at MoDOT and with partners; and clarify MoDOT roles for advancing and planning for synergies between CAV and EV.

Actions

Table 6. | Actions to Advance CAV Applications—Electric Vehicles

	ACTION	PRIORITY
5.1	Research synergies in CAV and EV deployment.	**Medium**
5.2	Define MoDOT roles for advancing synergies between CAVs and EVs.	**Medium**
5.3	Coordinate CAV and EV advancement within MoDOT.	**Medium**

Freight

Freight is anticipated to be an area of early CAV deployment across the U.S. and a strategic CAV application for MoDOT. Advancing MoDOT's plans, goals, partnerships, and institutional capabilities to facilitate CAV applications in freight can help capture early benefits of CAV deployment in Missouri. It can also help position MoDOT to leverage broader CAV deployments. Key objectives for actions in this group include: build partnerships with internal and external freight partners for collaboration on CAV; increase staff knowledge of CAV freight applications; work towards a vision/strategy for the future of CAV technology in freight in Missouri; and integrate freight considerations throughout MoDOT's CAV work.

Actions

Table 7. | Actions to Advance CAV Applications—Freight

	ACTION	PRIORITY
5.4	Create a MoDOT vision for the future of CAV technology in freight.	**High**
5.5	Establish CAV leads and liaisons to integrate freight in all CAV work.	**Medium**
5.6	Review MoDOT and Missouri policies related to CAV in freight.	**High**

5.1 Summary of Actions

Table 8. | Summary of All CAV Plan Actions

FOCUS AREAS		ACTION	PRIORITY
1. Institutional Capabilities	1.1	Develop, implement, and maintain a MoDOT CAV plan.	**High**
	1.2	Develop performance metrics for MoDOT's CAV readiness with an emphasis on infrastructure (physical and digital), operations, and safety.	**High**
	1.3	Identify staff liaisons for internal and external collaboration.	**Medium**
	1.4	Establish CAV working group for ongoing coordination.	**Medium**
	1.5	Map out MoDOT plans that should coordinate with CAV.	**Medium**
	1.6	Explore a Capability Maturity Model (CMM) for CAV workshop.	**Medium**
	1.7	Identify pathways/opportunities to integrate CAV into MoDOT business processes.	**Medium**
2. Outreach and Education	2.1	Inventory relevant resources on CAV—especially from Missouri.	**Medium**
	2.2	Create a MoDOT CAV website to share resources, etc.	**Low**
	2.3	Develop CAV communications materials to promote understanding and buy-in.	**Low**
	2.4	Continue tracking Missouri and Federal legislation and initiatives related to CAV. Add relevant MoDOT staff to distribution lists for legislative information.	**High**
	2.5	Review existing Missouri legislation relevant to CAV.	**Medium**
	2.6	Conduct scan of peer state legislation related to CAV to identify best practices and recommendations for Missouri.	**High**
	2.7	Conduct outreach and develop communications materials for MoDOT staff and legislators.	**High**
3. Partnerships	3.1	Identify strategies for building partnerships and connecting with new partners.	**Medium**
	3.2	Track partnership opportunities (within and beyond Missouri).	**Medium**
	3.3	Lead the Transportation Pooled Fund for Establishment of a Public-Private Transportation Data Exchange Center.	**High**
4. Projects to Advance CAV	4.1	Track project and funding opportunities related to CAVs (including BIL/IIJA).	**High**
	4.2	Define a strategy and priorities for CAV projects and pilots in Missouri.	**Medium**
	4.3	Review relevant peer projects for best practices and lessons learned.	**Medium**
	4.4	Support existing MoDOT CAV research and projects, such as the Autonomous TMA pilots.	**Medium**
5. CAV Applications	5.1	Research synergies in CAV and EV deployment.	**Medium**
	5.2	Define MoDOT roles for advancing synergies between CAVs and EVs.	**Medium**
	5.3	Coordinate CAV and EV advancement within MoDOT.	**Medium**
	5.4	Create a MoDOT vision for the future of CAV technology in freight.	**High**
	5.5	Establish CAV leads and liaisons to integrate freight in all CAV work.	**Medium**
	5.6	Review MoDOT and Missouri policies related to CAV and freight.	**High**

6.0 RESOURCES

The following resources are publicly available to increase CAV knowledge and help implement the actions in this plan. The CAV team will continue building out this table as their work progresses.

Table 9. | Running List of CAV Resources for MoDOT

ORGANIZATION/ SOURCE	NAME	SUMMARY	URL
U.S. DOT	AV Hub (website)	AV activities across Federal agencies.	https://www.transportation.gov/AV/hub
U.S. DOT FHWA	Office of Operations—CAVs and Emerging Technologies (website)	Homepage for resources on CAVs and emerging technologies by FHWA Office of Operations.	https://ops.fhwa.dot.gov/program_areas/ops-cavet.htm
U.S. DOT ITS JPO	Benefits Estimation Model for Automated Vehicle Operations: Phase 2 Final Report (2018)	Framework for estimating a range of interconnected benefits of AVs.	https://rosap.ntl.bts.gov/view/dot/34458
U.S. DOT ITS JPO	Connected Vehicle Deployer Resources (website)	Collection of U.S. DOT resources for CV deployments, including temporary equipment loans and technical assistance.	https://www.pcb.its.dot.gov/CV_deployer_resources.aspx
Transportation Pooled Fund	Establishment of a Public-Private Transportation Data Exchange Center (2024)	Pooled fund effort with nine or more states to develop a public-private data repository.	https://pooledfund.org/Details/Study/773
Institute of Transportation Engineers (ITE)	Connected/ Automated Vehicle Resources	List of ITE technical briefs and research related to CAVs.	https://www.ite.org/technical-resources/topics/connected-automated-vehicles/resources/
Iowa DOT	Cooperative Automated Transportation (CAT) Service Layer Plan (2019)	A plan for CAV (here: CAT) deployment, as part of Iowa DOT's TSMO program.	https://iowadot.gov/TSMO/IowaCAT.pdf
Iowa Advisory Council on Automated Transportation	Homepage	Council of many partners across Iowa working to advance CAV to promote safety, mobility, and freight movement.	https://iowadrivingav.org/

ORGANIZATION/ SOURCE	NAME	SUMMARY	URL
University of Iowa	National Advanced Driving Simulator—Homepage	Transportation safety research center at the University of Iowa. Conducts CAV research including research related to human factor and rural CAV.	https://nads.uiowa.edu/connected-and-automated-vehicles
Minnesota DOT	CAV webpage and CAV Strategic Plan (2019)	Minnesota DOT maintains an educational CAV webpage with resources. They have also developed a CAV Strategic Plan with actions across nine focus areas.	CAV webpage: http://www.dot.state.mn.us/automated/ CAV Strategic Plan: https://www.dot.state.mn.us/automated/cav-planning-mn.html
Ohio DOT	DriveOhio—Homepage	DriveOhio is an initiative of Ohio DOT, serving as the state's hub for smart mobility.	https://drive.ohio.gov/
University of Illinois, Illinois Center for Transportation	Illinois Autonomous and Connected Track—Homepage	Facility for the research and testing of smart, autonomous, and multimodal transport.	https://ict.illinois.edu/i-act
Mid America Association of State Transportation Officials (MAASTO)	Homepage	Regional transportation industry association that maintains a CAV committee.	http://www.maasto.net/default.aspx http://www.maasto.net/docs/CAVcontacts.pdf
Argonne National Laboratory	Connected and autonomous vehicles (webpage)	Science and engineering research center in Illinois that conducts research related to CAVs.	https://www.anl.gov/topic/connected-and-autonomous-vehicles
The Car Guide	GM Adds New Super Cruise Features for 2022 (2021)	Among the new Super Cruise features, compatible roads will be displayed in the in-vehicle navigation. A snapshot is shown in his article.	https://www.guideautoweb.com/en/articles/61011/gm-adds-new-super-cruise-features-for-2022/