MOUNTAIN-PLAINS CONSORTIUM

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STATE OF THE PRACTICE OF CRASH REPORTING IN THE US AND IMPLICATIONS FOR CAV SAFETY ASSESSMENT

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16. Abstract

This study evaluated connected and autonomous vehicle (CAV) crash reporting practices across the United States, emphasizing the importance of standardized reporting and legislation for the safe deployment of CAVs on public roads. Through a survey of state transportation officials and a review of current practices and legislation, the study identified challenges in data consistency and gaps in reporting. Findings revealed significant variations in how states report CAV involvement and automation levels during crashes, complicating comparisons and analysis across jurisdictions. Current laws primarily focus on CAV definitions and deployment rather than crash reporting policies. Recommendations include standardizing crash report forms across states, mandating CAV crash reporting by operators and manufacturers, and enhancing reporting requirements for CAV manufacturers. Education and training for first responders and transportation officials on CAV technology and crash assessment is suggested to help improve data quality. Collaboration among state agencies, industry stakeholders, and academic institutions is crucial for developing comprehensive reporting practices. By adopting these measures, state DOTs and policymakers can navigate the challenges of CAV crash reporting and contribute to safer roadways for all.

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State of the Practice of Crash Reporting in the U.S. and Implications for CAV Safety Assessment

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ABSTRACT

This study evaluated connected and autonomous vehicle (CAV) crash reporting practices across the United States, emphasizing the importance of standardized reporting and legislation for the safe deployment of CAVs on public roads. Through a survey of state transportation officials and a review of current practices and legislation, the study identified challenges in data consistency and gaps in reporting. Findings revealed significant variations in how states report CAV involvement and automation levels during crashes, complicating comparisons and analysis across jurisdictions. Current laws primarily focus on CAV definitions and deployment rather than crash reporting policies. Recommendations include standardizing crash report forms across states, mandating CAV crash reporting by operators and manufacturers, and enhancing reporting requirements for CAV manufacturers. Education and training for first responders and transportation officials on CAV technology and crash assessment is suggested to help improve data quality. Collaboration among state agencies, industry stakeholders, and academic institutions is crucial for developing comprehensive reporting practices. By adopting these measures, state DOTs and policymakers can navigate the challenges of CAV crash reporting and contribute to safer roadways for all.

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LIST OF ACRONYMS

AB	Assembly Bill
ADA	American Disability Act
ADAS	Advanced Driving Assistance Systems
ADS	Automated Driving Systems
AAMVA	American Association of Motor Vehicle Administrators
AV	Autonomous Vehicle
CAV	Connected and Autonomous Vehicle
DOT	Department of Transportation
DMV	Department of Motor Vehicles
EDR	Electronic Data Records
EPA	Environmental Protection Agency
FMVSS	Federal Motor Vehicle Safety Standards
HB	House Bill
IIHS	Insurance Institute of Highway Safety
MMUCC	Model Minimum Uniform Crash Criteria
NAIC	National Association of Insurance Commissioners
NHTSA	National Highway Traffic Safety Administration
NCSL	National Conference of State Legislatures
ODD	Operational Design Domain
OOIDA	Owner-Operator Independent Drivers Association
SAE	Society of Automotive Engineers
SB	Senate Bill

EXECUTIVE SUMMARY

This report explores the current state of connected and autonomous vehicle (CAV) crash reporting practices across the United States and provides recommendations for improvement. With the rapid advancement of CAV technology, there is a growing need for standardized crash reporting and legislative frameworks to ensure accurate data collection and safe CAV deployment on public roads. By examining existing practices, identifying gaps and challenges, and proposing strategies for enhancement, this report aims to guide policymakers, transportation officials, and other stakeholders toward more effective crash reporting systems. The study's objectives were focused on assessing the state of CAV crash reporting practices in the U.S. through a questionnaire survey among state transportation officials, reviewing existing guidance and definitions, and compiling best practices, definitions, and challenges to guide future crash reporting efforts. The study aimed to provide recommendations for state agencies to improve CAV crash reporting standards.

The report includes a general background of the emergence and growth of CAVs in the United States, including projections for market penetration over the coming decades. CAVs offer potential benefits such as improved safety, mobility, and accessibility, yet they also present challenges for transportation agencies, particularly in terms of crash reporting and safety. Current safety studies rely heavily on simulations and controlled environments, which may not accurately reflect real-world scenarios. Consequently, systematic reporting of CAV-related crashes is essential for evaluating safety performance and guiding future policy.

A review of legislation outlines the varying approaches to CAV regulation across different states, reflecting inconsistencies in definitions, testing, deployment, and operation. Some states have enacted laws related to CAVs, while others have not. Additionally, the National Highway Traffic Safety Administration (NHTSA) issued a standing order for crash data submission involving automated and semi-automated vehicles. Challenges remain in terms of standardization, limited education, and time constraints for personnel, impacting the public implementation and deployment of CAVs. The definition of CAVs by state highlights the range of terms and classifications used across different states. These include variations in defining automation levels and types of vehicles involved. While some states adopt the Society of Automotive Engineers (SAE) definitions, others create their own classifications, resulting in further inconsistencies in reporting and interpretation. Highlighted AV legislation reveals the diverse approaches states have taken to regulate CAVs, including executive orders, bills, and regulations. These efforts cover a range of topics such as truck platooning, fully autonomous vehicle operations, and safety assessments. Although many states have implemented measures for CAV deployment, testing, and operation, significant variations remain across jurisdictions. While NHTSA is developing a crash database for CAV safety assessment, limitations exist due to a lack of required reporting from manufacturers and operators. Additionally, existing laws primarily focus on CAV definitions and deployment rather than crash reporting policies. This highlights the need for proper guidance and standardization to ensure consistent crash reporting and data collection.

A survey of state officials examined states' current practices and plans for updating crash reporting systems. Nine states have established CAV crash reporting practices, with varying methods for recording automation levels and engagement during crashes. In contrast, 25 states lack standard practices for reporting CAV crashes. Plans to update crash reporting vary, with some states reviewing their forms and others awaiting the release of updated MMUCC editions.

Recommendations presented in the report emphasize the importance of standardizing crash reporting practices across states. State DOTs should develop standardized crash report forms with specific fields for recording CAV involvement, automation levels present, and engaged automation levels during crashes. This standardization would facilitate accurate data collection and analysis, enabling reliable comparisons across jurisdictions. Legislative updates are also necessary to mandate CAV crash reporting by operators and manufacturers, providing clear guidance on criteria, timelines, and responsible entities. Regular updates to reporting forms should be conducted in consultation with relevant stakeholders and based on user feedback.

This report also suggests that NHTSA should enhance reporting requirements for CAV manufacturers to include data such as the number of vehicles on the road, miles traveled, and whether the automated system was engaged during a crash. These requirements would provide comprehensive data for safety assessments and regulatory oversight. Education and training programs for first responders, transportation officials, and other stakeholders are recommended to improve crash reporting accuracy and response capabilities. Public awareness campaigns can educate the public on CAV technology, its benefits, and potential safety implications. Collaborative efforts among state agencies, industry stakeholders, and academic institutions can foster the development of comprehensive and effective reporting practices. International collaboration can provide insights into best practices and help harmonize standards and regulations.

Finally, further research and monitoring initiatives can advance understanding of CAV technology and its impact on roadway safety. Monitoring and evaluating the effectiveness of CAV crash reporting practices and legislative frameworks are crucial for ongoing improvement. By implementing these recommendations, state DOTs and policymakers can navigate the challenges of CAV crash reporting and contribute to safer roadways. Through proactive measures, collaboration, and standardization, stakeholders can enhance data quality and support the safe integration of CAVs into modern transportation systems.

1. INTRODUCTION

1.1 General Background

Recently, there has been rapid growth in the development, testing, research, and advertisement of connected and autonomous vehicles (CAVs) in the world, including the U.S., realizing the future of automation in transportation. Though vehicles having full automation levels are yet to arrive for the public, vehicles having some levels of automation are abundantly advertised and becoming prevalent on U.S. roads. It is estimated that by 2040, more than 90% of all vehicles sales will have level 4 or 5 automation (Munster & Bohlig, 2017). It is also anticipated that there will be 3.5 million self-driving vehicles in the U.S. by 2025 and 4.5 million by 2030 (NAIC, 2022). Another study (Litman, 2021) predicted that half of new vehicles will be autonomous by 2045 and half of the vehicle fleet will be autonomous by 2060.

Having more CAVs on the roads can be viewed as a positive improvement, especially because of the safety, mobility, and accessibility benefits associated with this technology. However, transportation agencies need to be well prepared to account for the changes these vehicles bring in the transportation system. The reporting of crashes involving CAVs can be considered an important aspect to be prepared for. Although the increasing market penetration and technological maturity of CAVs comes with high optimism, there are also traffic safety concerns as it changes the conventional role of human drivers. Being a new technology, there is lack of transparency and no clear guidance available in the transportation industry for the proper adoption of this technology. New traffic safety risks will arise as increasing numbers of CAVs mix with driver-operated vehicles on the road. There is significant uncertainty about actual CAV safety performance. Current CAV safety evaluations are mostly based on simulations, whereas some are based on CAV crash reports or performance that occurred in controlled testing environments. Since there could be much variability and unexpected scenarios on real roads compared with simulated or controlled environments, the analysis of actual CAV driving (and crashes if they occurred) on real roads is the best way to accurately evaluate CAV safety performance. However, this type of analysis can be considered practically impossible at least within a few years of CAV deployment because hundreds of millions of miles, or sometimes hundreds of billions of miles, of CAV driving are necessary to truly demonstrate their safety and reliability (Klara & Paddock, 2016). Any such analysis requires data on CAV driving and CAV crashes. This necessitates the systematic reporting of CAV-related crashes. Existing operational policies of first responders and other transportation officials need to be changed to address the impending widespread CAV deployment, particularly in regard to crash reporting. Collecting crash data with information on CAV involvement is critical to understanding the drastically shifting landscape of vehicle technology. It is important for crash reporting methods to "keep up." Therefore, investigations of crash reporting can improve protocols and legislation to promote the safe and effective deployment and operation of CAVs.

Not only is systematic CAV crash reporting necessary, but uniformity in crash reporting across states and regions is also warranted to enable consistent analyses of crashes and their contributing factors across different regions. This is true for both CAV and non-CAV crashes. The National Highway Traffic Safety Administration (NHTSA) first developed the Model Minimum Uniform Crash Criteria (MMUCC) guideline in 1988. It defined a minimum set of crash elements and attributes that should be incorporated in crash reports across the states. To account for changes brought by CAVs in transportation, the latest edition of MMUCC (NHTSA, 2017) has suggested reporting the presence of an automated system ("no," "yes," or "unknown"), the level of automated system present ("no automation," "driver assistance," "partial automation," "conditional automation," "high automation," "full automation," "automation level unknown," or "unknown"), and the level of automated system engaged during the time of the crash for all

vehicles involved (NHTSA, 2017). This guideline has also considered some other attributes related to automated driving: the dynamic driving task, driving mode, and request to intervene. Including these crash elements and attributes in state department of transportation (DOT) crash reports could help attain the goal of uniformity in recording CAV crashes.

The discussion made above highlights the importance of uniformly reporting CAV crashes across the states. It is crucial to review the current CAV crash reporting practices across the states, which is the primary objective of this study. Through this review, this study gauges the current level of states' preparedness, identifies the commonalities/differences among the states, and guides them to accommodate for the changes that can be expected with the introduction of CAVs in terms of reporting crashes involving CAVs. This study considers automated vehicles, automated vehicles with connected capabilities, and vehicles equipped with advanced driving assistance system (ADAS) technology as falling under the umbrella term of CAV.

There are six levels of automation (SAE, 2021). At level 0, all driving tasks (except temporary assistance) are performed by a human driver. At level 1, only one driving task at a time is performed via automation. Level 2 (also known as active assistance) allows the vehicle to automatically control its speed and lateral position simultaneously. Level 3 (also known as conditional automation) has full automated control in only certain situations or conditions, requiring driver engagement when those conditions are not met. Level 4 is high level automation and is mainly designed for public transport services and driverless taxis in controlled environments. Level 5 is full automation under any conditions without any driver input. At present, commercially available vehicles have only achieved level 2 or lower, always requiring the attention and control of a human driver.

An ADAS consists of driving assistance features to help drivers perform tasks, but are not intended to replace drivers, and falls within level 1 to level 2 automation. Automated driving systems (ADS) fall under level 3 to level 5 automation. However, note that these terms are often used interchangeably. As of 2017, no states addressed ADAS-related factors in their crash reports (National Safety Council, 2017). It is recommended that states should develop regulations or recommendations to identify CAVs, or at least level 3–5, consistently in their different data systems, such as vehicle title and registration, driver licensing, and crash data (Hedlund, 2018). CAVs are recognized as great disruptors, but most state crash reports collect little to no information regarding CAV involvement or factors in crashes.

In 2022, the NHTSA issued a standing order (Figure 1.1) for the submission of crash data involving automated and semi-automated vehicles (NHTSA, 2022). Although CAV technology is progressing rapidly, there is still inadequate guidance on crash reporting. There is a significant gap in the guidance for and consistency of CAV crash reporting from state to state. Many potential CAV crashes are not reported to NHTSA due to the lack of CAV knowledge among investigating individuals. Additionally, there is no national-level consensus on how to account for CAVs in crash reports. Current challenges in crash reporting, such as standardization, delayed updates relative to technological shifts, and limited education/time of personnel, will negatively impact the public implementation and deployment of CAVs. Steven Cliff, NHTSA's acting administrator, stated, "In fact, gathering data will help instill public confidence that the federal government is closely overseeing the safety of automated vehicles" (Hawkins, 2021). Having appropriate crash reporting will help officials to further understand CAV safety impacts and will guide future efforts on effective countermeasures and policies.

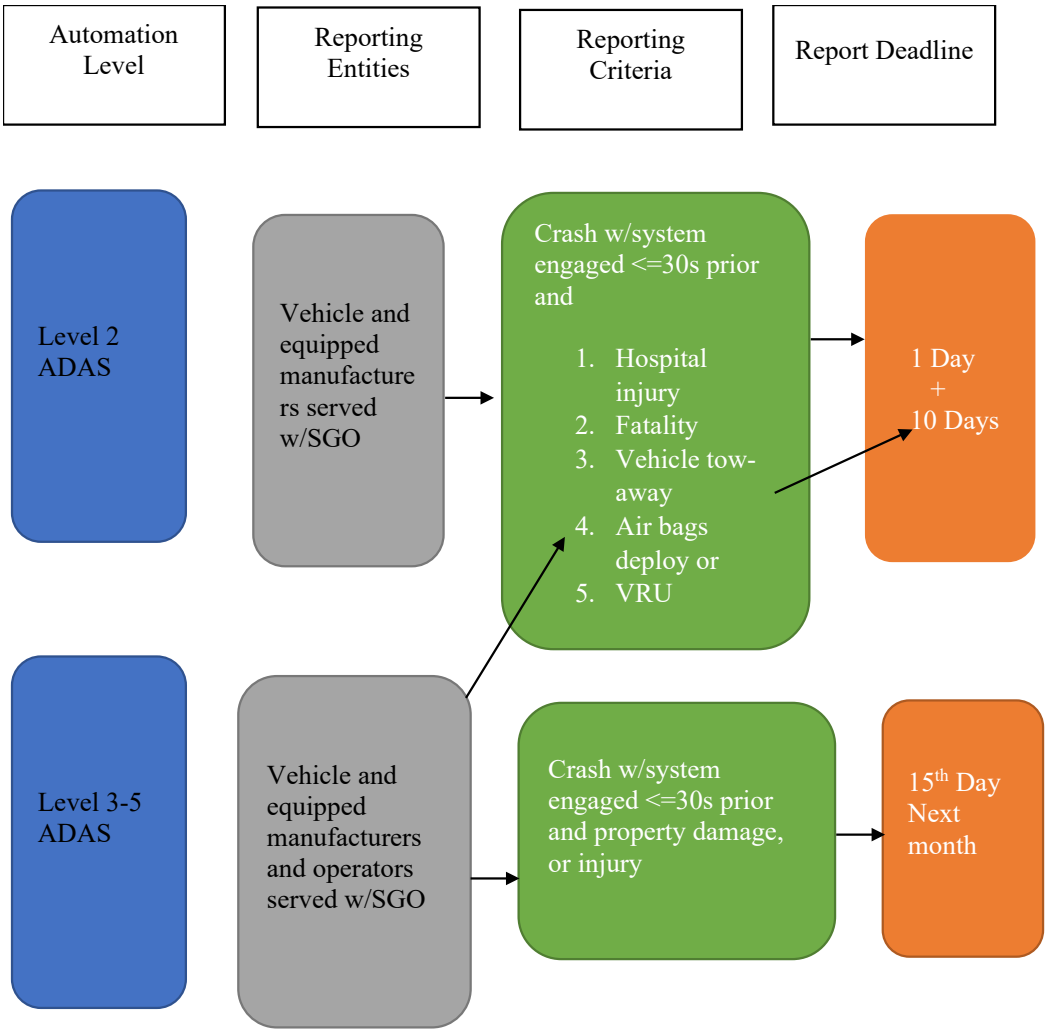

Figure 1.1 Standing general order on crash reporting (NHTSA, 2022)

1.2 Research Objectives

This study's main goal is to assess the state of CAV crash reporting practice in the United States. A questionnaire survey was conducted among state transportation officials to gather information about current crash reporting practices. An extensive literature review was conducted to understand different terminologies, definitions, and established legislation related to CAVs. Finally, based on the data collected from the survey, possible recommendations were identified to improve CAV crash reporting standards. This project had the following objectives:

- Conduct a comprehensive review of current crash reporting practices.
- Conduct a review of current guidance and definitions regarding CAV safety and reporting at state, federal, and industry levels.
- Compile a list/summary of best practices, definitions, challenges, and knowledge gaps and identify possible recommendations for state agencies regarding CAV crash reporting.

2. LEGISLATION

Although vehicle manufacturers are continuously working toward increasing CAV deployment, only a few states have legislation for the testing, deployment, and operation of CAVs. The current set of laws and legislation related to CAVs are quite murky and inconsistent among the states. Some states require individuals (drivers or operators) behind the wheel while others do not. While it is not practical to consider each unique set of laws across all states given the nature of deployment, there should be an over-arching trend line at the federal level. Given the fast and impending nature of deployment, there needs to be established laws as soon as possible.

"While regulations are created through lengthy processes, technologies evolve and move quickly. Even if policymakers are able to enact effective laws or regulations applicable to a given technology, the policies will soon become obsolete if they are not revised iteratively. Because technology develops quickly—facilitating new uses and capabilities that could threaten safety, security, public health, or civil rights—the law that was once developed for it may become outdated and no longer comprehensive or effective." (Acosta, 2018)

Presently, 21 states have enacted laws regarding the deployment of autonomous vehicles (six of them only for semi-trucks), and 10 states do not have any laws or formally announced research for autonomous vehicles (Banner, 2023). In 2011, Nevada became the first state to authorize the operation of autonomous vehicles. In Michigan, the testing or deployment of automated vehicles does not require anyone behind the wheel. However, if there is someone behind the wheel, that individual must have a license. Pennsylvania allows fully autonomous vehicles with a licensed driver behind the wheel and does not require any licensed driver behind the wheel for a work zone vehicle. Oklahoma allows the testing of CAVs but there is no indication about the requirement for a licensed driver. For Florida, Georgia, Nevada, North Carolina, North Dakota, Utah, and Virginia, there is no need for a licensed driver behind the wheel if the vehicle is capable of level 4 or 5 automation, as defined by SAE. In Texas and Tennessee, there is no need for a human being to be present in an autonomous vehicle. Only commercial vehicles are allowed to operate autonomously on the road in Arkansas, Alabama, and Louisiana. In Arizona, Kansas, and Nebraska, a licensed human driver is required behind the wheel should taking over control become necessary. However, in Kansas, a driver is required behind the wheel for the first 12 months of operating the autonomous vehicle. In New Hampshire, a licensed driver is required only when a driverless vehicle is in its testing phase. In Arizona, a fully autonomous vehicle without any backup driver can operate if they follow the state's traffic and motor vehicle safety laws.

As CAV technology is continuously growing, there is a push to regulate and address the legal implications regarding the deployment of this technology. Agencies and relevant stakeholders should be brought together to address this issue. State legislations have mainly been focused on driver presence/certification, incident reporting, manufacturer insurance, and compliance with safety regulations regarding testing and data storage (Isaac, 2016). Table 2.1 represents the existing distribution of jurisdiction over policy regarding AVs.

Table 2.1 Current distribution of jurisdiction over policy to the automobile system and AVs (Freemark, Stacy, Fiol, & Morales-Burnett, 2022)

Domain	Policy Area	Federal Government	State Governments	Local Governments
Vehicle Operation	Crash reporting	Manufacturers and operators are required to report any crashes involving level 2-5 level AVs. (NHTSA, 2022)	Some states require AVs to fulfill the FMVSS regulations to operate on the public roads	No role
	AV operational standards	No role	States enforce rules related to vehicle moving violations, while there are some rules involving passenger safety plans. Some states have AV operational standards	No role
	Liability and insurance	No role	States have established insurance coverage and the minimum liability standards	No role
	Data	USDOT has guidance for the companies to record the data and share with the NHTSA	Some states require anonymous data sharing with government from Avs that are in testing and have the ride hailing capacities	No role
	Inspections	No role	In general, the DMV oversees the safety and emission inspections	No role
	Equity in operation	No role	California requires the location data (pick up and drop off) from the ride hailing providers whether it is AV or not to ensure equity metrics	No role
	Environmental impacts	No role	California is working toward developing emission standards for fleet-owned and ride-hailing companies. This	No role

			standard might apply to AVs in the future in order to follow Senate Bill 500 for AVs to be free of emissions by 2030	
Street Standards	Signage and Markings	The Federal Highway Administration has manual uniform traffic control devices (MUTCDs) for streets and highways but no separate signage rule for AVs	Many states have specific signage for streets under their territory	Many local governments add specific signage for streets under their jurisdiction
	Pedestrian and cyclist protections	No role except the MUTCD	Some states have specific requirements	Some cities have vision zero plan to minimize pedestrian and bicycle fatalities through street design
	Access and curb use	No role	Some states have preempted local regulations for AV operation	Impose non-moving violations like double parking, or assign lanes and curbs for certain types of usage
	Crash response	No role	In case of the major roads, the sheriff may get involved	Generally, the police and sheriff departments respond
Vehicle Design	Manufacturer and design	NHTSA issues FMVSS, including the crash protection standards of the occupants	Some states require that AVs meet the requirements of the FMVSS to operate on the roads	No role
	Crashworthiness	NHTSA conducts crash worthiness program for new cars but not for AVs	No role	No role
	Protection for pedestrians, cyclists, and other vulnerable road users	No role	No role	No role
	Efficiency	NHTSA issues the cooperative average fuel economy standards but no particular rules for AVs	Some states regulate vehicle fuel economy rules; for example, California has rules for light-duty	No role

			and heavy-duty vehicles	
Consumer standards	Information	EPA provides data on gas mileage while NHTSA provides information on crashworthiness	States impose the sales requirement	No role
	Taxes and fees	No role	Some states have vehicle registration fees. For example, California has imposed taxes on AV ride sharing trips	Sometimes there are vehicle registration fees, while some cities have additional fees for ride-hailing services
	Ride-hailing requirements	No role	Sometimes there are rules involving service requirements, cost, and passenger safety.	Sometimes there are rules involving passenger safety, service requirements, and cost
	Vehicle accessibility meeting (ADA Act)	No role	In general, state DMVs regulate the vehicle registration process. Some states are initiating programs for AV permits	Some local governments establish rules for a minimum share of ride-hailed fleets to be ADA accessible
	Registrations and permitting			
	Subsidies	No role	No role	Some local governments provide ride hailing service for certain users

NHTSA issued vehicle performance guidance for CAVs, where manufacturers involved with the production of CAVs and their components are subject to report to NHTSA (U.S. Department of Transportation, 2016). The following reporting areas are of greatest relevance to CAV crash reporting: system safety, crashworthiness, post-crash behavior, federal/state/local laws, ethical considerations, and object/event detection and response. Otherwise, policies and legislation generally relate to research, development, testing, and operation of AV technology. This study reviewed 514 state-level bills up through 2022 to understand CAV operation, testing, and crash reporting policies across the U.S. The list of the available bills was collected from the National Conference of State Legislatures (NCSL, 2022). Out of 514 bills, 109 were enacted, 146 failed, and 251 are pending (as of this writing). The remaining seven bills had either an unknown status or were vetoed by or sent to the governor for enrollment.

Although AV development and testing has accelerated in recent years, legislation specifically regarding AV crash reporting is still very limited or nonexistent at both the state and federal levels. According to a standing general order issued by NHTSA, incidents meeting the following criteria are required to be reported by an operator and a manufacturer within one day of each entity learning about the crash, followed by an updated report within 10 days of the incident (Johnson, Wilson, Pandya, & Dworkin, 2021):

- The crash occurred on a publicly accessible U.S. road.
- ADS/ADAS was engaged at any time within 30 seconds before the end of the crash.
- The outcome of the crash involved an air bag deployment, hospital treated injury, fatality, or vulnerable road users.

The following sections review AV definitions by state, highlighted/major pieces of legislation regarding AVs by state, and a summary of the state of AV legislation (and gaps in that legislation) across the U.S.

2.1 Definition of CAVs by State

California – "Autonomous vehicle" means any vehicle equipped with autonomous technology that has been integrated into a vehicle that meets the definition of level 3, level 4, or level 5 of SAE International's "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles, standard J3016 (APR2021)," as may be revised. 2021 CA S 500 (Min, 2021)

West Virginia – The term "autonomous motor vehicle" means one that conforms to level 3, level 4, or level 5 of the Society of Automotive Engineers automation level definitions specified in SAE International Standard J3016. 2021 WV H 2760 (Capito, 2021)

North Dakota – "Autonomous vehicle" means one equipped with an automated driving system. 2019 ND H 1418 (Ruby, 2019)

North Carolina – "Fully autonomous vehicle" means one equipped with an automated driving system that will not at any time require an occupant to perform any portion of the dynamic driving task when the automated driving system is engaged. If equipment that allows an occupant to perform any portion of the dynamic driving task is installed, it must be stowed or made unusable in such a manner that an occupant cannot assume control of the vehicle when the automated driving system is engaged. 2017 NC H 469 (Shepard, 2017)

New York – The term "autonomous vehicle technology" shall mean the hardware and software that are collectively capable of performing part or all of the dynamic driving task on a sustained basis, and the term "dynamic driving task" shall mean all of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints. 2017 NY S 2005 (Office of the Governor, 2017)

New Jersey – "Advanced autonomous vehicle" means one equipped with autonomous technology that has a driving automation level of 3, 4, or 5, as defined in the SAE J3016, which is an automated driving system standard issued by the Society of Automotive Engineers International and is used by the United States Department of Transportation for autonomous vehicle policy guidance. 2018 NJ AJR 164 (Benson, 2019)

Nevada – Existing law defines a fully autonomous vehicle as one that is equipped with an automated driving system which is designed to function at a certain level of driving automation. 2021 NV A 412 (Growth and Infrastructure, 2021)

Maine – "Autonomous vehicle" means any vehicle or motor vehicle equipped with a driving automation system. 2017 ME H 1204 (H S. , 2018)

Washington – "Autonomous" means a level four or five driving automation system as provided in the Society of Automotive Engineering International's standard J3016, as it existed on the effective date of this section, or such subsequent date as may be provided by the department by rule, consistent with the purposes of this section. 2021 WA S 5460 (Nguyen, 2021)

Arizona – "Autonomous Vehicle" means a motor vehicle that is equipped with an automated driving system. 2021 AZ H 2813 (Weninger, 2021)

Louisiana – "Autonomous commercial motor vehicle" means a motor vehicle used in commerce and equipped with an automated driving system, including those designed to function without a driver. 2019 LA H 455 (Landry, 2019)

Connecticut – "Fully autonomous vehicle" means a motor vehicle that is equipped with an automated driving system, designed to function without an operator and classified as level four or level five by SAE J3016. 2019 CT S 924 (Joint Committee on Transportation, 2019)

Florida – "Autonomous vehicle" means any vehicle equipped with an automated driving system; "fully autonomous vehicle" means one equipped with an automated driving system designed to function without a human operator. 2019 FL H 311 (Fischer, 2019)

Georgia – "Fully autonomous vehicle" means a motor vehicle equipped with an automated driving system that has the capability to perform all aspects of the dynamic driving task without a human driver within a limited or unlimited operational design domain. It will not at any time request that a driver assume any portion of the dynamic driving task when the automated driving system is operating within its operational design domain. 2017 GA S 219 (Gooch, 2017)

New Mexico – "Autonomous commercial motor vehicle" means a commercial motor vehicle, as defined in Subsection J of Section 66-1-4.3 NMSA 1978, which is being controlled by an automated driving system; "autonomous motor vehicle" means a motor vehicle that is being controlled by an automated driving system. 2021 NM H 270 (H G. , 2021)

Oklahoma – "Fully autonomous vehicle" means a motor vehicle equipped with an automated driving system designed to function without a human driver as a level 4 or 5 system under SAE J3016B. 2021 OK S 1541 (Rosino, 2022)

2.2 Highlighted AV Legislation

Alabama

SB125 describes a truck platoon as "A group of individual commercial trucks traveling in a unified manner at electronically coordinated speeds at following distances that are closer than would be reasonable and prudent without the electronic coordination."

SJR No.81 established a joint legislative committee to study self-driving vehicles.

Arizona

In Executive Order 2015-09, Governor Doug Ducey outlined necessary steps to be taken for the safe deployment of AVs. "Undertake any necessary steps to support the testing and operation of self-driving vehicles on public roads within Arizona."

Executive Order 2018-04 is an updated version of the Executive Order 2015-09, mandating the submission of necessary documents to AZDOT prior to testing a vehicle without a human operator.

Executive Order 2018-09 established the Institute of Automated Mobility as a collaborative platform between public universities and private AV companies to facilitate AV testing facilities and resources.

Arkansas

HB1754 defines a "driver assistive truck platooning system" and regulates vehicle testing with autonomous technology.

HB 1561 defines autonomous and fully autonomous vehicles. This bill also authorizes the operation of autonomous and fully autonomous vehicles under the AV pilot program approved by the State Highway Commission.

California

SB1298 authorizes the operation of AVs on public roads, regulates manufacturers' AV advertisements, and establishes required conditions to operate a vehicle without a human operator.

AB 1592 authorizes the Contra Costa Transportation Authority to conduct a pilot project for AV testing under 35 MPH.

AB 669 allows vehicle platooning in the state.

AB 1444 authorizes the Livermore Amador Valley Transit Authority to conduct a project on shared autonomous vehicles without a driver's seat, steering wheel, brake pedal, or accelerator pedal for demonstration purposes.

AB 87 allows authorities to confiscate AVs operating out of compliance.

AB316 states that an autonomous vehicle weighing 10,000 pounds or more will not be operated on the public roads without the physical presence of a human safety operator.

Colorado

SB213 regulates the operation of automated driving systems statewide. This bill also defines the automated driving system, human operator, and dynamic driving task.

SB 239 requires the Colorado DOT to consult with a stakeholder group to understand the impacts of new transportation technologies and corresponding business models.

Connecticut

SB 260 defines autonomous vehicle and other relevant terms. This bill also established a task force to study fully autonomous vehicles and established NHTSA's evaluation guidelines as standard for state.

Florida

FL SB 2500 allocated $2.5 million for the Tampa Bay Regional Transit Authority, with $1 million explicitly for the study of smart city innovations, including AVs.

FL HB 7027 allows drivers with valid licenses to drive AVs in the state.

FL HB 7061 allows the testing and operation of autonomous vehicles on state roadways. This bill considers level 4 automation vehicles as driverless vehicles.

Georgia

SB 219 allows an unlicensed person to operate a fully autonomous vehicle. It also defines requirements for operating a vehicle without a human operator.

HB 472 exempts non-leading vehicles in a coordinated platoon from the "following too close" law.

Hawaii

HCR 220 requests the attorney general to convene a task force on AVs.

HB 2253 develops a plan to establish requirements for AV testing and creates liability protection for AV manufacturers in the event of a crash.

Illinois

HB 791 defines automated driving system-equipped vehicles. It also provides rules indicating that local governments cannot prohibit AV usage on roadways.

HB 2575 allows fully autonomous vehicles to drive on state highways with or without a driver. This bill states that any liability involving fully autonomous vehicle incidents will be determined by the product liability law or by the common law negligence principles.

Indiana

HB 1290 defines a vehicle platoon and exempts platoon vehicles from the following distance rule.

Iowa

SF 302 defines an automated driving system and other relevant terms. It also mandates financial liability coverage to operate a vehicle equipped with an automated driving system and establishes rules related to crashes involving automated driving system-equipped vehicles.

Kentucky

SB 116 establishes rules for the operation of platoons, including that the platoon operator must inform the Kentucky State Police prior to the operation of the platoon.

Louisiana

LA HB1143 defines "autonomous technology" and develops highway regulatory provisions.

Maine

Executive order 2018-001 creates the Highly Automated Vehicles Advisory Committee to oversee the beneficial aspects of AV and assess, develop, and implement recommendations related to possible pilot projects to advance the technologies.

Maryland

HB 1013 establishes the Safe Autonomous Vehicle (SAVE) Act to supervise AV driving on state highways through eligible motor vehicle manufacturers.

Massachusetts

Executive order 572 formed an "AV Working Group" to encourage autonomous vehicles development and their component parts across Massachusetts.

Michigan

MI SB169 permits the testing of AVs under certain conditions.

SB 996 allows the operation of autonomous vehicles on highways under certain conditions and allows operation without a human driver behind the wheel.

SB 995 allows the operation of autonomous vehicles without a human under certain conditions and defines a minimum following distance rule (500 ft.) for commercial vehicle platoons.

Minnesota

Executive order 18-04 created a governor's advisory council on the operation and adoption of AVs.

Mississippi

HB 1343 allows the operation of platoons in the state based upon the approval from the Mississippi Department of Transportation and asks the Motor Carrier Division of the Department of Public Safety to develop acceptable standards for platoons.

Missouri

SB 811 allows the operation of the AVs and ride sharing services without any human operator under certain conditions. It also mandates the submission of financial responsibility from the owner to operate any vehicle equipped with ADS technologies on the road.

Nebraska

Legislative Bill No. 989 authorizes the operation of automated driving system-equipped vehicles, automated driving systems and driverless capable vehicles. It also defines the requirements to operate AVs without a human behind the wheel.

Nevada

(Nevada Legislature, 2015) Indicates that to be registered or sold, all testing AVs must have a certificate of compliance (482A.030, 190).

NV SB511 authorizes AV testing on public roads.

NV SB140 prohibits the use of cell phones and other wireless communication devices while operating AVs under certain conditions.

NV SB313 mandates insurance coverage for AV testing and indicates that the manufacturers are not liable for a crash involving an AV if a third party has converted a conventional vehicle into an AV.

NV AB 69 defines "full autonomous vehicle," "driver assistive platooning technology," and "automated driving system." It also specifies different requirements related to the operation of the AV network companies. This bill also allows the use of driver assistive platooning technology on the state highways.

New Hampshire

HB 314 allows companies or individuals to apply for permits to test AVs without a human operator and mandates the presence of an individual with a valid license to monitor the testing. An entity performing the test must submit proof of insurance for $5 million to the Department of Safety and Department of Motor Vehicles.

SB 216 establishes a pilot program for testing autonomous vehicles on public roads within the state. It also mandates an amount of at least $5 million for proof of insurance for testing the vehicles. This bill also establishes an autonomous vehicle advisory commission, which incorporates two members of the House of Representatives and one member of the Senate.

New Jersey

SB 2149 defines criteria for operating and testing an autonomous vehicle on public roads.

AJR 164 established the "Advanced Autonomous Vehicle Task Force" to conduct necessary studies on advanced autonomous vehicles and develops necessary laws and regulations for the safe integration of advanced autonomous vehicles on state highways.

New York

SB 2005 defines autonomous vehicle technology and the driving task. It specifies regulations related to the operation and testing of autonomous vehicles.

AB 10586 established an AV committee to study AV operation and testing for policy updates and development.

North Carolina

HB 469 established a committee on AVs and defines regulations for the operation of AVs on public highways. This bill indicates that a driver's license is not necessary for operating AVs.

HB 716 describes rules related to the following distance of platoons.

North Dakota

HB 1202 calls on the DOT to work with the AV industry to study AV technology so that the findings can be used to develop state legislation on AVs.

Ohio

Executive order 2018-01K established the DriveOhio program, with a focus on the development, design, and testing of intelligent transportation systems in Ohio.

Executive order 2018-04K authorizes test and pilot programs for AVs on public roads.

Oregon

HB 4063 established a task force for the coordination of AV programs and policies. This bill permits the operation of AVs on state highways under certain conditions and establishes requirements for commercial AVs to have vehicle liability insurance to operate.

HB 4059 allows vehicle platooning on state roads.

Pennsylvania

SB 1267 allocated up to $40 million for local governments to upgrade and implement intelligent transportation systems.

HB 1958 allows the operation of certain vehicles to platoon.

Rhode Island

SB 2514 did not become law. However, this bill defines the autonomous vehicle as, "Any vehicle equipped with autonomous technology." The bill was intended to allow the operation of AVs on state roadways and included provisions requiring the Department of Motor Vehicles to prepare an AV report for the state legislature.

South Carolina

HB 3289 establishes minimum following distance laws. However, this distance is not applicable for commercial vehicles equipped with cooperative adaptive cruise control or any other automated driving technology.

South Dakota

SB 139 did not become law. This bill proposed fees and application requirements for manufacturers to test AVs and defined operational requirements to test AVs.

Tennessee

TN SB 598 prohibits local governments from banning AVs.

TN SB 2333 allows operators to use the electronic monitor display while operating an AV.

TN SB 1561 mandates certification for manufacturers for vehicle testing, selling, or leasing. It also imposed a tax for the operation of AVs on the public highways.

TN SB 0151 introduces the "Autonomous Vehicle Act" and other regulation for the operation of AVs on public roads.

Texas

SB 2205 defines automated motor vehicles and allows the unmanned operation of AVs in the state under certain conditions.

HB 1791 allows vehicle platooning systems equipped with connected braking systems.

Utah

HB 373 authorizes the DOT to initiate programs for testing connected vehicle technology.

HB 280 mandates a study on AVs to ensure compliance with NHTSA and AAMVA standards.

SB 56 amends previous House Bill 373 and modifies the definition of the "connected platooning system." It also exempts the platooning system from the following distance rule.

Vermont

HB 494 requires the secretary of transportation to convene a meeting of stakeholders from public and private sectors with expertise on AVs. The secretary is required to meet with House and Senate committee members on policy recommendations and legislations related to AVs.

SB 149 mandates permit application for AV testers from the Traffic Committee to ensure compliance.

Washington

HB 2970 created the AV Work Group and establishes regulations for AV deployment and operation in the state. The AV Work Group is designed to make recommendations to the Transportation Commission.

EB 17-02 established an AV work group to advance policy and legislation for the deployment of AVs.

West Virginia

HB 4675 authorizes the operation of autonomous delivery vehicles at lower speeds on certain roads.

HB 4787 allows the operation of highly automated motor vehicles and establishes license and insurance requirements.

Wisconsin

SB 695 defines platoons and exempts them from the following distance law.

Executive order 245 created a governor's steering committee for the advancement of AV testing and operation.

2.3 Summary and Gaps in Legislation

NHTSA is developing a crash database for CAV safety assessments. However, there are certain limitations to the current NHTSA data collection programs. CAV manufacturers do not need to report the number of cars that are on the road, how many miles they have traveled, or whether the automated system was engaged at the time of a crash (Associated press, 2022). Jay Grimes, director of federal affairs of the Owner-Operator Independent Drivers Association (OOIDA), stated, "We agree with NHTSA's acknowledgment that Level 2 (advanced driver assistance systems) are not designed to and are not able to perform critical operating components of the driving task. We also support NHTSA's goal of gathering more data on all autonomous vehicles, but crashes will continue without more transparency from AV manufacturers. We believe NHTSA should expand reporting requirements throughout the development and testing processes, not just after a crash occurs. This will help federal regulators, the general public, and professional drivers better understand AV safety performance or lack thereof." (Fisher, 2022).

Currently, crash reports submitted to NHTSA regarding whether an automated system was engaged or not at the time of crash are often the statement and judgment of a first responder with limited education on the issue. Meanwhile, existing laws and legislation are mainly focused on the definition and deployment of CAVs rather than policies and reporting in the event of a crash. Therefore, with the lack of a standard crash reporting format in practice for CAVs, many CAV crashes go unreported. Although the total number of crashes involving CAVs is estimated to be significantly lower than for non-CAVs, there should be proper guidance on investigating a CAV-related crash given the technology's increasing adoption and deployment (Insurance Information Institute, 2022). Of the 109 enacted CAV-related bills, only 24 were related to crash reporting. Furthermore, 38 of the 109 bills were related to CAV testing. Of the 109 bills, 59 were related to the commercial operation of autonomous vehicles. Figure 2.1 shows the enacted bills involving CAV crash reporting across U.S. Figure 2.2 represents states that have enacted bills for commercial AVs. Figure 2.3 shows states that have enacted bills for AV testing and Figure 2.4 shows states that allow autonomous truck platooning.

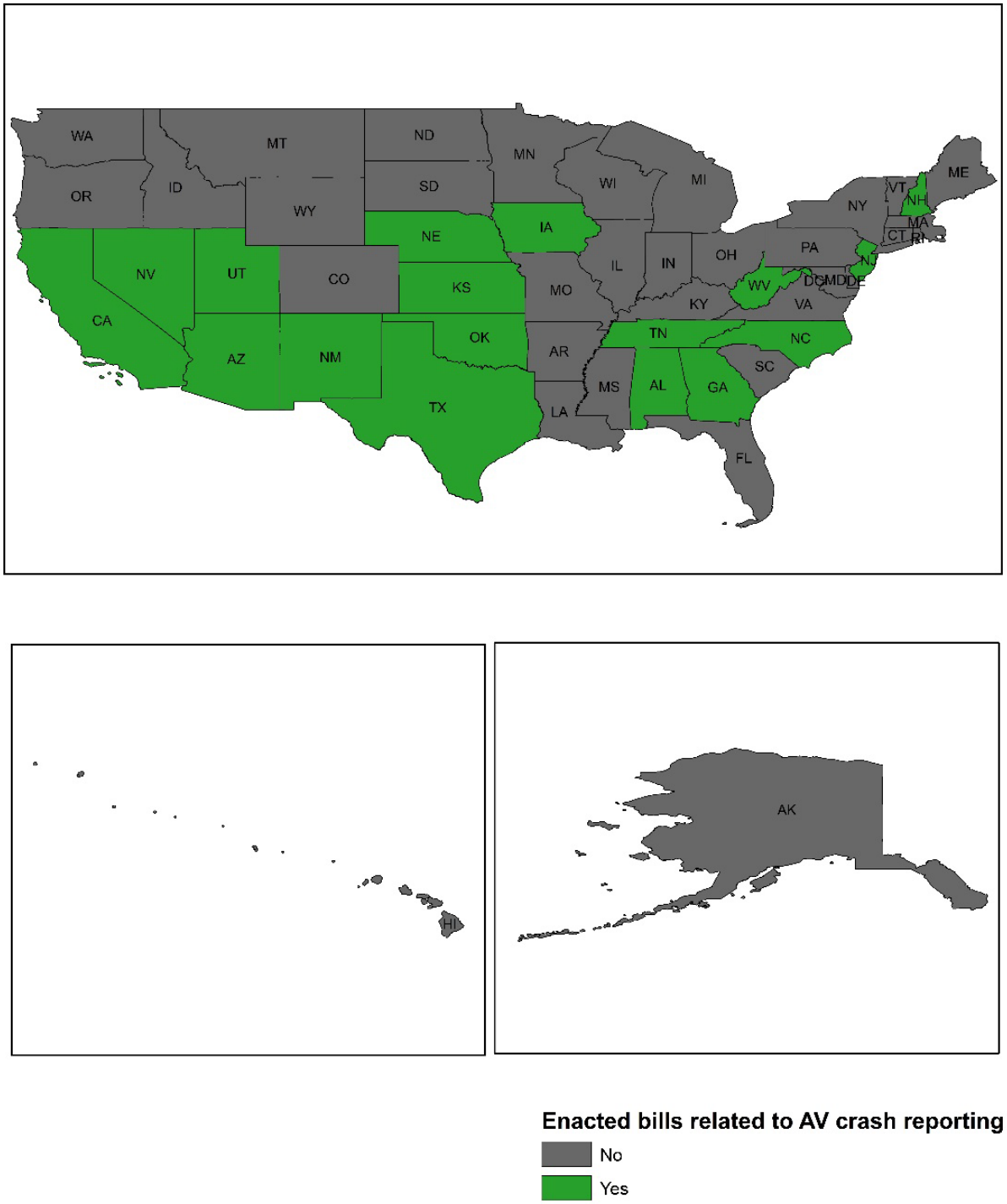

Figure 2.1 Enacted bills related to AV crash reporting by state (NCSL, 2022)

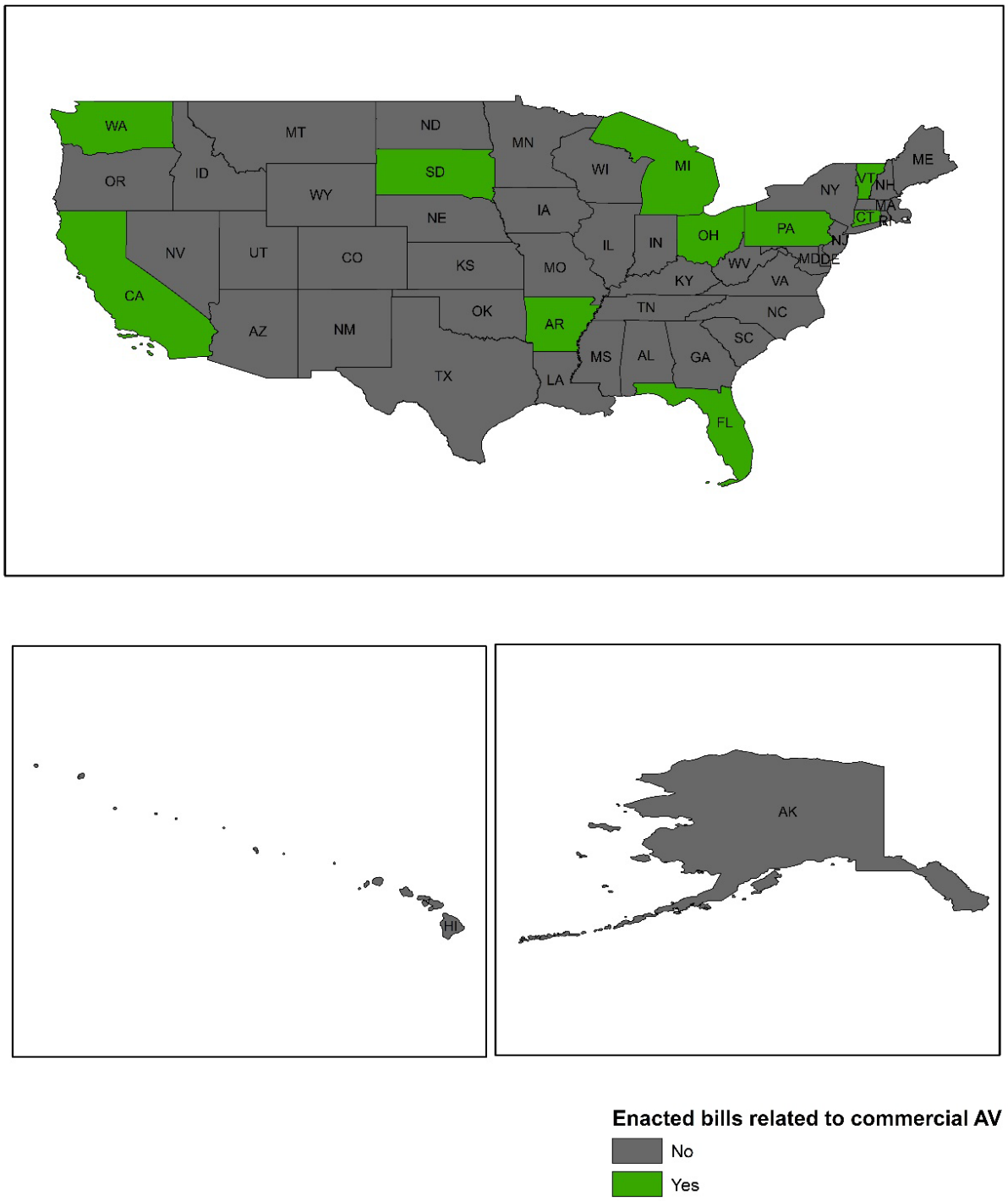

Figure 2.2 Enacted bills related to commercial AV by states (NCSL, 2022)

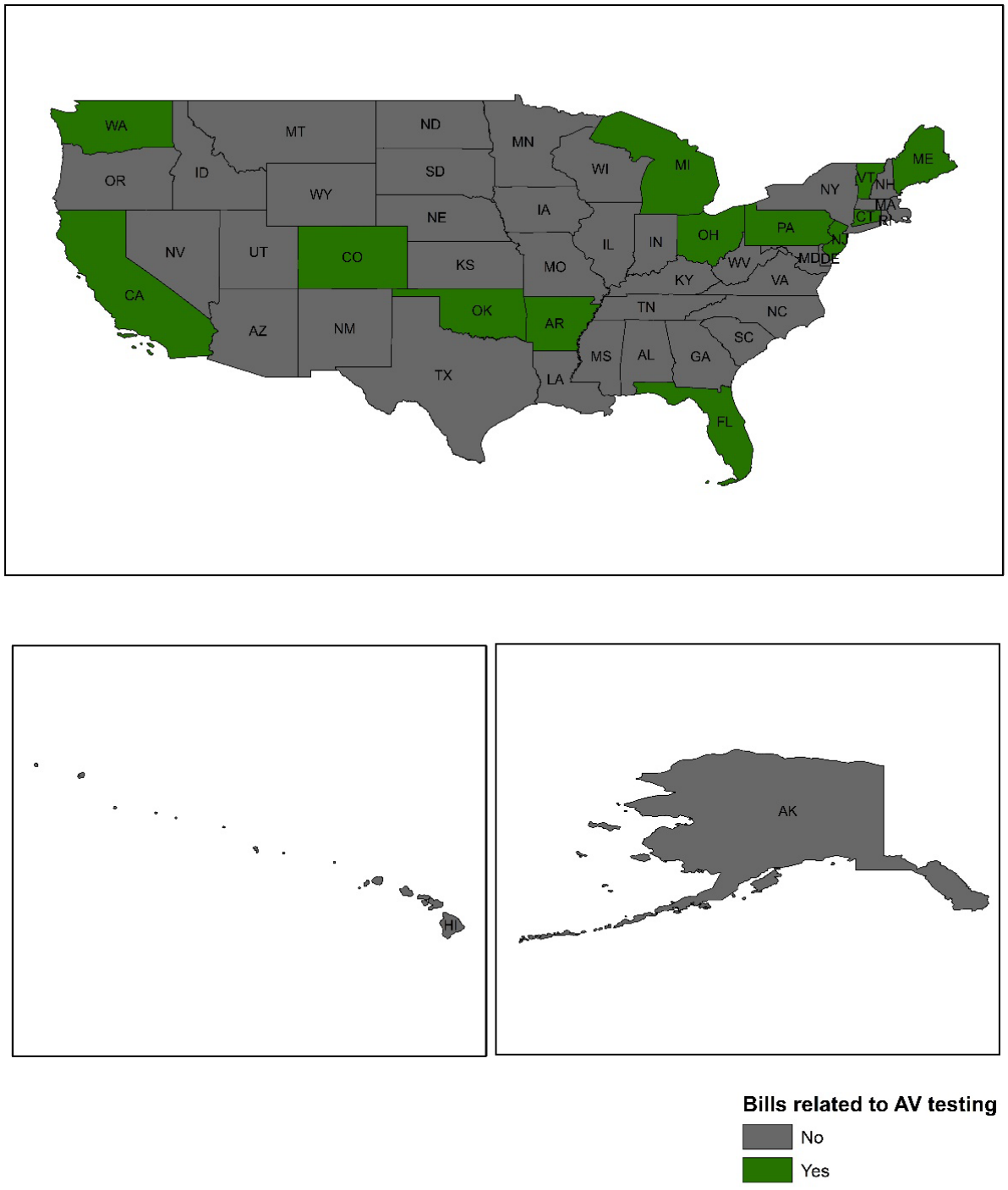

Figure 2.3 Enacted bills related to AV testing by state (NCSL, 2022)

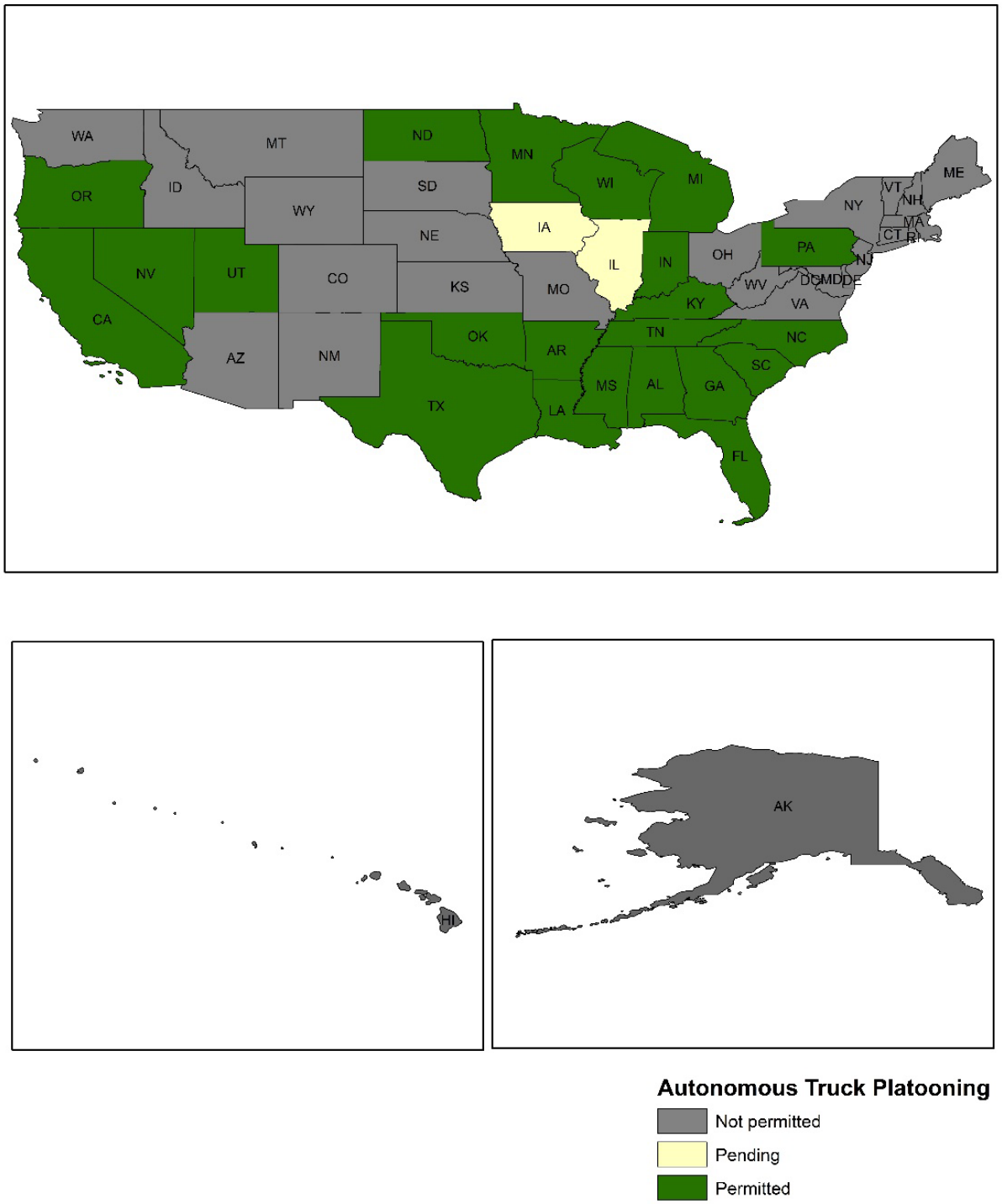

Figure 2.4 Bill status of autonomous truck platooning by state (NCSL, 2022)

3. SURVEY OF STATE OFFICIALS AND PRACTICES

A review of legislation is a limited approach to such a quickly advancing and changing issue as CAVs. Therefore, a mixed method approach was adopted for this study to review U.S. crash reporting practices. In order to obtain more detailed information about actual practice around CAVs, a questionnaire survey was developed, and is shown in Appendix A. The raw data/responses from the questionnaire are shown in Appendix B. The leading personnel on crash reporting and/or CAVs from each state's DOT and safety departments were invited to complete the questionnaire. All responses were kept anonymous (aside from the affiliated state) since the responses represented general practice and conjecture rather than officially published stances or policies. Conducted parallel to the survey was a review of each state's crash report form and manual currently in use. Altogether, 50 states, the District of Columbia, and Puerto Rico were contacted for the survey and included in the crash reporting review.

3.1 States Having CAV Crash Reporting Practices

Nine states were identified to have some form of CAV crash reporting practices and were further studied. An exception here is Pennsylvania, where the CAV crash reporting practices were mentioned in the crash reporting instruction manual, but the actual crash form did not have fields about vehicle automation.

3.1.1 Automation Levels

This section focuses on how different levels of automation present and engaged in the crash vehicle are considered in crash reports. The summary of this review is presented in Table 3.1. Of these nine states, Ohia was the only one not to report the level of automation present in the crash vehicle. Arizona's form did not classify the level of automation present in the vehicle during the time of the crash; it included the check box to report whether the vehicle is autonomous or not. Pennsylvania's crash reporting instruction manual classified vehicle automation into three levels: no automation, partial automation, and full automation. The remaining seven states, Colorado, Louisiana, Maine, Michigan, Mississippi, Nebraska, and Ohio, had the practice of classifying the automation level present in the crash vehicle into six levels as defined in MMUCC 5th edition: no automation, driver assistance, partial automation, conditional automation, high automation, and full automation. A different practice in Nebraska's form was all levels of automation (up to five) had to be selected instead of selecting the highest level of automation present in the vehicle in the rest of the states.

Besides the automation level present in the crash vehicle, crash reports across nine states had provisions to record the automation level engaged in the vehicle during the crash. One exception to this was Pennsylvania, where the manual did not ask to record the automation level engaged in the vehicle during the crash. Arizona and Colorado had the practice of classifying whether the crash vehicle was controlled by a manual driver or autonomous system without actually identifying the automation level engaged. The crash forms of Louisiana, Maine, Michigan, Mississippi, Nebraska, and Ohio included six levels of automation as defined in MMUCC 5th edition: no automation, driver assistance, partial automation, conditional automation, high automation, and full automation. Again, Nebraska's crash report form necessitated selecting up to five automation levels engaged in the vehicle during the time of the crash instead of selecting the highest level engaged in other states. Although the Michigan and Ohio crash reporting instruction manuals talked about the dynamic driving task, driving mode, and request to intervene, their crash report forms did not have the actual fields/checkboxes to report this information.

Table 3.1 Automation levels considered in the crash reports across nine states having AV crash reporting practice

State	Automation level present in the crash vehicle				Automation level engaged or vehicular control			Revision year*
	Not reported	Absent	3-levels	6-levels	Not reported	Driver or AV	6-levels	
AZ		✓				✓		2021
CO				✓		✓		2019
LA				✓			✓	2022
ME				✓			✓	2018
MI				✓			✓	2021
MS				✓			✓	2022
NE				✓[a]			✓[a]	2021
OH	✓						✓	2019
PA[b]			✓		✓			2021

Notes: 3-levels = no automation, partial automation, full automation; 6-levels = no automation, driver assistance, partial automation, conditional automation, high automation, full automation; *the latest year among the revisions of crash form or manual; [a]choose up to five automation levels; [b]based on crash report instruction manual.

3.1.2 Narratives for CAV Crash Information

This section is dedicated to understanding how nine states having some mechanism of AV crash reporting consider including AV crash information on the narrative field in their crash report forms. The discussion presented here is based on the responses collected from the survey of state DOTs, which is shown in Table 2. Since these states' crash report forms have dedicated fields to record AV information as stated in Section 5.1.1, most of the state DOT respondents indicated that narrative fields are not used to report AV information, as expected. However, some respondents stated that the narrative field in the crash report can be used to include additional information about vehicle automation and crash details that are not explicitly recorded in checkboxes. Notable was a response from Michigan where the crash form narrative field was identified to be used to elaborate the automation level recorded in the checkbox: "If checkbox records that vehicle had automation level 1, the narrative could be used to indicate that the vehicle had adaptive cruise control."

3.1.3 Plans to Update Crash Reporting

The state DOT representatives were asked about their plans to update crash reporting practices to accommodate AV crash information. The summary of responses to this question for the states currently having AV crash reporting practices is presented in Table 3.2. Since crash report forms for these states were updated only after the release of MMUCC 5th edition in 2017 (see Table 3.1), most of the states responded that they do not have any immediate plan to update their crash report forms. Arizona, whose AV crash reporting protocol is quite inferior because it lacks a classification of the automation levels present and engaged in the crash vehicle compared with the other states, had anticipated updating its crash report form in the next two years, but they have not discussed the specific changes related to AVs. Michigan and Pennsylvania DOTs stated that their next crash report form update is likely to follow the release of the next edition of MMUCC. Nebraska DOT indicated that its crash report form needs to be updated only when AVs are widely available on real roads.

Table 3.2 Reporting AV crash information as narratives and plans to update crash reports across nine states having AV crash reporting practice

State	AV crash information on the narrative field?	Plans to update crash reporting
AZ	No.	We anticipate changing the crash report in the next two years. We have not yet discussed any changes related to AVs.
CO	N/A	There are no immediate plans to update the crash report form in Colorado.
LA	N/A	We have a new crash report that began on 7/1/2021 and will be used statewide by 12/31/2021. This new crash report is nearly 100% MMUCC aligned. This is the first report with any AV information. The only AV information being collected is what is recommended by MMUCC.
ME	No. The officer is only asked to select if the vehicle was equipped with automation and if equipped, to what level and if the automation was in use at the time of the crash.	No changes are expected at this time.
MI	Michigan's crash form has a narrative that is a free text field. This allows the officer to record other information to help them recall any specifics about the crash. For example, a level 1 on the crash report may be indicated on the crash report, but the officer may explain in the narrative that the vehicle had adaptive cruise control.	Michigan is MMUCC compliant for all AV fields until a new edition is published.
MS	N/A	N/A
NE	Possible to have some statements in the crash description by the officer.	Will continue to adapt as AVs are more widely available.
OH	No.	The next update aligns with the MMUCC release, 1/2024.
PA	No, just check the boxes in the form. However, the industry is required to report and provide additional information directly to the DOT.	We are not planning to change the crash reporting form, but we are updating the crash reporting protocols from the industry.

N/A: respondent did not answer the question.

3.2 States Without CAV Crash Reporting Practice

This section discusses the crash reporting practices across 25 states that do not currently have any standard practice of reporting AV crashes. The summary of the review of crash report practices for these 25 states is presented in Table 3.

3.2.1 Latest Update on Crash Report Form

Based on the review of crash report forms and/or instruction manuals across the states, the years of their latest update are reported in Table 3. Among 25 states we have data from, the oldest crash report form/manual was from Wyoming (updated in 2007), whereas the latest (updated in 2022) came from New Jersey, Oregon, and Texas. The distribution of update years across the states shows that 17 out of 25 states had updated their crash report form or manual in or after 2018. This summary concludes that the majority of the crash forms updated after the release of MUMMC 5th edition in 2017 did not consider its recommendations related to including AV-related fields.

Table 3.3 Reporting AV crash information as narratives and plans to update crash reports across states without standard AV crash reporting practice

State	Revision year*	AV crash information on the narrative field?	Plans to update crash reporting to include AV information
AL	-	-	-
AK	2020	We do not have a process for reporting autonomous vehicles. The officer or driver would just write it in the narrative.	There is currently no plan to improve reporting of AVs.
AR	2017	N/A	We are in the process of an update to MMUCC 5th edition standards which should reflect the appropriate data for AVs. The update is scheduled for January 2023.
CA	-	-	-
CT	2015	Currently, there are no checkboxes for AVs and officers are not asked to document anything special related to AVs in the narrative.	In the next year when MMUCC 6th edition is released, we plan to update the crash report form and add fields specific to AVs. We will wait to see what MMUCC 6 recommends and then develop the form to meet the needs of the CTDOT with respect to AV data collection.
DE	-	-	-
DC	-	-	-
FL	2019	Not to my knowledge. Neither the phrase "connected vehicle," nor the phrase "autonomous vehicle," nor the acronym CAV, appear anywhere in the crash report form instruction manual or on the form itself.	N/A
GA	2018	None.	None at this time.
HI	2018	Not at this time.	No plans at this time.
ID	2011	No, there is not.	We currently do not have a plan.
IL	-	-	-
IN	-	-	-
IA	2015	No specific instruction has been made at this time.	Our agency is waiting for the MMUCC 6th edition, which has been delayed until 2024. We would anticipate not being able to have a

			new version of our crash report form until 2026 with information about autonomous vehicles. This would allow us time to make form changes, database changes, and thorough testing before going live.
KS	2019	I do not recall any mention of it in narratives over my 15 years.	The crash report for Kansas is planned to be revamped to comply with MMUCC 6th edition within 24-48 months.
KY	-	-	-
MD	2017	Not yet.	MSP is part of a statewide task force regarding AVs which is reviewing the MMUCC 5th edition and is considering updating the 2015 ACRS report to include more MMUCC 5th edition elements, including AV attributes. It is likely to be updated in 2023.
MA	-	-	-
MN	2016	Not at this time. VIN and vehicle information is in the report, but nothing specifically about automation.	There is no immediate plan at this time. We do have a research project to better understand AV-involved crashes. We are planning on using VIN at this time to classify and find vehicles.
MO	2019	There are currently no checkboxes of fields on the crash report to collect information on AVs other than the crash report narrative.	We are tentatively planning to implement a new crash report on 01/01/2024. The new report will have fields and values pertaining to AVs. The fields include the following: 1) Automation system/s in vehicle - yes, no, unknown; 2) Automation system levels engaged at the time of the crash: based on the SAE J3016 chart; 3) Driver ceded control - yes, no, unknown, not available.
MT	-	-	-
NV	2021	AV involvement is reported within the officer's written narrative.	There is currently no schedule for updating. AV crashes are still very rare in NV. If/when they become more common, we will address our data collection needs with an update.
NH	-	-	-
NJ	2022	None at this time.	NJ is in its infancy with AVs. Pre-pandemic, the Governor's Office had convened a Task Force to begin crafting regulations. Fast forward to today, more pressing issues have emerged, leaving AVs unregulated at this point. Police training for crash report preparation has a separate module for AV; training is ongoing.
NM	-	-	-
NY	2018	Not at this time	DMV is in the process of updating their crash reporting system at this time. It is estimated that the new system will be installed in early 2024. The crash report will be revised at that time as well. Previous discussions have been held with other state agencies, including enforcement agencies on the need to include AV information in the new crash report. The

			values to be used and how that information will be captured in the new system and on the new report is yet to be determined.
NC	2018	No standard practice.	The crash report form is currently being revised (estimated to be finalized by end of 2022). For the first time ever, it will have fields related to vehicle automation. There will be three fields: 1) Automation system in vehicle - yes, no, unknown; 2) Automation system levels in the vehicle - none, partial, full, unknown; 3) Automation system levels engaged at the time of the crash – none, partial, full, unknown.
ND	-	-	-
OK	2011	No.	Oklahoma is fielding a new crash report on 01 July 2022 that will include AV information.
OR	2022	Not at this time.	There is a task force that is working on the topic and following what ODOT's next steps will be.
PR	2021	There is no current practice of reporting the involvement of AVs in PRC narratives.	The state is waiting for the updated MMUCC (6th edition) to be published in order to update the PCR.
RI	-	-	-
SC	2019	Not at this time.	The crash form is currently undergoing an update to capture more MMUCC elements. There is no way currently for the officer to know what level of autonomy and what was being used in the particular vehicle. Having DMV update their registration process to include this information would help.
SD	-	-	-
TN	2020	N/A	We are following MMUCC and ANSI D.16 and will likely revisit AV definitions for our crash report form in 2024 after the next MMUCC release.
TX	2022	The crash report form currently utilized by law enforcement does not include an AV field. It is a separate field that is captured by analyzing the narrative and identifying which unit is an AV. This information is captured for any unit with a unit description of motor vehicle, towed/pushed/trailer, or non-contact.	The plan is to implement a new crash form to be effective 1/1/2023 which will capture the following two fields: 1) Autonomous unit - this field is intended to capture whether a unit was equipped with driving automation capabilities. The valid values can be yes, no, or unknown. 2) Autonomous level engaged - This field is intended to capture the degree of driving automation a unit had engaged at the time of the crash. The valid values can be no automation (0), driver assistance (1), partial automation (2), conditional automation (3), high automation (4), full automation (5), automation level engaged unknown (6), or unknown (99).
UT	2021	We do not have any fields for the officer on autonomous vehicles at this time.	No plans at this time
VT	2020	We do not collect this information on our crash form yet.	We will be reviewing the crash form this summer for updates.

VA	-	-	-
WA	-	-	-
WV	-	-	-
WI	-	-	-
WY	2007	Currently, we don't have AV-related fields on our crash report, however, the narrative field could be used for it.	The State of Wyoming is in the process of updating our crash form to implement AVs in the crash report and the newest MMUCC standards. We hope to purchase a newer electronic reporting system to get away from our current software. We hope to make the switch on January 1st of 2025 or sooner. MMUCC will be our standard lining.

3.2.2 Narratives for CAV Crash Information

For 25 states that did not have standard checkboxes to record AV information in crash reports, the representatives from those state DOTS were asked about their practice of recording AV-related information as narratives in the crash report; the responses are presented in Table 3. Our review shows that only a few states (Alaska, Missouri, Nevada, Texas, and Wyoming) had identified the use of the narrative field to record vehicle automation in their crash reports, whereas most of the states reported having no such practice. Texas DOT reported it has been using the crash narrative to identify AV information and analyze the AV-involved crashes. This response highlights the need for a standard practice of recording AV information in the crash forms. However, a surprising fact is that the Texas DOT updated its crash report form in 2022 but still did not include the standard checkboxes related to AVs. Apart from crash narratives, Minnesota DOT is using the vehicle identification (VIN) number to identify if the automation features were present in the crash vehicles.

3.2.3 Plans to Update Crash Reporting

These 25 state DOT representative summary responses about their plans to update crash reporting practices to accommodate AV crash information is presented in Table 2. Vermont and South Carolina have been currently reviewing their crash report forms to accommodate for AV crashes, however, no specific timeline of the update was reported. Oregon has currently set up a task force to study the necessity of having AV information in its crash report form, and the state department is waiting for the taskforce's recommendations. Oklahoma planned to release an updated crash report form, which includes reporting AV information, in July 2022. States that planned to implement updated crash report forms with AV-related fields by early 2023 are Arkansas, North Carolina, Texas, and Wyoming. Maryland planned to finalize its crash form updates sometime in 2023. Missouri has planned to implement the updated form at the start of 2024. New York and Tennessee are planning to finalize their updates in 2024. Kansas hoped to have its update in the next two to four years. Connecticut and Puerto Rico are waiting for the sixth edition of the MMUCC for updating their crash report forms, whereas Iowa has planned to update its form in 2026. The states that reported not having current plans to update their crash report forms are Alaska, Georgia, Hawaii, Nevada, New Jersey, and Utah. In summary, a notable number of states (19 of 25) have some definite plan to update their existing crash reporting practices to include AV information.

Some state DOT representatives talked about the AV attributes to be included in their updated crash report forms. Here we discuss the similarities and differences in their update plans in terms of the AV attributes likely to be included in their updated crash report forms. Arkansas and Maryland clearly specified that they would follow MMUCC 5th edition recommendations in their updates; whereas Connecticut, Iowa, Kansas, Puerto Rico, and Tennessee were reportedly waiting for the release of

MMUCC 6th edition for their updates. Wyoming was clear about following the latest MMUCC guidelines in its next form update. Missouri stated that its updated from will have three fields related to AVs: 1) Automation system/s in vehicle – yes, no, unknown; 2) Automation system levels engaged at the time of the crash: based on the SAE J3016 chart; 3) Driver ceded control – yes, no, unknown, not available. Texas has updated its form similarly to that of Missouri except without the "driver ceded control" field. North Carolina's updated crash form will also have three fields related to AV: automation system in vehicle, automation level present, and automation level engaged, similar to that recommended by MMUCC 5th edition. However, the state will not classify automation levels based on the SAE chart; instead, the classification would be none, partial, full, or unknown. New York has yet to decide on the details of the AV-related fields to be included in its updated form. South Carolina has identified a slightly different approach to assess automation information for crash vehicles: detailed information on vehicle automation during vehicle registration so that the same information can be accessed when needed. This review indicates that although most of the states are likely to follow the MMUCC recommendations, some states have slightly different plans to include AV information in their crash report forms.

Some respondents specified their reasoning behind not having a specific plan to update crash report forms to include AV information. New Jersey has realized the importance of AV information in the crash report and has started to provide training to crash responders, but the focus is on more pressing issues, leaving AVs unregulated. Nevada has not identified the need to include AV information in crash reports at this time, but would make updates when more AVs are on Nevada roads.

3.3 Summary

The survey aimed to gather information about state DOTs' current practices and future plans for reporting CAV-related crashes. Key findings from the survey included:

- **States with CAV Crash Reporting Practices:** Nine states were found to have some form of CAV crash reporting practices, with most classifying the level of automation in crash vehicles according to the Model Minimum Uniform Crash Criteria (MMUCC) 5th edition. However, there were variations in how states recorded automation levels during crashes and in the use of narrative fields for additional information.
- **States without CAV Crash Reporting Practices:** Twenty-five states lacked standard practices for reporting CAV crashes. Most states had updated their crash report forms after the release of MMUCC 5th edition in 2017, but few incorporated its recommendations on including CAV-related fields. Only a few states used narrative fields to record CAV information, highlighting the need for standardization.
- **Future Plans for Crash Reporting:** Most states without CAV crash reporting practices have plans to update their crash report forms to accommodate CAV information. Many states plan to follow the MMUCC 5th edition recommendations or wait for the release of MMUCC 6th edition. A few states, however, have different approaches to incorporating CAV information in crash reporting.

Overall, the survey revealed a lack of uniformity in CAV crash reporting practices across states and highlights the need for standardized approaches and guidelines to improve the collection and analysis of CAV-related crash data.

4. RECOMMENDATIONS

As the transportation landscape evolves with the rapid development of CAVs, it is imperative for state DOTs and policymakers to establish comprehensive strategies for CAV crash reporting and legislation. Drawing upon the findings and analyses presented in this report, a series of recommendations are proposed to address the existing gaps and challenges in CAV crash reporting practices, with a focus on enhancing data collection, legislative frameworks, education, collaboration, and awareness.

4.1 Standardization of Crash Reporting Practices

Standardizing crash reporting practices across all states is paramount to ensure consistent data collection and analysis. State DOTs, in collaboration with relevant stakeholders (including law enforcement agencies, CAV manufacturers, and academic institutions), should work toward developing standardized crash report forms. These forms should include specific fields for recording CAV involvement, automation levels present, and engaged automation levels during crashes, aligning with guidelines such as the Model Minimum Uniform Crash Criteria (MMUCC). By adhering to standardized reporting practices, states can facilitate accurate data collection and enhance the reliability and comparability of crash data across jurisdictions. Here are several key aspects to consider when expanding on this recommendation:

Integration of Standardized Data Elements: Standardized crash reporting protocols should incorporate specific data elements related to CAV technology, such as automation levels, system engagement status, and CAV manufacturer information. These data elements should align with industry standards and best practices, such as those outlined in the MMUCC guidelines. Additionally, states should consider incorporating emerging data elements and metrics relevant to CAV safety and performance, such as sensor activation status, system malfunctions, and intervention requests. By integrating standardized data elements into crash reporting systems, states can capture comprehensive information about CAV incidents, facilitating more robust analysis and evaluation.

Adoption of Common Reporting Formats: State DOTs should advocate for the adoption of common reporting formats and data standards across jurisdictions to facilitate interoperability and data sharing. This can involve promoting the use of standardized crash report forms, data schemas, and electronic data interchange formats compatible with existing reporting systems. Additionally, states should encourage collaboration with neighboring jurisdictions, regional partners, and national organizations to align reporting practices and facilitate data exchange. By adopting common reporting formats, states can streamline data collection and analysis efforts, enabling more efficient monitoring and evaluation of CAV safety performance. Furthermore, the implementation of electronic reporting systems should be considered to streamline data collection processes and improve data accuracy. Electronic reporting systems can provide automated prompts and validation checks to ensure that all relevant information is captured consistently, reducing the likelihood of reporting errors and enhancing the overall quality of crash data.

Periodic Review and Updates: State DOTs should establish mechanisms for periodic review and updates of standardized reporting protocols to accommodate evolving technology, regulatory requirements, and industry standards. This can involve convening stakeholder workshops, conducting comprehensive reviews of reporting practices, and soliciting feedback from industry experts and stakeholders. Regular updates to standardized reporting protocols ensure that reporting practices remain current, relevant, and aligned with the latest developments in CAV technology and regulation. By staying proactive and adaptive, states can ensure the continued effectiveness and relevance of standardized crash reporting practices in the dynamic CAV landscape.

4.2 Legislative Updates

State legislatures must enact legislation to explicitly address CAV crash reporting requirements. Legislation should mandate the reporting of CAV crashes by both operators and manufacturers, defining the criteria for reporting incidents such as the types of incidents requiring reporting, the timeline for reporting, and the entities responsible for submitting reports. Additionally, legislative frameworks should be updated to address liability and insurance issues related to CAV crashes, providing clarity and guidance for stakeholders in the event of CAV-related incidents. It is recommended that state legislatures collaborate with industry experts, legal scholars, and advocacy groups to develop comprehensive legislative frameworks that reflect the complexities of CAV technology and its implications for roadway safety. By incorporating diverse perspectives and expertise, states can develop legislation that strikes an appropriate balance between promoting innovation and protecting public safety. Key aspects of legislative updates to consider:

Reporting Requirements: Legislation should outline clear criteria for reporting incidents involving CAVs, specifying the types of incidents that must be reported (such as crashes involving injury or property damage) and the time frame within which reports must be submitted. Additionally, the legislation should identify the entities (operators, manufacturers, law enforcement, etc.) responsible for reporting.

Liability and Insurance: Laws should clarify liability and insurance issues related to CAV crashes, providing clear guidance on the distribution of responsibility in CAV-related incidents. This includes addressing questions such as who is liable when a CAV is involved in a crash, and what insurance coverage is required for CAV operators and manufacturers.

Collaboration with Industry and Legal Experts: State legislatures should collaborate with industry experts, legal scholars, and advocacy groups to develop comprehensive legislative frameworks that balance promoting innovation with protecting public safety. This can involve consultation on topics such as CAV technology capabilities, potential risks, and legal implications.

Flexibility for Technological Advancements: Legislation should be adaptable to accommodate advancements in CAV technology. This includes provisions for periodic reviews and updates to the legislative frameworks to ensure they remain current and relevant in light of new developments.

Consistency Across States: To promote consistency and interoperability, state legislatures should strive to align their CAV-related laws with those of other states, as well as with federal regulations and international standards where applicable.

4.3 Enhancement of NHTSA Reporting Requirements

The National Highway Traffic Safety Administration (NHTSA) should expand reporting requirements for CAV manufacturers to include additional data, such as the number of vehicles on the road, miles traveled, and whether the automated system was engaged at the time of a crash. By enhancing reporting requirements, the NHTSA can obtain more comprehensive data for safety assessments and regulatory oversight, enabling informed decision-making and the development of effective safety measures. Moreover, the NHTSA should establish clear guidelines and protocols for CAV crash reporting, outlining the specific information that manufacturers are required to report and the timeframe for reporting incidents. These guidelines should be regularly updated to reflect advancements in CAV technology and emerging safety considerations, ensuring that reporting requirements remain relevant and effective.

4.4 Education and Training Programs

Education and training programs should be developed to provide specialized training on CAV technology and crash reporting protocols to first responders, transportation officials, and other relevant stakeholders. These programs should cover topics such as CAV technology fundamentals, crash scene assessment procedures, and the importance of accurate and consistent reporting. By equipping stakeholders with the necessary knowledge and skills, states can enhance the quality and reliability of CAV crash data and improve response capabilities in the event of CAV-related incidents. Additionally, ongoing education and training initiatives should be established to keep stakeholders informed about developments in CAV technology and changes in crash reporting requirements. These initiatives can take the form of webinars, workshops, and online courses, providing stakeholders with opportunities to stay updated on best practices and emerging trends in CAV crash reporting. Key aspects of education and training programs to consider:

Specialized Training for First Responders: First responders, such as law enforcement officers and emergency medical personnel, should receive targeted training in CAV technology and crash reporting protocols. This training can include how to identify CAVs at crash scenes, how to assess vehicle conditions and damage, and how to collect relevant data accurately. Understanding the unique characteristics of CAVs will enable responders to handle incidents effectively and efficiently.

Crash Scene Assessment Procedures: Training programs should cover best practices for crash scene assessment, including how to gather and document CAV-specific information such as automation levels, system engagement status, and potential malfunctions. Proper assessment and documentation at the scene will contribute to more reliable and comprehensive crash reporting.

Ongoing Education Initiatives: As CAV technology continues to evolve, ongoing education initiatives should be established to keep stakeholders updated on new developments and changes in crash reporting requirements. This can include webinars, workshops, online courses, and other formats that provide access to the latest information and best practices.

Training for Transportation Officials: State DOTs should provide training for their employees on CAV crash reporting protocols, including how to interpret and analyze CAV-related data. This training can help transportation officials identify trends and patterns in CAV crashes, enabling them to make data-driven decisions and recommendations.

Interdisciplinary Education: Given the complexity of CAV technology, interdisciplinary education programs can help stakeholders understand the intersection of CAVs with other fields such as law, engineering, and public safety. This broader perspective can facilitate better coordination and collaboration across different sectors.

Public Awareness Campaigns: State DOTs should launch public awareness campaigns to educate the public about CAV technology, its benefits, and potential safety implications. These campaigns can include outreach efforts through traditional media channels, social media platforms, community events, and educational materials distributed to schools and driver education programs. By raising awareness about CAV technology and crash reporting requirements, states can foster a culture of safety and responsibility among road users, promoting greater cooperation and compliance with laws and rules on CAV operation.

4.5 Collaborative Efforts

Collaboration among state agencies, industry stakeholders, academic institutions, and other relevant organizations is essential to develop standardized crash reporting guidelines and protocols for CAV incidents. Regular communication and coordination among these entities will facilitate the development of comprehensive and effective reporting practices that address the needs of all stakeholders. Additionally, collaborative efforts can promote knowledge sharing and best practices, fostering innovation and continuous improvement in CAV crash reporting. It is recommended that states establish formal mechanisms for collaboration, such as task forces or working groups, to facilitate ongoing dialogue and collaboration on CAV crash reporting initiatives. These mechanisms should provide a forum for stakeholders to exchange ideas, share experiences, and coordinate efforts to address common challenges and opportunities in CAV crash reporting.

Additionally, collaboration with international counterparts can provide valuable insights and perspectives on best practices for CAV crash reporting and regulation. State DOTs should actively engage with international organizations, regulatory agencies, and research institutions to share knowledge, exchange information, and collaborate on joint initiatives aimed at advancing CAV safety and regulation. By participating in international forums and working groups, states can gain access to global expertise and best practices, enabling them to stay informed about developments in CAV technology and regulatory approaches. Additionally, international collaboration can facilitate harmonization of standards and regulations, promoting consistency and interoperability in CAV deployment and regulation across borders.

4.6 Research and Evaluation Initiatives

States should invest in research and development initiatives to advance the understanding of CAV technology and its implications for roadway safety. These initiatives can include research projects, pilot programs, and demonstration projects intended to evaluate the performance of CAVs, assess their impact on traffic flow and safety, and identify opportunities to enhance crash reporting practices. Additionally, states should collaborate with academic institutions, research organizations, and industry partners to conduct research on emerging issues and challenges related to CAV technology and crash reporting. By fostering a culture of innovation and inquiry, states can drive advancements in CAV technology and safety, paving the way for safer and more efficient transportation systems.

State DOTs should also establish mechanisms to monitor and evaluate the effectiveness of CAV crash reporting practices and legislative frameworks. This can involve conducting regular reviews of crash data, analyzing trends and patterns in CAV-related incidents, and soliciting feedback from stakeholders on the usability and effectiveness of reporting systems. Additionally, states should leverage data analytics and predictive modeling techniques to identify potential areas for improvement and inform strategic decision-making. By continuously monitoring and evaluating CAV crash reporting practices, states can identify opportunities to enhance data quality, streamline reporting processes, and address emerging safety concerns proactively.

4.7 Summary

In conclusion, the recommendations outlined above are intended to guide state DOTs and policymakers in developing comprehensive strategies for CAV crash reporting and regulation. By prioritizing standardization, legislative updates, education, collaboration, and research, states can enhance the safety and efficiency of CAV deployment, ensuring that this transformative technology benefits society while minimizing risks to public safety. As CAV technology continues to evolve, it is essential for states to remain proactive and adaptive in their approach to crash reporting and regulation, staying abreast of emerging trends and developments to effectively address the challenges and opportunities presented by this rapidly evolving landscape.

5. CONCLUSION

The rapid development and deployment of connected and autonomous vehicles (CAVs) present new challenges for transportation safety and crash reporting. This report has examined the current state of CAV crash reporting practices across the United States, highlighting the need for standardization, enhanced data collection, and legislative updates to address the evolving transportation landscape.

Current Best Practices:

- **Standardized Crash Reporting:** States that incorporate specific fields for recording CAV involvement and automation levels in their crash report forms demonstrate a commitment to capturing accurate and comprehensive CAV incident data.
- **Legislative Frameworks:** Some states have enacted legislation that explicitly addresses CAV crash reporting requirements, providing clarity on liability and insurance issues, and establishing criteria for reporting incidents.
- **Education and Training:** Programs that provide specialized training to first responders and transportation officials on CAV technology and crash scene assessment improve the quality and reliability of CAV crash data.

Recommendations:

- **Further Standardization:** State DOTs should work toward uniform crash reporting practices by developing standardized crash report forms and adopting common reporting formats. These practices should align with guidelines such as the Model Minimum Uniform Crash Criteria (MMUCC) and be periodically reviewed to stay current with technological advancements.
- **Regular Updates:** State legislatures should enact clear and comprehensive laws that mandate reporting requirements for CAV operators and manufacturers. This includes outlining reporting criteria, timelines, and responsible entities, as well as addressing liability and insurance issues related to CAV crashes. States should also regularly update their crash reporting forms to reflect emerging CAV technologies and align with best practices, such as the MMUCC.
- **Enhancement of Reporting Requirements:** The NHTSA should expand reporting requirements for CAV manufacturers to include additional data such as the number of vehicles on the road, miles traveled, and the status of automated systems during crashes. Clear guidelines and protocols should be established for CAV crash reporting.
- **Education and Training:** Specialized training for first responders and transportation officials on CAV technology and crash reporting protocols can improve the quality and reliability of crash data. Ongoing education initiatives will keep stakeholders informed about developments in CAV technology and reporting requirements.
- **Collaboration:** State agencies should collaborate with industry stakeholders, academic institutions, and other organizations to develop comprehensive reporting guidelines and foster knowledge sharing and best practices.

By implementing these recommendations, state DOTs and policymakers can address the challenges of CAV crash reporting, enhance data collection and analysis, and promote the safe and responsible deployment of CAVs. Through collaboration and proactive measures, states can navigate the evolving transportation landscape and contribute to safer roadways for all.

5.1 Limitations

In any research study, there are inherent limitations that may impact the findings and conclusions. For this study on CAV crash reporting practices, the following limitations should be noted:

1. **Limited Participation:** The study was limited by the number of state officials who responded to the survey or participated in the research. Additionally, the study was limited by the knowledge and understanding of the participants.
2. **Variability in Data Quality:** The quality and consistency of crash reporting policy information may vary across states due to differences in existing practices, forms, and levels of training and knowledge among first responders and other officials.
3. **Rapid Technological Changes**: The study may not fully capture the most recent advancements in CAV technology or regulatory changes that could impact crash reporting practices. Given the fast pace of technological development, some findings may become outdated quickly.
4. **Lack of Long-Term Data:** Since CAV deployment is still in its early stages, there was limited long-term data available on CAV crash reporting and outcomes. This affected the ability to identify trends and draw robust conclusions.
5. **Potential Bias in Responses:** The survey and data collection process may be subject to bias if respondents provided responses that align with their own opinions or interests rather than objective assessments or agency-wide interests. Additionally, due to limited publicly available information on DOT personnel expertise, it was often difficult to determine and/or contact the "right" individual for the survey.
6. **Complexity of Legislation**: The study's analysis of state-level legislation may have been complicated by varying interpretations of laws and regulations across jurisdictions. Additionally, changes in laws may not have been accounted for if the study was conducted during periods of legislative updates.
7. **Lack of International Context:** The study was focused on U.S. states and did not consider international practices and standards that could provide valuable insights into best practices for CAV crash reporting.
8. **Focus on Reporting, Not Outcomes:** The study primarily focused on the processes and practices of crash reporting rather than examining the actual outcomes of CAV incidents, such as safety impacts or effectiveness of reporting.

Despite these limitations, the study provides valuable insights into current CAV crash reporting practices and offers recommendations for improvement. Future research can build on these findings by addressing some of the limitations and exploring additional aspects of CAV crash reporting and its impact on road safety.

5.2 Future Work

There are several areas of future work and research that could build upon this study and its findings, helping to advance the understanding of CAV crash reporting practices and safety. These include:

1. **Longitudinal Studies:** Conducting longitudinal studies can help track changes in CAV crash reporting practices over time, providing insights into how regulatory frameworks, data collection methods, and technology evolve and impact crash data and road safety.
2. **Cross-jurisdictional Analysis:** Analyzing crash reporting practices across different states and even internationally can identify best practices and challenges. A cross-jurisdictional approach may lead to the development of more consistent and standardized reporting protocols globally.
3. **Impact Assessment of New Technologies:** As CAV technologies evolve, future research could assess the impact of specific new technologies (e.g., advanced sensors, AI-driven crash analysis tools) on crash reporting practices and outcomes.
4. **Comparative Analysis of CAV and Non-CAV Crashes:** Comparing crash reporting and safety outcomes between CAVs and non-CAVs can help identify areas where CAVs may present unique challenges or benefits, informing future regulatory and safety strategies.
5. **Public Perception and Acceptance:** Understanding public perception of CAVs and related crash reporting practices can provide insights into how public awareness campaigns and education efforts can be improved to promote road safety.
6. **Legal and Insurance Implications:** Future research could explore the legal and insurance implications of CAV crashes in more detail, including liability issues, coverage types, and potential impacts on insurance premiums.
7. **Data Privacy and Security:** Investigating data privacy and security concerns associated with CAV crash reporting is essential for safeguarding sensitive information and maintaining public trust in CAV technologies.
8. **Integration of Emerging Data Sources:** Exploring how emerging data sources such as telematics, vehicle-to-vehicle communication, and smart infrastructure can be integrated into crash reporting practices may improve the accuracy and timeliness of data.
9. **Performance Metrics and Benchmarks:** Developing performance metrics and benchmarks for CAV crash reporting can help evaluate the effectiveness of different approaches and identify areas for improvement.
10. **Stakeholder Engagement:** Research on collaborative efforts and stakeholder engagement in developing crash reporting practices can shed light on how to create effective partnerships among industry, government, and research institutions.
11. **Training and Education Methods:** Investigating the most effective training and education methods for stakeholders involved in CAV crash reporting can lead to better data quality and more reliable reporting practices.

By exploring these areas, future work can provide valuable insights into the continuous improvement of CAV crash reporting practices and contribute to the safe and effective integration of CAVs into transportation systems.

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7. APPENDIX A: QUESTIONNAIRE

Default Question Block

Welcome! You are invited to participate in a research study led by Utah State University. The purpose of the study is to assess the state of the practice of the crash reporting in the US, especially in the context of autonomous vehicles.

You are asked to fill the following questionnaire based on the perspective of your state/agency/department, so no personal information will be collected. If you are familiar with the practice of reporting, storage, and use of crash data adopted by your state/agency/department, you are the good fit for this study.

We anticipate that this survey takes less than 10 minutes to complete. This research is part of a funded project (MPC-660) by the Mountain-Plains Consortium (https://www.mountain-plains.org/), a USDOT University Transportation Center. If you have any questions, please contact Michelle Mekker at michelle.mekker@usu.edu.

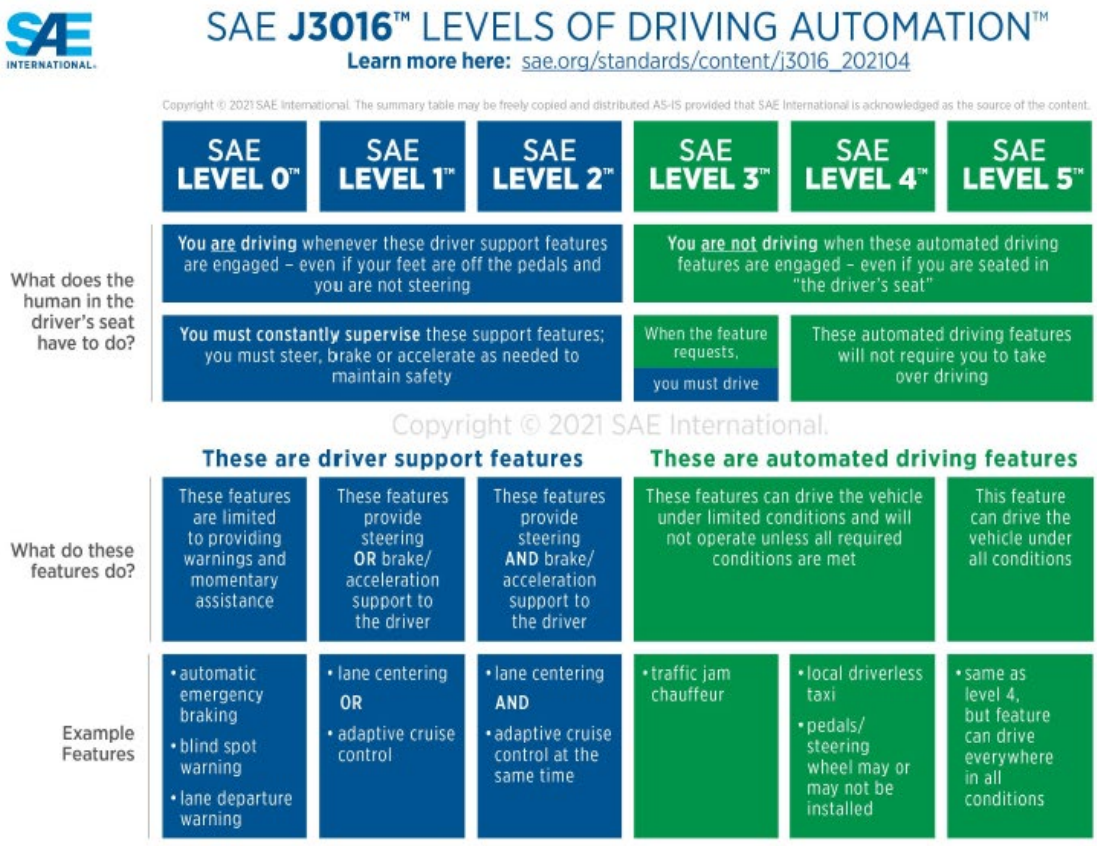
Please select "Accept" if you wish to participate in this study, otherwise please suggest someone from your agency who is good fit for our study.

- ○ Accept
- ○ I wish to recommend other (please specify name and email address)

Q1 On behalf of which agency/department/state are you filling this survey?

Let's talk about the crash reporting practice in ${q://QID1/ChoiceTextEntryValue}.

The SAE (Society of Automotive Engineers) has defined levels 0-5 of vehicle automation according to the figure below:



Q2 To your knowledge, your state/agency/department defines autonomous vehicles (AVs) as:

- ○ SAE Level 0 and up
- ○ SAE Level 1 and up
- ○ SAE Level 2 and up
- ○ SAE Level 3 and up
- ○ SAE Level 4 and up
- ○ SAE Level 5 only
- ○ Other (please describe) _____

For the rest of this survey, "autonomous vehicles" and "AVs" will refer to your state's/agency's/department's definition.

Please provide a link to the sample of the latest crash report form.

- ○ I can provide the document (e.g. in pdf) rather than the link.
- ○ Here is the link: [ ]
- ○ I cannot provide the sample of the latest crash report form.

Please upload the sample of the latest crash report form.

Please provide a link to the instruction manual of the crash report. Though this manual may be dedicated to the officers reporting the crash at scene, we need this manual to understand how the crashes are reported.

- ○ I can provide the document (e.g. in pdf) rather than the link.
- ○ Here is the link: [ ]
- ○ There is no instruction manual (to my knowledge).
- ○ I cannot provide the instruction manual.

Please upload the latest crash reporting instruction manual.

Q3 When was the latest crash report form updated / implemented?

Year [ ]
Month [ ]

Day

Q4 Other than the specific check boxes in the crash report form, is there any practice of reporting the involvement of autonomous vehicles in the crash report narratives? Please describe as much as possible.

Q5 Please describe the future plan of this agency/department/state for reporting the of involvement of autonomous vehicles in crashes. Please describe as much as possible. Please include when the crash report is likely to be updated next, what change does this agency/department/state expect to make in reporting the involvement of AVs in the crashes, etc.

Would you be able to provide us with sample crash data (raw, processed, or aggregated) so that we can use it for further study of crash reporting practices? If yes, we will contact you later for this.

- ○ Yes
- ○ No

Q6 Does your agency/department/state follow the Model Minimum Uniform Crash Criteria (MMUCC) crash reporting standard while recording AV crashes?

[MMUCC=A minimum set of motor vehicle crash data elements and their attributes collected and included by the state in the state crash data system]

- ○ Yes
- ○ No
- ○ Not sure

Q7 Has your agency/department/state hired/designated an individual as an expert in reporting AV crashes?

- ○ Yes
- ○ No
- ○ Not sure

Q8 Does your agency/department/state have any Voluntary Safety Self-Assessments (VSSAs) program?

[VSSAs=Summary information that different entities may want to provide to the public to demonstrate how they are addressing safety]

- ○ Yes
- ○ No
- ○ Not sure

Q9 Does your agency/department/state record vehicle positional data pre- and post-crash in accordance with Federal Motor Vehicle Safety Standard (FMVSS) and SAE 3197 standards?

- ○ Yes
- ○ No
- ○ Not sure

Q10 Do current state regulations require that owners stipulate which automated driving systems are active/available on their vehicles when they are registered?

- ○ Yes
- ○ No
- ○ Not sure

Q11 Are there any practices or codes for reporting certain automated driving systems (such as adaptive cruise control, lane keeping, or automatic emergency braking) as a crash-contributing factor?

- ○ Yes
- ○ No
- ○ Not sure

Q12 Does your agency/department/state allow the testing of AVs without an on-board human operator (these vehicles would most often be levels 4 or 5)?

- ○ Yes
- ○ No
- ○ Not sure

Q13 In your state, who is typically held responsible for a crash where an AV is at fault?

- ○ Vehicle owner
- ○ Vehicle manufacturer
- ○ Other
- ○ Not sure

Q14 Is there any standard process for recording AV crashes other than via the standard crash report form?

- ○ Yes
- ○ No
- ○ Not sure

Q15 Please describe this other reporting process:

Q16 In your state, is there a standard monetary value in terms of property damage or physical injury that acts as a threshold for reporting an AV crash?

- ○ Yes, the threshold is: _____
- ○ No
- ○ Not sure

Q17 Do police officers receive any training specific to the capabilities/limitations of AVs or crashes involving AVs?

- ○ Yes
- ○ No
- ○ Not sure

Q18 How frequently is the training content updated with new information?

- ○ Monthly
- ○ Quarterly
- ○ Annually
- ○ Other _____

Q19 How frequently is the training retaken by police officers?

- ○ Monthly
- ○ Quarterly
- ○ Annually
- ○ Other

Q20 What type of training is provided/offered (select all that apply)?

- ☐ Modular (topics are split up into distinct units or modules and are covered in sequential and/or separate training sessions)
- ☐ Blended (a combination of online and in-person training)
- ☐ Self-Guided (officers are responsible for completing the training on their own and at their own pace)
- ☐ Experimental (includes hands-on training from a vehicle technology expert)
- ☐ Workshop/Lecture (training is provided in a traditional lecture format, usually in person)
- ☐ Other

Q21 Does traffic incident management personnel (i.e., other then police officers) receive any training specific to the capabilities/limitations of AVs or crashes involving AVs?

- ○ Yes
- ○ No
- ○ Not sure

Q22 How frequently is the training content updated with new information?

- ○ Monthly
- ○ Quarterly
- ○ Annually
- ○ Other

Q23 How frequently is the training retaken by traffic incident management personnel?

- ○ Monthly
- ○ Quarterly
- ○ Annually
- ○ Other

Q24 Does anyone at your agency/department/state have experience or expertise in interpreting/processing data recorded by AVs?

- ○ Yes
- ○ No
- ○ Not sure

Q25 How does your agency/department obtain and use the AV data?

Q26 Does your agency/department/state have any programs or initiatives for disseminating knowledge regarding AVs to the public?

- ○ Yes
- ○ No
- ○ Not sure

Q27 Does your agency/department regularly share any AV crash data with any other agencies/entities?

- ☐ Public

- [ ] Insurance companies
- [ ] Vehicle manufacturers
- [ ] Other in-state agencies
- [ ] Other out-of-state agencies
- [ ] Contracted research or consultant entities
- [ ] Non-contracted research or consultant entities
- [ ] Other
- [ ] Data is not shared

If you want to discuss more about this study, please provide us your name and email address. We will contact you later.

Thank you for filling out this survey. We appreciate you time and effort. If you have any suggestions or further comments, feel free to mention them here.

8. APPENDIX B: SURVEY DATA

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Ohio DOT	100%	5/18/2022 12:44	SAE Level 3 and up	1/1/2019	Check boxes and in the narrative	I have not been involved in any of these discussions. The formal crash report is updated every 5 years so meetings will start in 2023 to discuss updates on AV crash reporting.
Missouri State Highway Patrol	100%	5/19/2022 7:59	SAE Level 3 and up	1/1/2019	There are currently no checkboxes of fields on the crash report to collect information on AVs other than the crash report narrative.	We are tentatively planning to implement a new crash report on 01/01/2024. The new report will have fields and values pertaining to AVs. The fields include the following: 1. Automation System or Systems in Vehicle - Yes, No, or Unknown. 2. Automation System Levels Engaged at Time of Crash (This is based on the SAE J3016 chart). 3. Driver Ceded Control - Yes, No, Unknown, NA.
Minnesota Department of Transportation	100%	5/19/2022 8:35	SAE Level 3 and up	1/12016	Not at this time. VIN and vehicle information is in the report, but nothing specifically about automation.	There are no immediate plans at this time. We do have a research project to better understand autonomous vehicles involved with crashes. We are planning on using VIN's at this time to classify and find vehicles.
Iowa DOT	100%	5/20/2022 6:50	SAE Level 3 and up	3/12019	No specific instruction has been made at this time.	Our agency is waiting for MMUCC 6 which has been delayed until 2024. We would anticipate not being able to have a new version of our crash report out until 2026 with information about autonomous vehicles. This would allow us time to make form changes, database changes, and thorough testing before going live.

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
SC Department of Public Safety/Office of Highway Safety	100%	5/20/2022 13:27	SAE Level 3 and up	4/12016	Not at this time	The crash form is currently undergoing an update to capture more MMUCC elements. There is no way currently for the officer to know what level of autonomy and what was being used in the particular vehicle. Having DMV update their registration process to include this information would help.
Colorado Department of Transportation	100%	5/23/2022 17:03	Other: Unsure	10/92019	Autonomous Vehicles Field 16: Autonomous Vehicle Capability See Manual page 138	There are no immediate plans to update the crash report form in Colorado.
Montana Department of Transportation	100%	5/24/2022 8:06	SAE Level 3 and up			
Georgia DOT	100%	5/24/2022 9:28		1/12018	none	none at this time.
Alaska Department of Transportation and Public Facilities	100%	5/24/2022 9:43	SAE Level 4 and up	11/12020	We do not have a process of reporting autonomous vehicles. The officer or driver would just write it in the narrative.	There is currently no plan to improve reporting of AVs.
Oklahoma Highway Safety Office	100%	5/26/2022 10:44	SAE Level 4 and up	1/1/2007	NO	Oklahoma is fielding a new crash report on 01 July 2022 that will include AV information
Wyoming Department of Transportation Highway Safety	21%	5/27/2022 7:38	Other: We are in the process of defining			

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
WV Governor's Highway Safety Program	21%	5/27/2022 10:56	SAE Level 0 and up			
Utah Highway Safety Office	100%	5/31/2022 7:41	SAE Level 0 and up	7/1/2020	We do not have any fields for the officer on autonomous vehicles at this time.	No plans at this time
Vermont Agency of Transportation	61%	6/2/2022 10:18		8/7/2020	We do not collect this information on our crash form yet.	We will be reviewing the crash form this summer for updates.
TN Dept. of Safety and Homeland Security	100%	6/6/2022 14:34				
MS Office of Highway safety	21%	6/8/2022 7:23	SAE Level 0 and up			
Idaho Transportation Department, Highway Safety	21%	6/9/2022 14:09	Other: Unknown			
Oregon Department of Transportation - Trans Data Section - Crash Analysis & Reporting Unit	100%	6/22/2022 16:45	SAE Level 0 and up	1/1/2022	not at this time	There is a task force that is working on the topic and following what ODOT's next steps will be
Puerto Rico Traffic Safety Commission	100%	6/23/2022 5:19	SAE Level 2 and up	11/8/2019		

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Ohio Department of Public Safety	100%	6/23/2022 6:50	SAE Level 3 and up	1/1/2019	No	Next update aligns with the MMUCC release, 1/2024.
NJ Division of Highway Traffic Safety	100%	6/23/2022 14:49		1/1/2022	None at this time	Police training for crash report preparation has a separate module for AV; training is on-going.
University of Wisconsin-Madison	100%	6/24/2022 9:54	SAE Level 4 and up	1/1/2017	All of our forms are electronic and the training is through the software so I can't provide them to you but I can show you them if it's helpful. The technical reconstruction unit collects more data.	It should be updated next year. We will work on looking at level and also based on the recommendations from our TRCC project.
Idaho Transportation Department, Office of Highway Safety	100%	6/27/2022 17:07	Other: no official definition	6/1/2011	No, there is not.	We currently do not have a plan
MSHP	16%	6/30/2022 7:23	Other (please describe)			
Michigan State Police	100%	6/30/2022 12:02	Other: We follow MMUCC. We refer to them as levels of automation, just like the infographic.	11/9/2021	Michigan's crash form has a narrative that is a free text field. This allows the officer to record other information to help them recall any specifics about the crash. For example, a level 1 on the crash report may be indicated on the crash report, but the officer may explain in the narrative that the vehicle had adaptive cruise control.	Michigan is MMUCC complaint for all AV fields until a new edition is published.
RI Dept. of Transportation	16%	7/7/2022 5:37	Other: No idea			

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Arkansas State Police	21%	7/7/2022 8:16	SAE Level 0 and up			
CT Department of Transportation Highway Safety Office	100%	9/15/2022 13:16	SAE Level 0 and up	7/1/2014	No check boxes at this time; room in narrative	During the update phase of the next form, AV information will be considered for inclusion; this will most like occur in the next couple of years
Connecticut	100%	9/16/2022 6:30	Other: 2-4 are automated 5 is Fully Automated we avoid autonomous as there is so much confusion around the term	1/1/2015	Currently there are no check boxes for AVs and officers are not asked to document anything special related to AVs in the narrative.	In the next year when MMUCC 6th edition is released we plan to update or crash report form and add fields specific to AVs. We will wait to see what MMUCC 6 recommends and then develop the form to meet the needs of the CTDOT with respect to AV data collection.
US Virgin Islands Police Department Office of Highway Safety	100%	9/16/2022 9:01	Other: autonomous vehicles are not used in the US Virgin Islands		autonomous vehicles are not used in the US Virgin Islands	autonomous vehicles are not used in the US Virgin Islands
Pennsylvania DOT	100%	9/19/2022 7:50	SAE Level 3 and up	1/1/2018	No, just check boxes in the form. However, industry is required to report and provided additional information directly to the DOT.	We are not planning to change the crash reporting form, but we are updating the crash reporting protocols from industry.

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Texas Department of Transportation	100%	9/16/2022 6:57	Other: Currently only capture AV as Yes, No, NA for a unit not the levels.	1/1/2018	The form currently utilized by the law enforcement does not include an AV field on the crash report. It is a separate field that is captured by analyzing the narrative and identifying which unit is an AV. This information is captured for any unit with a Unit Description of Motor Vehicle, Towed/Pushed/Trailer, or Non-Contact.	The plan is to implement a new crash form to be effective 1/1/2023 in which will capture the following two fields: Autonomous Unit - This field is intended to capture whether a unit was equipped with driving automation capabilities. The valid values that can be indicated are: a. Yes b. No c. Unknown Autonomous Level Engaged - This field is intended to capture the degree of driving automation a unit had engaged at the time of the crash. The valid values that can be indicated are: 0 - No Automation 1 - Driver Assistance 2 - Partial Automation 3 - Conditional Automation 4 - High Automation 5 - Full Automation 6 - Automation Level Engaged Unknown 99 - Unknown

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Florida Department of Transportation	100%	9/16/2022 16:30	SAE Level 1 and up	6/1/2013	Not to my knowledge. Neither the phrase "connected vehicle" nor the phrase "autonomous vehicle", nor the acronym CAV, appear anywhere in the crash report form instruction manual or on the form itself.	Information on the Florida Department of Transportation's activities and planning regarding connected and autonomous vehicles can be found on-line at <https://www.fdot.gov/traffic/teo-divisions.shtm/cav-ml-stamp/connected-vehicles>. For more information about the FDOT's approach to connected and autonomous vehicles, please contact Dr. Raj Ponnaluri at <Raj.Ponnaluri@dot.state.fl.us>. The FDOT is not the custodian of the Florida Traffic Crash Report data or forms. The custodial agency for crash report data and documents for Florida is the Florida Department of Highway Safety and Motor Vehicles (FLHSMV). Information on the Florida Traffic Crash Report form, form instructions, and crash database information for FLHSMV can be found on-line at <https://www.flhsmv.gov/courts-enforcement/about-crash-records-and-crash-reporting/forms-and-resources/>.
Wyoming Highway Safety Program	100%	9/19/2022 7:07	Other: We are in the process of defining MMUCC will be our standard.	1/1/2007	Stacey.gierisch@wyo.gov can provide crash report, and manuals.	The State of Wyoming is in the process of updating our crash form to implement autonomous vehicles in the crash report and the newest MMUCC standards. We hope to purchase a newer electronic reporting system to get away from our current software. We hope to make the switch January 1, 2025, or sooner.

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
Maryland Department of Transportation	100%	9/19/2022 12:54	SAE Level 0 and up	1/1/2015	Not yet. This is under review currently. MSP is part of a statewide task force regarding AVs. MSP is reviewing MMUCC 5 and is considering updating the 2015 ACRS report to include more MMUCC 5 elements, including automated vehicle attributes.	Likely to be updated in 2023. MSP will have to answer whether they are including AV. I have forwarded the survey to them.
KDOT Crash Data Processing Unit	100%	9/19/2022 14:27	Other: no familiar with this coding	1/1/2019	I do not recall any mention of it in narratives over my 15 years.	The crash report for Kansas is planned to be revamped to comply with MMUCC 6 within 24-48 months.
Montana Dept of Transportation	100%	9/20/2022 8:27	Other: unknown		Unknown	Has not been determined at this time.
LSU\CARTS\LA	100%	9/22/2022 13:03	SAE Level 2 and up	7/1/2021	We have a new crash report that began on 7/1/2021 and will be used statewide by 12/31/2021. This new crash report is nearly 100% MMUCC aligned. This is the first report with any autonomous vehicle information. The only autonomous vehicles information being collect is what is recommended by MMUCC.	Please see above response
Arkansas State Police	34%	9/22/2022 13:55	SAE Level 3 and up	1/1/2017	We are in the process of an update to MMUCC 5th edition standards which should reflect the appropriate data for AV's. The update is scheduled for January 2023.	See above.
HDOT	100%	9/23/2022 18:35	SAE Level 3 and up	8/1/2018	Not at this time	No plans at this time

Entity (Q1)	Progress	Recorded	Q2	Q3	Q4	Q5
NYS Department of Motor Vehicles	100%	9/26/2022 13:38	Other: Not defined	7/1/2018	Not at this time	DMV is in the process of updating their crash reporting system at this time. It is estimated that the new system will be installed in early 2024. The crash report will be revised at that time as well. Previous discussions have been held with other state agencies, including enforcement agencies on the need to include autonomous vehicle information on the new crash report. The values to be used and how that information will be captured in the new system and on the new report is yet to be determined.

Entity (Q1)	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Ohio DOT	Yes	No	Not sure	Not sure	Not sure	No	Not sure	Not sure	No		No
Missouri State Highway Patrol	Yes	No	Not sure	No	No	No	Not sure	Not sure	No		Yes, the threshold is: Yes, $500.00 or more for any crash.
Minnesota Department of Transportation	Yes	No	Not sure	Not sure	Not sure	No	Not sure	Not sure	No		No
Iowa DOT	No	No	No	No	No	No	Yes	Vehicle owner	No		Yes, the threshold is: Any injury, fatality, or $1500 or more damage
SC Department of Public Safety/Office of Highway Safety	No	No	No	No	No	No	No	Other: Driver	No		Yes, the threshold is: $1,000 or injury

Entity (Q1)	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Colorado Department of Transportation	Yes	No	Not sure	Not sure	Not sure	No	Not sure	Not sure	No		Yes, the threshold is: $1,000
Montana Department of Transportation	Yes	No	No	No	Not sure	No	Yes	Other: county jurisdiction	No		No
Georgia DOT	No	No	No	No	No	No	No	Other: Driver/Operator in Driver's Seat	No		No
Alaska Department of Transportation and Public Facilities	No	No	Yes	No	Not sure	No	No	Not sure	No		Yes, the threshold is: $2000 or physical injury
Oklahoma Highway Safety Office	Yes	No	No	Yes	Yes	Yes	Yes	Vehicle owner	No		Yes, the threshold is: 500
Wyoming Department of Transportation Highway Safety											
WV Governor's Highway Safety Program											
Utah Highway Safety Office	Yes	No	No	Yes	Not sure	No	Not sure	Not sure	Not sure		Yes, the threshold is: 2,500.00 and above
Vermont Agency of Transportation	No	No	No	No	Not sure	No	Not sure	Not sure	Not sure		
TN Dept. of Safety and Homeland Security	No	No	Not sure	No	No	No	Not sure	Not sure	No		Yes, the threshold is: $1,500
MS Office of Highway safety											
Idaho Transportation Department, Highway Safety											

Entity (Q1)	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Oregon Department of Transportation - Trans Data Section - Crash Analysis & Reporting Unit	No	No	No	Not sure	No	No	No	Not sure	Not sure		No
Puerto Rico Traffic Safety Commission	Yes	No	No	Yes	No	No	No	Not sure	No		No
Ohio Department of Public Safety	Yes	No	Yes	Not sure	No	No	No	Not sure	No		Yes, the threshold is: $1,000
NJ Division of Highway Traffic Safety	Not sure	No	No	Yes	No	No	No	Other: We're not that far along in our regulations.	No		Yes, the threshold is: $500 applies to all crashes
University of Wisconsin-Madison	No	Yes	No	Not sure		No	Yes	Vehicle owner	Yes	Technical Reconstruction Unit	Yes, the threshold is: 1000
Idaho Transportation Department, Office of Highway Safety	No	No	No	No	No	No	Not sure	Not sure	No		No
MSHP											
Michigan State Police	Yes	Yes	Not sure	Not sure	No	No	Yes	Other: Vehicle driver	No		Yes, the threshold is: $1,000
RI Dept. of Transportation											
Arkansas State Police											
CT Department of Transportation Highway Safety Office	Yes	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure		Not sure

Entity (Q1)	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Connecticut	Yes	No	No	Not sure	No	No	No	Not sure	No		Yes, the threshold is: 1000 (but that is for all crashes)
Texas Department of Transportation	No	Not sure	Not sure	Not sure	No	No	Not sure	Not sure	No		Not sure
US Virgin Islands Police Department Office of Highway Safety	No	No	No	No	No	No	No	Other:	No		No
Florida Department of Transportation	No	Not sure	Not sure	Not sure	Not sure	No	Not sure	Not sure	Not sure		No
Wyoming Highway Safety Program	Yes	No	Not sure	Not sure	No	No	Not sure	Not sure	No		Yes, the threshold is: $1000 property damage, injury, or fatality.
Pennsylvania DOT	Yes	Yes	Yes	Not sure	No	No	No	Vehicle owner	Yes	Per authorization requirements, ADS developers must notify PennDOT within 2 hours with preliminary details of the crash.	No
Maryland Department of Transportation	Yes	No	Not sure	Not sure	Not sure	No	Yes	Not sure	Not sure		Not sure
KDOT Crash Data Processing Unit	No	No	Not sure	Not sure	Not sure	No	Not sure	Not sure	Not sure		Yes, the threshold is: 1000
Montana Dept of Transportation	Yes	No	No	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure		Not sure
LSU\CARTS\LA	Yes	No	Not sure	No	Not sure		Not sure	Not sure	Not sure		Not sure

Entity (Q1)	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Arkansas State Police											
HDOT	Yes	No	No	No	Not sure	Not sure	Not sure	Not sure	No		No
NYS Department of Motor Vehicles	No	No	No	Not sure	No	No	No	Not sure	No		Yes, the threshold is: $1,000 for all vehicles

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Ohio DOT	Not sure				Not sure			Not sure		No	-Other: Provide what we can, when asked
Missouri State Highway Patrol	No				Not sure			Not sure		No	-Other: AV crash data currently not collected.
Minnesota Department of Transportation	No				No			No		Yes	-Other in-state agencies -Other out-of-state agencies -Contracted research or consultant entities
Iowa DOT	No				No			No		No	-Other: Not that I am aware of
SC Department of Public Safety/Office of Highway Safety	No				No			Yes	Obtained from the data recorder	No	-Data is not shared
Colorado Department of Transportation	Not sure				Not sure			Not sure		Yes	-Public -Other in-state agencies -Other out-of-state agencies -Contracted research or consultant entities -Non-contracted research or consultant entities
Montana Department of Transportation	No				No			No		No	-Data is not shared

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Montana Department of Transportation	No				No			No		No	-Data is not shared
Georgia DOT	Not sure				Not sure			Yes	A subpoena will be issued in certain cases to pull the data from the "black box" will be presented. This is done by law enforcement. Currently we are investigating how we could leverage connected vehicle data to improve safety on our roads	Not sure	-Other: as needed
Alaska Department of Transportation and Public Facilities	Not sure				Not sure			No		No	-Other: We have no record of any AV crashes yet in AK
Oklahoma Highway Safety Office	No				Yes	Annually	Other:	Yes	We only collect data on fatal crashes and that is done by a fatal crash investigation team.	Yes	-Data is not shared

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Wyoming Department of Transportation Highway Safety											
WV Governor's Highway Safety Program											
Utah Highway Safety Office	Not sure				No			Not sure		No	-Public -Insurance companies -Other in-state agencies -Other out-of-state agencies
Vermont Agency of Transportation											
TN Dept. of Safety and Homeland Security	No				No			Not sure		No	-Other: Any Non-PII data for all crashes can be shared
MS Office of Highway safety											
Idaho Transportation Department, Highway Safety											
Oregon Department of Transportation - Trans Data Section - Crash Analysis & Reporting Unit	Not sure				Not sure			Not sure		Yes	-Non-contracted research or consultant entities -Other: It would be the task force and I don't have this info
Puerto Rico Traffic Safety Commission	No				No			No		No	-Data is not shared
Ohio Department of Public Safety	Not sure				No			Not sure		No	-Public

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
NJ Division of Highway Traffic Safety	Yes	Annually	Annually	-Workshop	Not sure			No		No	-Data is not shared
University of Wisconsin-Madison	Yes	Other: when there's new information	Annually	-Modular -Blended -Self-Guided -Workshop	Yes	Annually	Annually	Yes	Our own vehicle.	Yes	-Public -Insurance companies -Other in-state agencies -Contracted research or consultant entities -Non-contracted research or consultant entities
Idaho Transportation Department, Office of Highway Safety	No				Not sure			Not sure		No	-Other: we don't have specific AV data to share
MSHP											
Michigan State Police	Yes	Other: Updated with SAE standards	Other: All training classes are done on a voluntary basis.	-Workshop	Not sure			Yes	This is done by our Accident Reconstruction Unit.	Not sure	-Other: Crash data extracts with traffic safety partners.
RI Dept. of Transportation											

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Arkansas State Police											
CT Department of Transportation Highway Safety Office	Not sure				Not sure			Not sure		Not sure	
Connecticut	No				No			No		Yes	-Data is not shared
Texas Department of Transportation	Not sure				Not sure			Not sure		Not sure	-Other: The Autonomous Unit field we collect is available to any user registered for Public or Standard extract and anyone who has direct access to CRIS.
US Virgin Islands Police Department Office of Highway Safety	No				No			No		No	-Other: N/A
Florida Department of Transportation	Not sure				Not sure			Not sure		Yes	

Entity (Q1)	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Wyoming Highway Safety Program	Not sure				Not sure			No		Not sure	-Other: We share our crash data but currently we don't have AV on our crash report just narrative.
Pennsylvania DOT	Yes	Annually	Other: Brand new, so we are still determining the refresh period	-Modular -Other	No			Yes	Provided by industry.	Yes	-Other in-state agencies
Maryland Department of Transportation	No				Not sure			Not sure		Yes	
KDOT Crash Data Processing Unit	Not sure				Not sure			Not sure		Not sure	-Other: not to my knowledge
Montana Dept of Transportation	Not sure				Not sure			No		Not sure	-Data is not shared
LSU\CARTS\LA	Not sure				Not sure			Not sure		Not sure	-Data is not shared
Arkansas State Police											
HDOT	Not sure				Not sure			Not sure		Not sure	-Data is not shared
NYS Department of Motor Vehicles	Not sure				Not sure			No		Not sure	-Other: Not captured at this time