



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



DOT HS 813 325

June 2022

Summary Report: Standing General Order on Crash Reporting for Level 2 Advanced Driver Assistance Systems

Introduction

In June 2021, the National Highway Traffic Safety Administration (NHTSA) issued a Standing General Order (the General Order) requiring identified manufacturers and operators (reporting entities) to report to the agency certain crashes involving vehicles equipped with SAE Level 2 Advanced Driver Assistance Systems (ADAS).¹ These vehicles (referred to as Level 2 ADAS-equipped vehicles) provide both speed and steering input when the driver assistance system is engaged but require the human driver to remain fully engaged in the driving task at all times. While the General Order also covers vehicles equipped with SAE Levels 3-5 Automated Driving Systems (ADS), that data summary is provided in a [separate report](#).

The General Order requires that reporting entities file incident reports for crashes involving Level 2 ADAS-equipped vehicles that occur on publicly accessible roads in the United States and its territories. Crashes involving a Level 2 ADAS-equipped vehicle are reportable if the Level 2 ADAS was in use at any time within 30 seconds of the crash and the crash involved a vulnerable road user² or resulted in a fatality, a vehicle tow-away, an air bag deployment, or any individual being transported to a hospital for medical treatment.

NHTSA issued the General Order on June 29, 2021, and received the first ADAS incident report on July 20, 2021. As of May 15, 2022, NHTSA has received incident reports for 392 Level 2 ADAS-equipped vehicle crashes. Prior to the implementation of the General Order, NHTSA's sources of timely crash notifications were limited (e.g., media, vehicle owner questionnaire input, voluntary direct company outreach, and Early Warning Reporting) and generally inconsistent across manufacturers, including developers.

The General Order allows NHTSA to obtain timely and transparent notification of real-world crashes associated with Level 2 ADAS-equipped vehicles from manufacturers and operators. With these data, NHTSA can respond to crashes that raise safety concerns about ADAS technologies through further investigation and enforcement. As an example, the General Order has provided the agency information on specific crashes of ADAS-equipped vehicles. NHTSA has followed up with several manufacturers to acquire more data on these crashes, and this information has informed an ongoing investigation the agency opened on a driver assistance system in late 2021. The information also provides transparency into the safety of vehicles equipped with this technology that are currently operating on public roads. It also provides crucial data necessary for research and for the development of policies to enhance the safety of these technologies. Safety is crucial to the deployment and public acceptance of new technologies and the General Order is an important measure in evaluating the safety of ADAS and ADS technology.

Data and Limitations

Understanding the terms and requirements of the General Order, the data it aims to obtain, and the limitations of those data are crucial for accurate interpretation and analysis. The following should be considered when reviewing these data and other information.

¹ For a description of the SAE International (SAE) levels of driving automation, see SAE J3016, "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles," April 2021.

² "Vulnerable Road User" includes any person who is not an occupant of a motor vehicle with more than three wheels. This definition includes, but is not limited to, pedestrians, people traveling in wheelchairs, bicyclists, motorcyclists, and riders or occupants of other transport vehicles that are not motor vehicles, such as all-terrain vehicles and tractors.

Access to Crash Data May Affect Crash Reporting

Crash data recording and telemetry capabilities may vary widely by manufacturer and driving automation system. Many Level 2 ADAS-equipped vehicles may be limited in their capabilities to record data related to driving automation system engagement and crash circumstances. The vehicle's ability to remotely transmit this data to the manufacturer for notification purposes can also widely vary. Furthermore, Level 2 ADAS-equipped vehicles are generally privately owned; as a result, when a reportable crash does occur, manufacturers may not know of it unless contacted by the vehicle owner. These limitations are important to keep in mind when reviewing the Summary Incident Report Data.

Manufacturers of Level 2 ADAS-equipped vehicles with limited data recording and telemetry capabilities may only receive consumer reports of driving automation system involvement in a crash outcome, and there may be a time delay before the manufacturer is notified, if the manufacturer is notified at all. In general, timeliness of the General Order reporting is dependent on if and when the manufacturer becomes aware of the crash and not on when the crash occurs. Due to variation in data recording and telemetry capabilities, the Summary Incident Report Data should not be assumed to be statistically representative of all crashes.

For example, a Level 2 ADAS-equipped vehicle manufacturer with access to advanced data recording and telemetry may report a higher number of crashes than a manufacturer with limited access, simply due to the latter's reliance on conventional crash reporting processes. In other words, it is feasible that some Level 2 ADAS-equipped vehicle crashes are not included in the Summary Incident Report Data because the reporting entity was not aware of them. Furthermore, some crashes of Level 2 ADAS-equipped vehicles with limited telematic capabilities may not be included in the General Order if the consumer did not state that the automation system was engaged within 30 seconds of the crash or if there is no other available information indicating Level 2 ADAS engagement due to limited data available from the crashed vehicle. By contrast, some manufacturers have access to a much greater amount of crash data almost immediately after a crash because of their advanced data recording and telemetry.

Incident Report Data May Be Incomplete or Unverified

A reporting entity is required to submit an incident report within a certain time from when it receives notice of a crash that may be reportable. This report is required regardless of whether the reporting entity has verified or agrees with the information. Therefore, initial reports may reflect incomplete or unknown information. This means that a reporting entity with access to vehicle telemetry may quickly become aware of an air bag deployment incident subject to the General Order, but it may not become aware of all circumstances related to the crash, such as surface conditions, whether all passengers were belted, or whether an injury occurred. Similarly, a reporting entity may receive a consumer complaint or claim that includes incomplete information. A reporting entity that receives new or additional information after the initial report is submitted is required to submit an updated report but is not required to take additional affirmative actions to gather further details.

Redacted Confidential Business Information and Personally Identifiable Information

Confidential Business Information (CBI) requests have been made by multiple reporting entities for three data fields available to the public: *ADAS / ADS Version*, *Was vehicle within its ODD* [operational design domain] *at the time of the incident?* and *Narrative*. All Personally Identifiable Information (PII) has also been removed from the Summary Incident Report Data. Redactions of CBI and PII are noted in the data except for the VIN of the subject vehicle and the dates recorded in the report. The last 6 digits of the subject vehicle VIN have been withheld as PII, and dates are reported as month and year without the day.

The Same Crash May Have Multiple Reports

For crashes involving a Level 2 ADAS-equipped vehicle that meet the reporting requirements of the General Order, the reporting entity may be required to submit multiple reports for a single crash (an initial report, a 10-day followup, and any subsequent updates). In addition, more than one entity may be responsible for reporting the same crash. For example, the vehicle manufacturer and the Level 2 ADAS equipment supplier may both be named in the General Order. This means that a single crash may have multiple reports from multiple entities. Consequently, the overall number of reports submitted does not equate to the total number of incidents and is not a meaningful safety metric.

Summary Incident Report Data Are Not Normalized

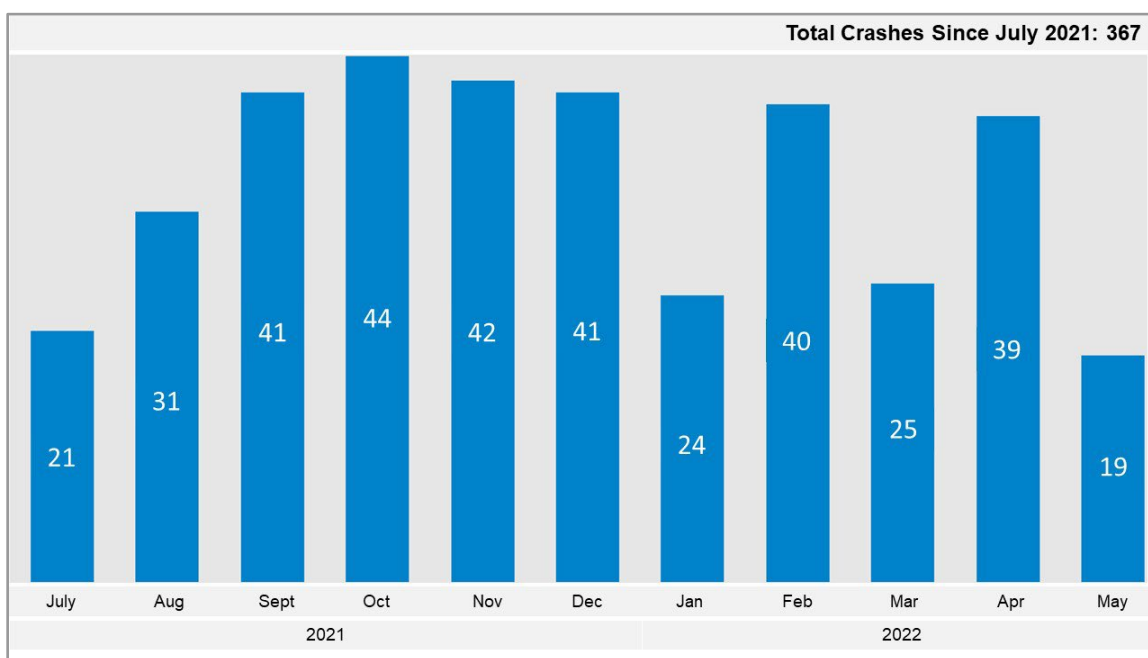
Reporting entities are not required to submit information regarding the number of vehicles they have manufactured, the number of vehicles they are operating, or the distances traveled by those vehicles. Data required to contextualize the incident rates are limited. Data regarding the number of crashes reported for any given manufacturer or operator, therefore, have not been normalized or adjusted by any measure of exposure, including the operational driving domain or vehicle miles traveled. For example, a reporting entity could report an absolute number of crashes that is higher than another reporting entity but operate a higher number of vehicles for many more miles.

Observations

Observations from reported crashes of Level 2 ADAS-equipped vehicles are presented in this section using data reported through May 15, 2022. It is important to note that these crashes are categorized based on what driving automation system was reported as being equipped on the vehicle, not on what system was reported to be engaged at the time of the incident. In some cases, reporting entities may mistakenly classify the onboard automation system as ADS when it is actually Level 2 ADAS (and vice versa). NHTSA is currently working with reporting entities to correct this information and to improve data quality in future reporting.

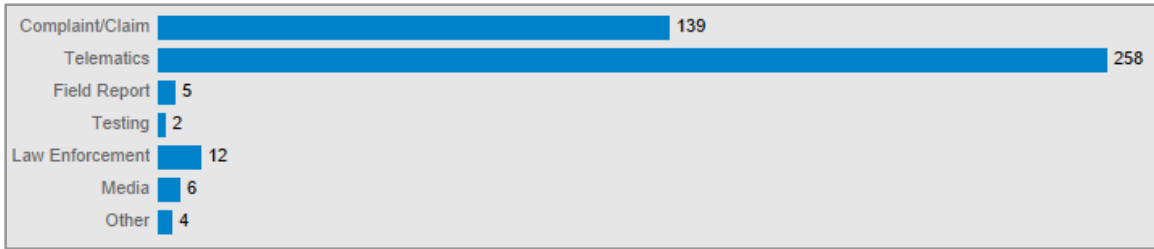
As of May 15, 2022, 12 reporting entities have submitted incident reports for 392 Level 2 ADAS-equipped vehicle crashes. Crashes in this report are identified as Level 2 ADAS when the reporting entity responded *No* to the *ADS Equipped?* field. When multiple versions of a report exist from a specific entity, the values from the latest report are used. Reports where the latest *ADS Equipped?* field is blank or contains *Unknown*, *see Narrative* or *Yes* have not been included in this data analysis. There may be cases where more than one report is submitted for a crash, resulting in duplicate counts if sufficient information is not available to match the reports to the same crash. All reports and associated data definitions, including reports not covered by this analysis, are available at [NHTSA.gov/SGOcrashReporting](https://www.nhtsa.gov/SGOcrashReporting).

Level 2 ADAS Crashes by Month



- 392 Level 2 ADAS crashes were reported as of May 15, 2022.
- 367 occurred from July 2021 to May 15, 2022.
- 25 crashes either occurred before July 2021 or had no incident date recorded and are not included in this figure.

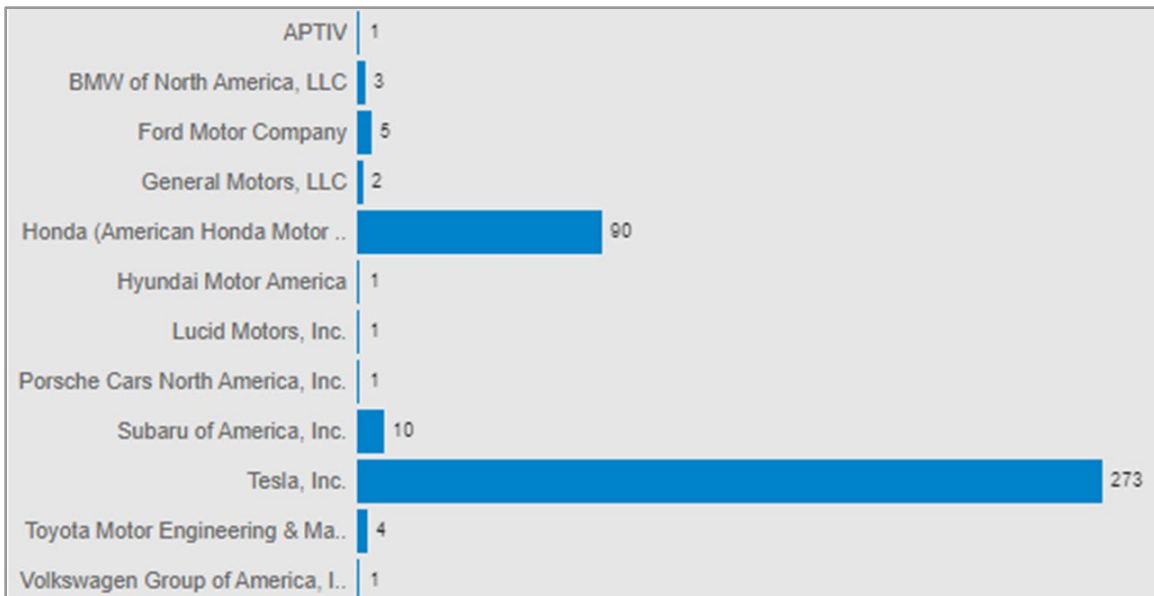
Sources of Level 2 ADAS Crash Reports



- Telematics and complaints/claims were the most common sources of crash report information.

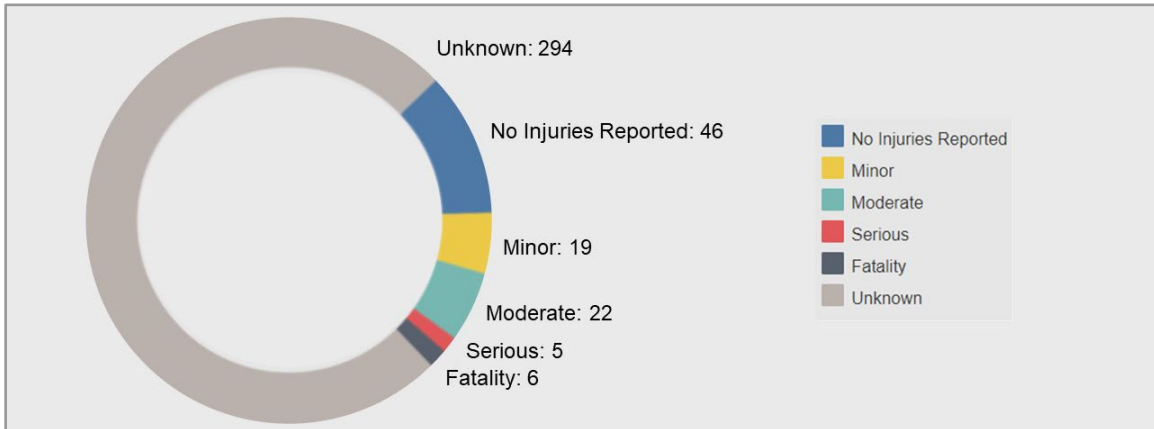
Note: Multiple reports and sources for the same crash result in a total number of sources greater than the number of crashes.

Level 2 ADAS Crashes by Reporting Entity



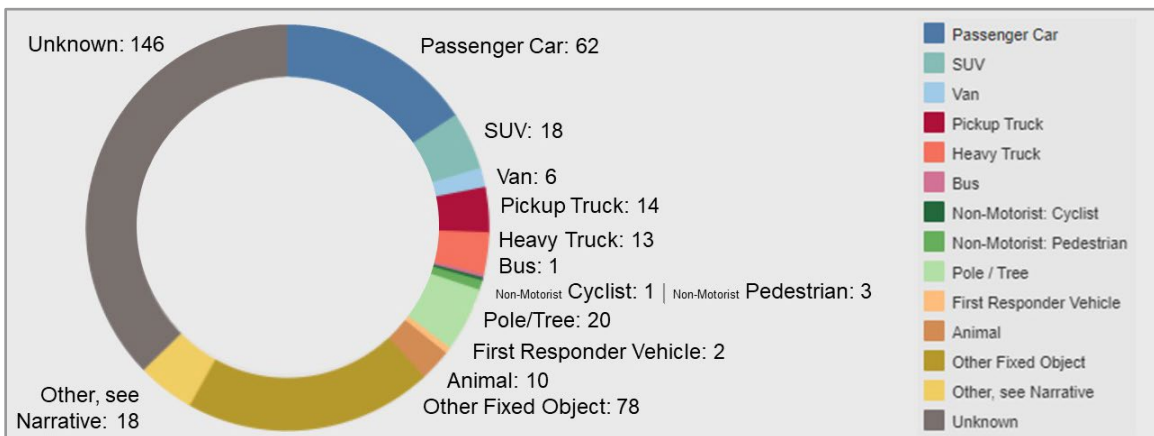
- Tesla, Honda, and Subaru reported the most Level 2 ADAS crashes.

Level 2 ADAS Highest Injury Severity



- Serious injuries or a fatality occurred in 11 of the 98 crashes where crash severity was reported (6 fatal and 5 serious). Injury severity may be unknown if a reporting entity's crash data source does not contain injury information.
- One additional fatal crash is not shown in the chart above because it was not identified as Level 2 ADAS in this data analysis (no value was recorded in the *ADS equipped?* field).

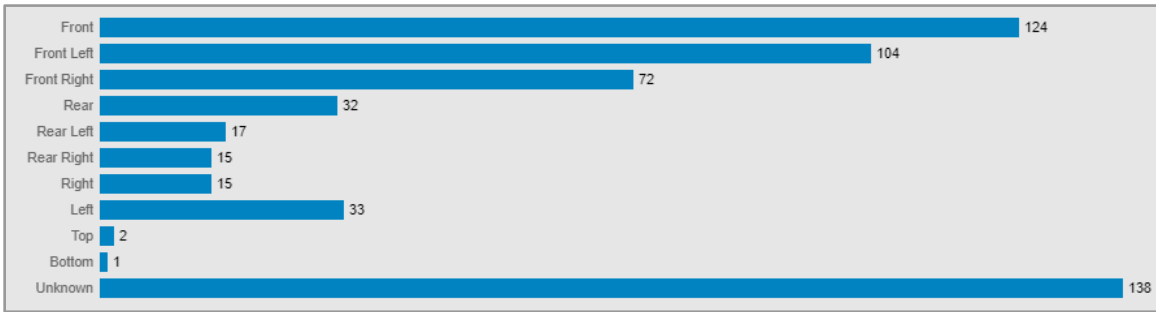
What Did the Level 2 ADAS Vehicle Collide With?



- 116 of specified Level 2 ADAS collisions were with another vehicle.
- Four crashes involved a vulnerable road user (1 with cyclist, 3 with pedestrians).

Note: Vehicles could have collided with more than one object, but only one object was selected per report.

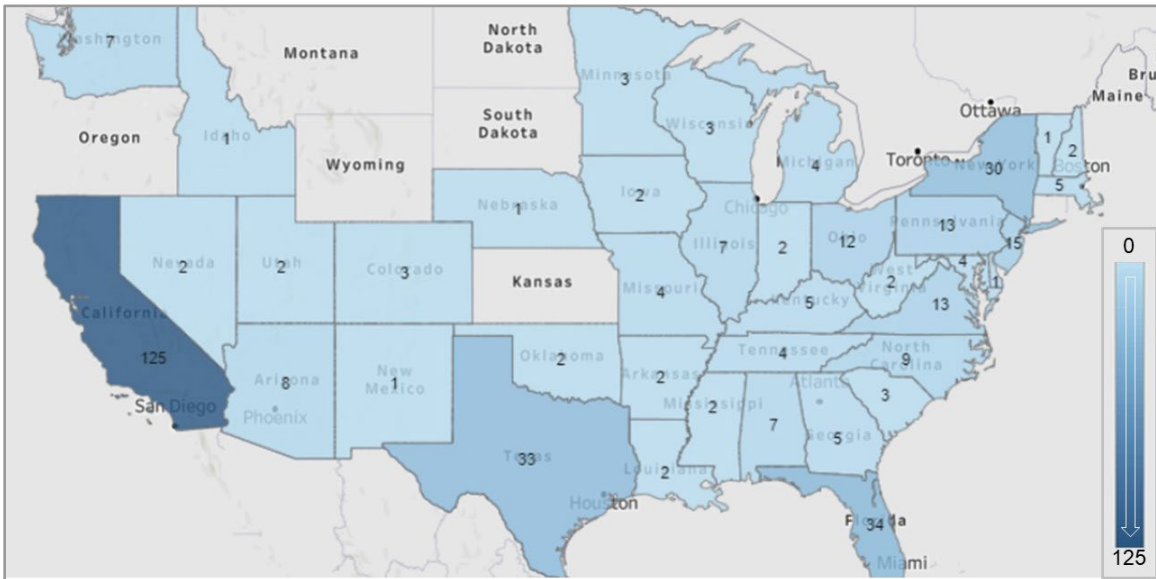
Level 2 ADAS Vehicle Damage



- When damage was reported, the Level 2 ADAS vehicles were most commonly damaged on the front.

Note: Reporting entities can select multiple damage areas for each report meaning that the count of damage areas is greater than the number of crashes.

Level 2 ADAS Crashes by State



- 125 of the Level 2 ADAS crashes occurred in California.

More Information

Summary incident report data reported to the agency under the General Order and additional information are available at [NHTSA.gov/SGOCrashReporting](https://www.nhtsa.gov/SGOCrashReporting).

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Summary Report: Standing General Order on Crash Reporting for Automated Driving Systems

Introduction

In June 2021, the National Highway Traffic Safety Administration (NHTSA) issued a Standing General Order (the General Order) requiring identified manufacturers and operators (reporting entities) to report to the agency certain crashes involving vehicles equipped with SAE Levels 3 through 5 Automated Driving Systems (ADS).¹ While ADS vehicles are currently still in development, once mature, they will be capable of performing the entire dynamic driving task under defined operating conditions and will not require a human driver to monitor and supervise the automation system. There are currently no ADS vehicles for sale to the general public. While the General Order also covers vehicles equipped with SAE Level 2 Advanced Driver Assistance Systems (ADAS), that data summary is provided in a [separate report](#).

The General Order requires that reporting entities file incident reports for crashes involving ADS-equipped vehicles that occur on publicly accessible roads in the United States and its territories. Crashes involving an ADS-equipped vehicle are reportable if the ADS was in use at any time within 30 seconds of the crash and the crash resulted in property damage or injury.

NHTSA issued the General Order on June 29, 2021, and received the first ADS incident report on July 13, 2021. As of May 15, 2022, NHTSA has received incident reports for 130 ADS-equipped vehicle crashes. Prior to the implementation of the General Order, NHTSA's sources of timely crash notifications were limited (e.g., media, vehicle owner questionnaire input, voluntary direct company outreach, and Early Warning Reporting) and generally inconsistent across manufacturers, including developers.

The General Order allows NHTSA to obtain timely and transparent notification of real-world crashes associated with ADS vehicles from manufacturers and operators. With these data, NHTSA can respond to crashes that raise safety concerns about ADS technologies through further investigation and enforcement. As an example, the General Order revealed a prototype ADS vehicle crash that led to a recall of the ADS software and an investigation regarding the adequacy of the remedy through an Information Request letter sent to the reporting entity. The information also provides transparency into the safety of vehicles equipped with this technology that are currently operating on public roads. It also provides crucial data necessary for research and for the development of policies to enhance the safety of these technologies. Safety is crucial to the deployment and public acceptance of new technologies and the General Order is an important measure in evaluating the safety of ADS technology.

Data and Limitations

Understanding the terms and requirements of the General Order, the data it aims to obtain, and the limitations of those data are crucial for accurate interpretation and analysis. The following should be considered when reviewing these data and other information.

Access to Crash Data May Affect Crash Reporting

Crash data recording and telemetry capabilities may vary widely by manufacturer and driving automation system. ADS-equipped vehicles typically utilize multiple sensors and cameras and tend to have relatively advanced data recording and telemetry capabilities. As a result, crashes

¹ For a description of the SAE International (SAE) levels of driving automation, see SAE J3016, "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles," April 2021.

involving ADS-equipped vehicles can generally be reported in a timely manner with great detail. However, it is important to keep in mind differences and variation in data recording and telemetry capabilities for different reporting entities when reviewing the Summary Incident Report Data.

Incident Report Data May Be Incomplete or Unverified

A reporting entity is required to submit an incident report within a certain time from when it receives notice of a crash that may be reportable. This report is required regardless of whether the reporting entity has verified or agrees with the information. Therefore, initial reports may reflect incomplete or unknown information. A reporting entity that receives new or additional information after the initial report is submitted is required to submit an updated report but is not required to take additional affirmative actions to gather further details.

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The Same Crash May Have Multiple Reports

For crashes involving an ADS vehicle that meet the reporting requirements of the General Order, the reporting entity may be required to submit multiple reports for a single crash (an initial report, a 10-day followup, and any subsequent updates). In addition, more than one entity may be responsible for reporting the same crash. For example, the vehicle manufacturer, ADS developer, and operator of the ADS vehicle may all be named in the General Order. This means that a single crash may have multiple reports from multiple entities. Consequently, the overall number of reports submitted does not equate to the total number of incidents and is not a meaningful safety metric.

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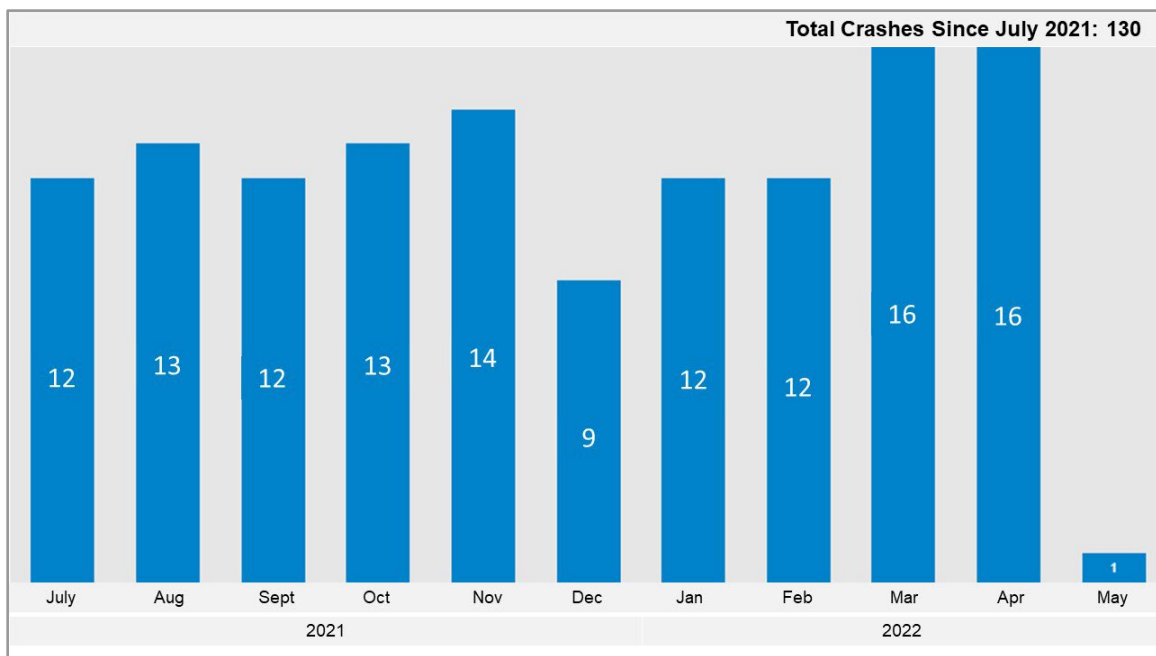
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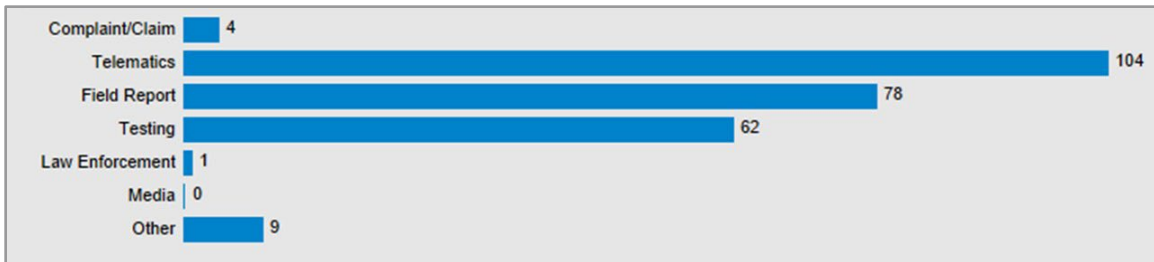
As of May 15, 2022, 25 reporting entities have submitted incident reports for 130 crashes involving ADS-equipped vehicles. When multiple versions of a report exist from a specific entity, the values from the latest report are used. Reports where the latest *ADS Equipped?* field is blank or contains *Unknown*, *see Narrative* or *No* have not been included in this data analysis. There may be cases where more than one report is submitted for a crash, resulting in duplicate counts if sufficient information is not available to match the reports to the same crash. All reports and associated data definitions, including reports not covered by this analysis, are available at [NHTSA.gov/SGOcrashReporting](https://www.nhtsa.gov/SGOcrashReporting).

ADS Crashes by Month



- 130 ADS crashes reported from July 2021 to May 15, 2022.

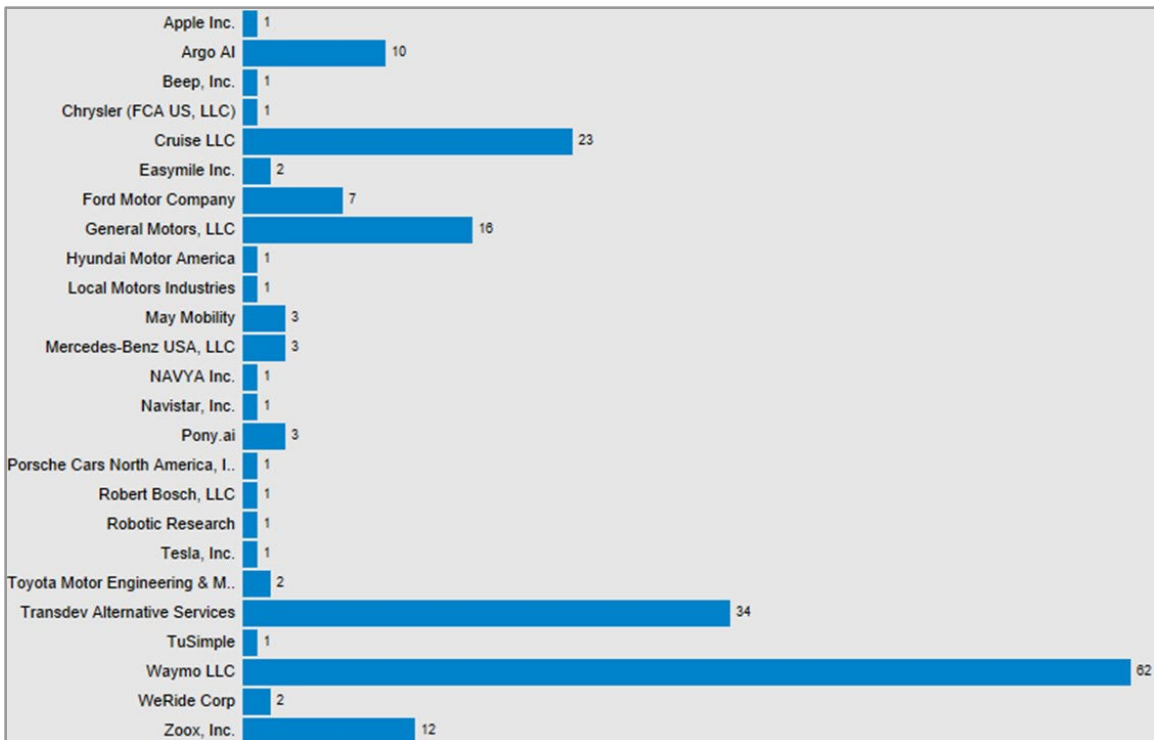
Sources of ADS Crash Reports



- The major sources of ADS crash reports were telematics, field reports from reporting entity employees, and testing communications.

Note: Multiple reports and sources for the same crash result in a total number of sources greater than the number of crashes.

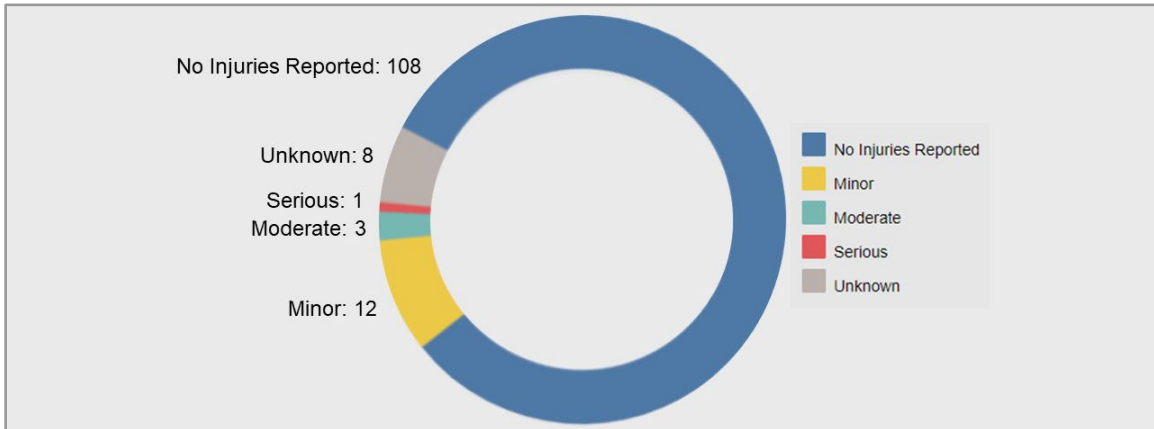
ADS Crashes by Reporting Entity



- Waymo, Transdev, and Cruise reported the most ADS crashes.

Note: The sum of the results shown in this figure are greater than the total number of crashes because multiple entities can report the same crash.

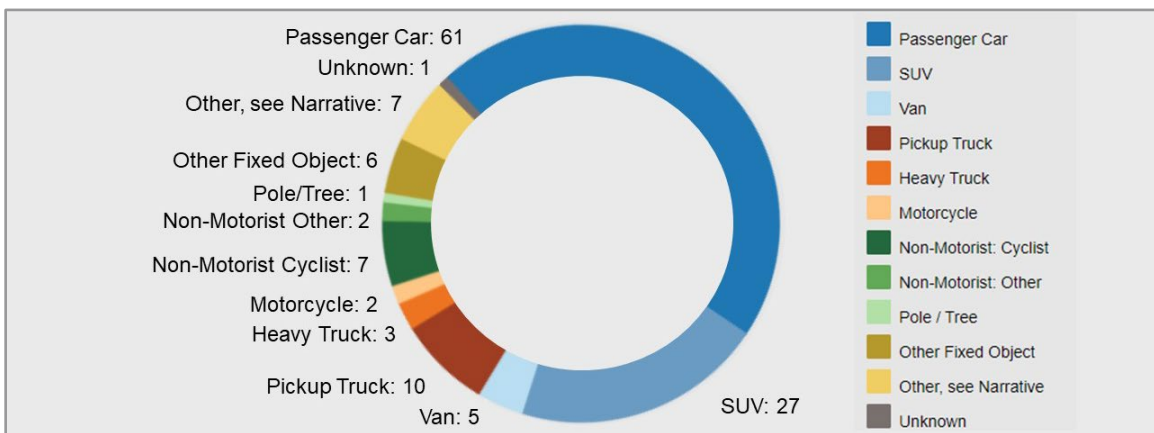
ADS Highest Injury Severity



- One of the specified crashes reported serious injuries.
- 108 of the specified crashes had no reported injuries.

Note: Reports by multiple entities for the same crash containing different information can result in totals greater than the number of crashes.

What Did the ADS Vehicle Collide With?

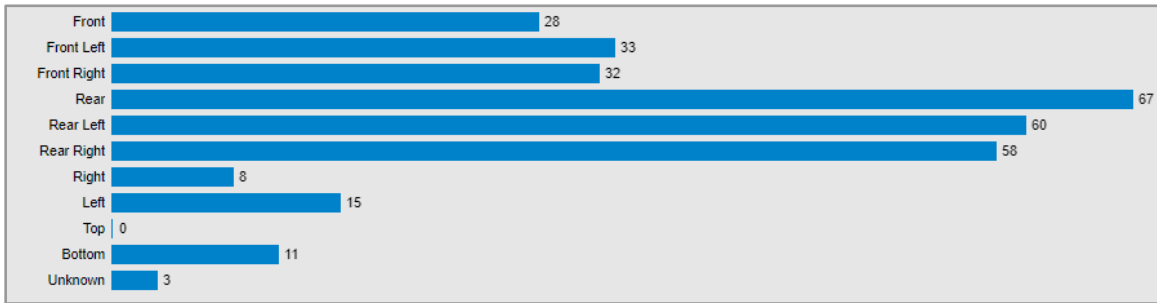


- 108 of ADS-involved crashes reported collisions with another vehicle.
- 11 crashes involved a vulnerable road user² (7 with cyclists, 2 with motorcycles, 2 *Non-Motorist: Other* crashes were with electric scooters).

Note: The sum of the results shown in this figure may be greater than the total number of crashes because multiple entities may report different information for the same crash.

²“Vulnerable Road User” includes any person who is not an occupant of a motor vehicle with more than three wheels. This definition includes, but is not limited to, pedestrians, people traveling in wheelchairs, bicyclists, motorcyclists, and riders or occupants of other transport vehicles that are not motor vehicles, such as all-terrain vehicles and tractors.

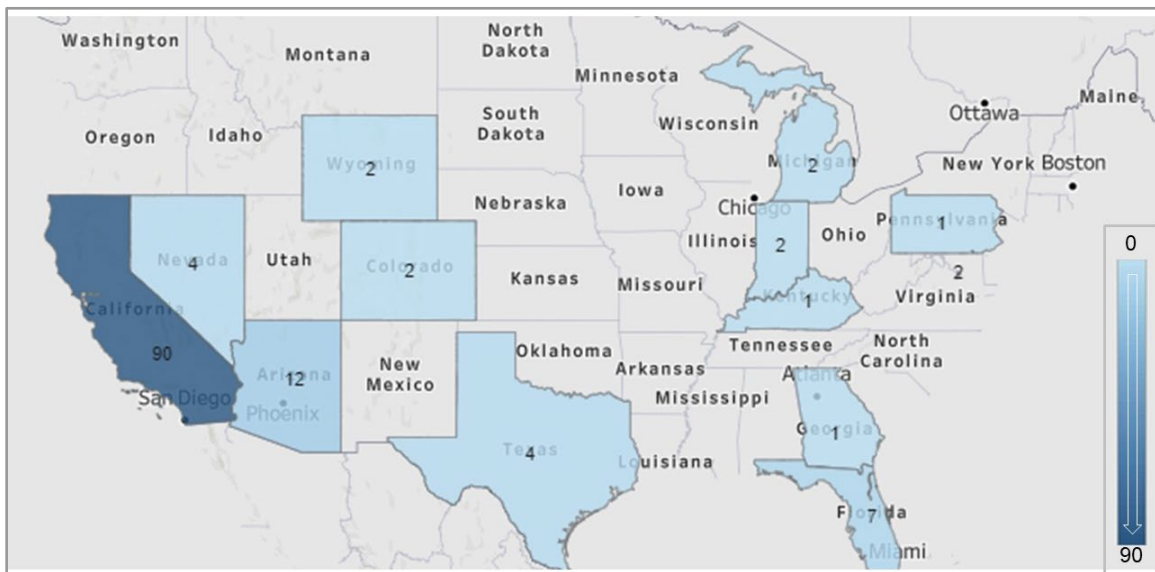
ADS Vehicle Damage



- When damage was reported, the ADS-equipped vehicles were most commonly damaged in the rear.

Note: Damage may occur in several areas of a vehicle during a crash (e.g., angled impact that damages left front and left side of vehicle).

ADS Crashes by State



- 90 ADS crashes occurred in California.

More Information

Summary incident report data reported to the agency under the General Order and additional information are available at [NHTSA.gov/SGOcrashReporting](https://www.nhtsa.gov/SGOcrashReporting).

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