



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



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DOT HS 813 324

June 2022

# **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).<sup>1</sup> 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

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<sup>1</sup> 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.

### ***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 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.

### ***Summary Incident Report Data Are Not Normalized***

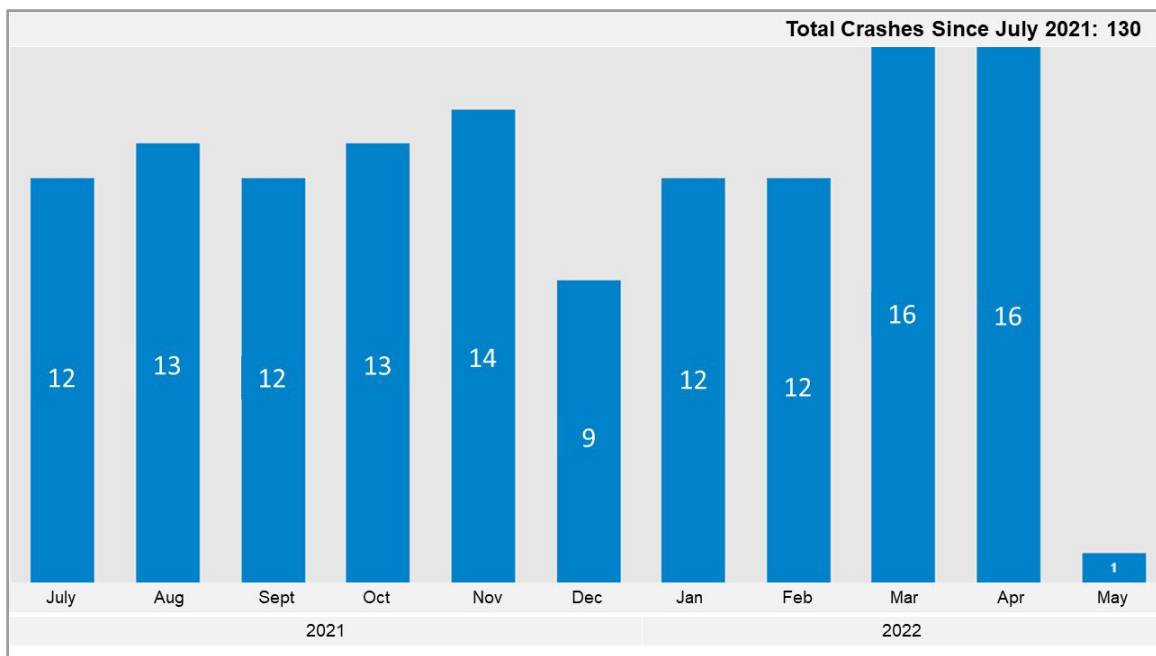
Reporting entities are not required to submit information regarding the number of vehicles they have manufactured, the number of vehicles they are operating, or the distances traveled by those vehicles. Data required to contextualize the incident rates are limited. Data regarding the number of crashes reported for any given manufacturer or operator have not, therefore, been normalized or adjusted by any measure of exposure, including operational design domains 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 ADS-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.

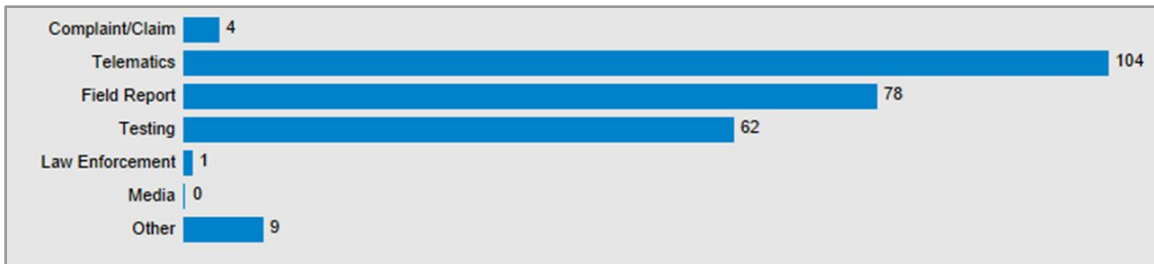
As of May 15, 2022, 25 reporting entities have submitted incident reports for 130 crashes involving ADS-equipped vehicles. When multiple versions of a report exist from a specific entity, the values from the latest report are used. Reports where the latest *ADS Equipped?* field is blank or contains *Unknown*, *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.

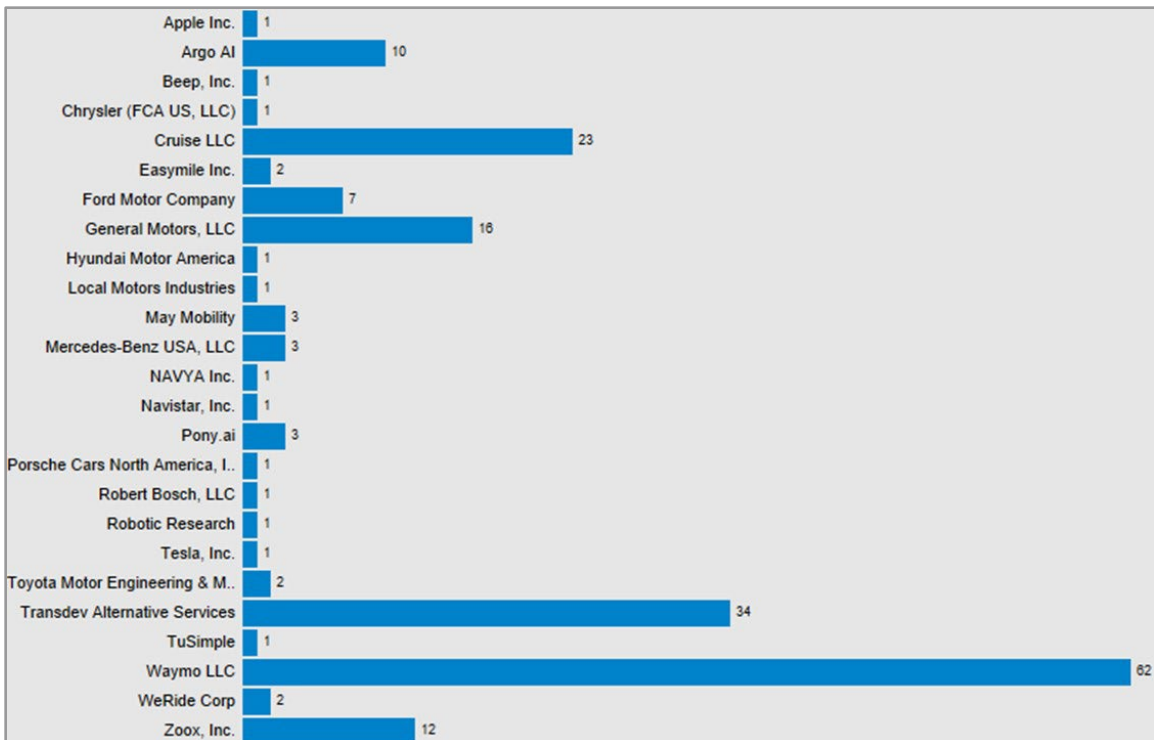
## Sources of ADS Crash Reports



- 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.*

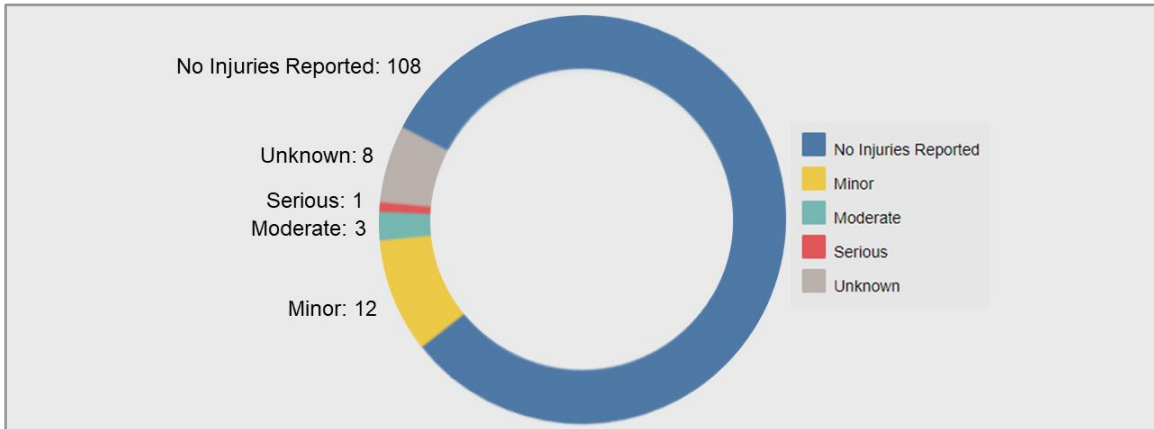
## ADS Crashes by Reporting Entity



- 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.*

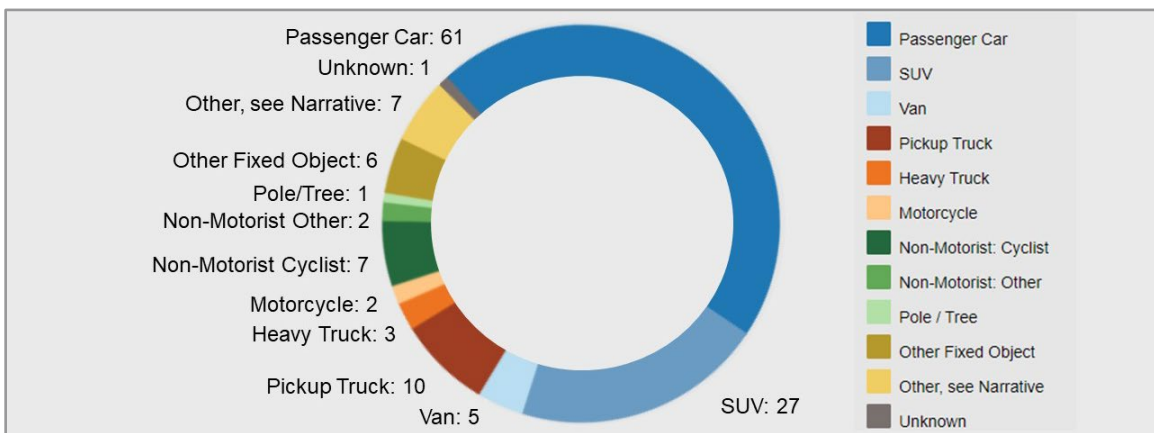
## ADS Highest Injury Severity



- 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?

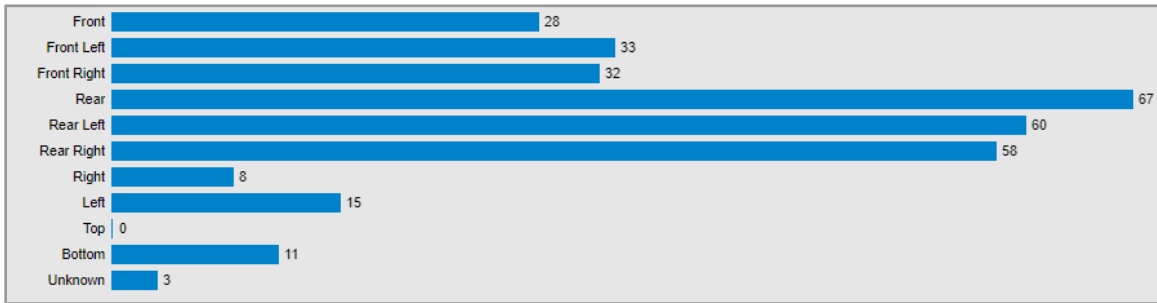


- 108 of ADS-involved crashes reported collisions with another vehicle.
- 11 crashes involved a vulnerable road user<sup>2</sup> (7 with cyclists, 2 with motorcycles, 2 *Non-Motorist: Other* crashes were with electric scooters).

*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.*

<sup>2</sup>“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.

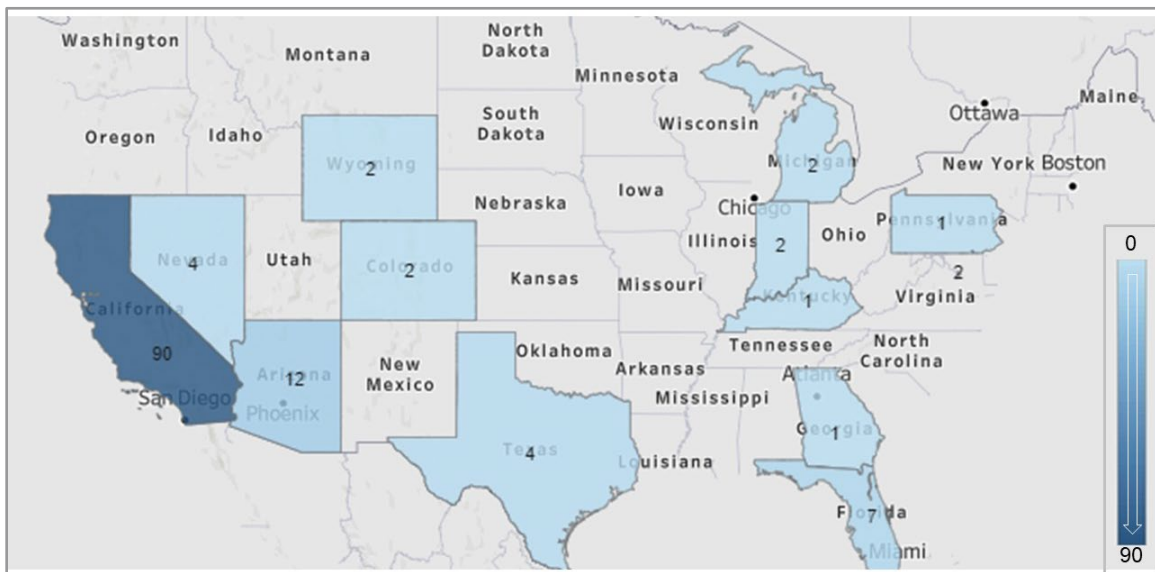
## ADS Vehicle Damage



- 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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