NHTSA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Crash Scenarios Involving Supervised Automation (Human Factors Concerns for L2-L5)

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1. Background
2. Analysis
3. Results
4. Conclusions

Background

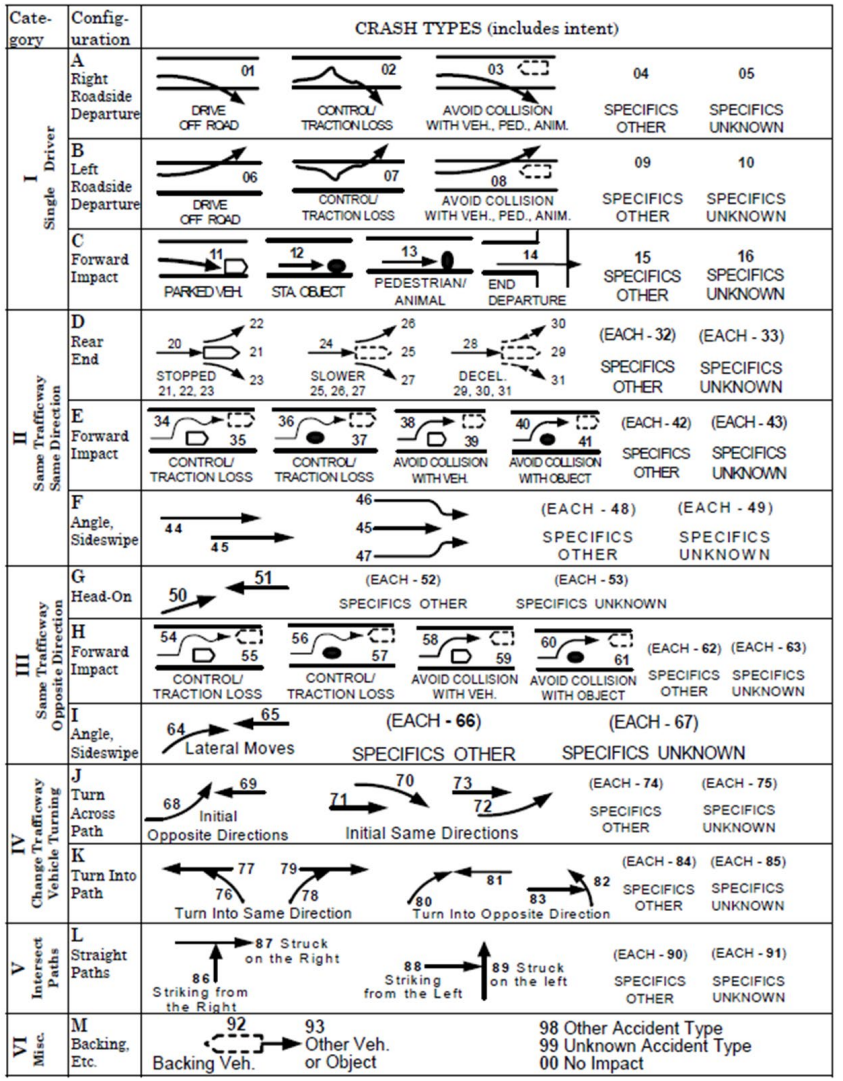
- June 2021: NHTSA issued a Standing General Order (Revised March 2025)
  - Requires identified manufacturers and operators to report certain crashes involving vehicles equipped with SAE Levels 3 through 5 Automated Driving Systems (ADS).
  - Also covers vehicles equipped with SAE Level 2 Advanced Driver Assistance Systems (ADAS).
- This presentation provides descriptive statistics; no safety claims are being made.

Analysis - Methodology

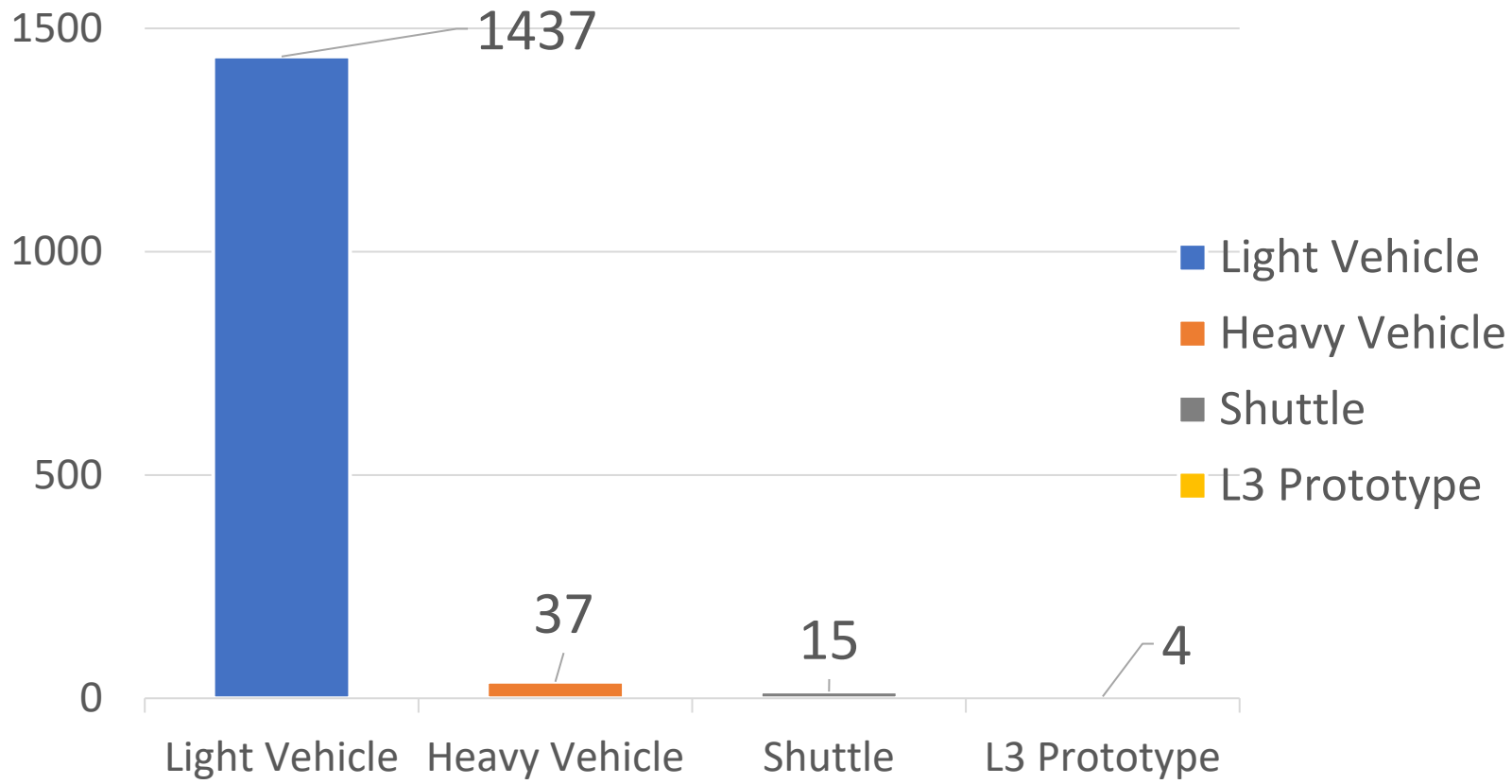
- Analysis of crashes when vehicle had ADS (L4 / L5) engaged in the 30-second window prior to the crash.
- Includes 1493 unique crashes from July 2021 through June 2025.
- Multidisciplinary team of analysts reviewed the crash data.
  - Crash types determined.
  - Pre-crash movement (i.e., stopped, turning, slowing, etc).
  - Traffic control device - ADS right of way.
  - Crash location (i.e., intersection, street, etc).
  - Vehicle type.

Analysis - Crash Types

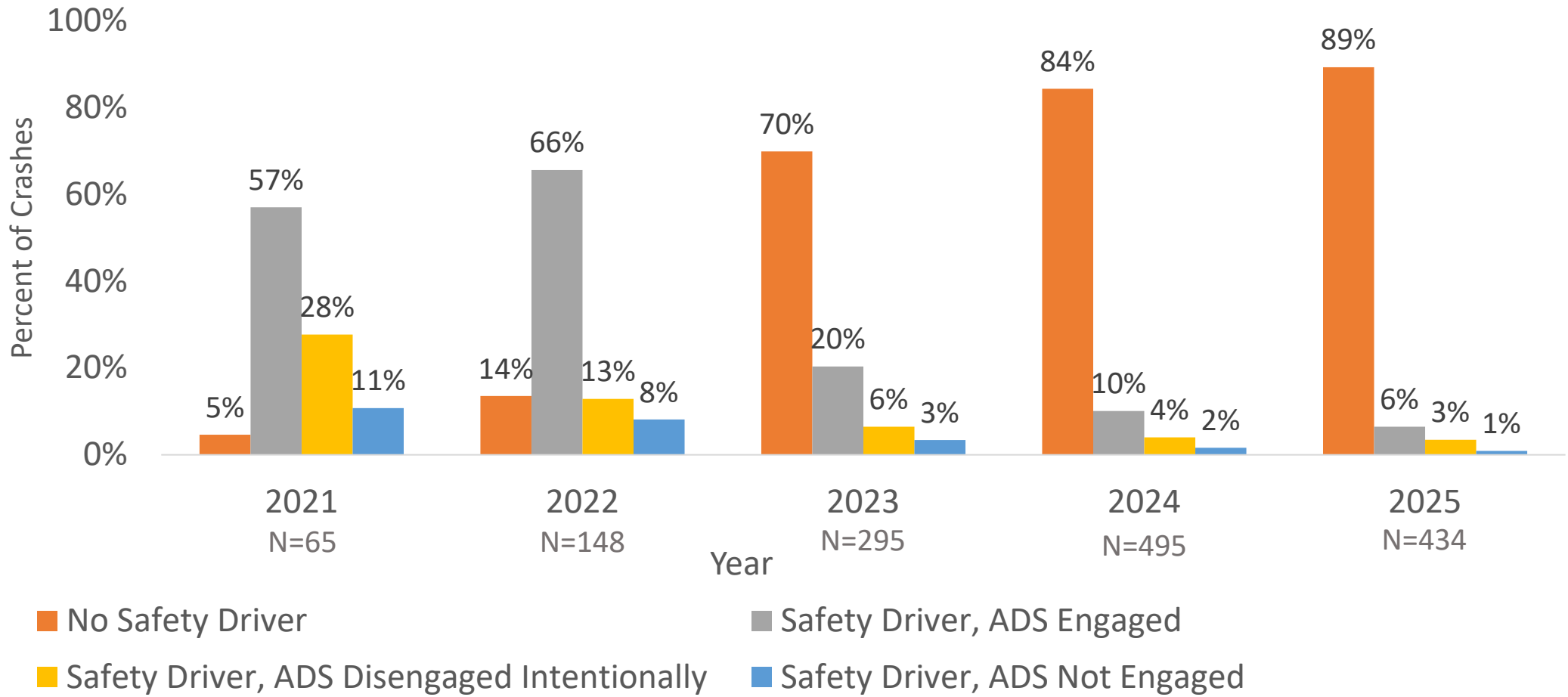
- For each crash, the narrative and reported data such as area of damage identified, and a crash type was assigned.
- Identified if safety driver was present or driverless.
- If the ADS was engaged at time of crash.



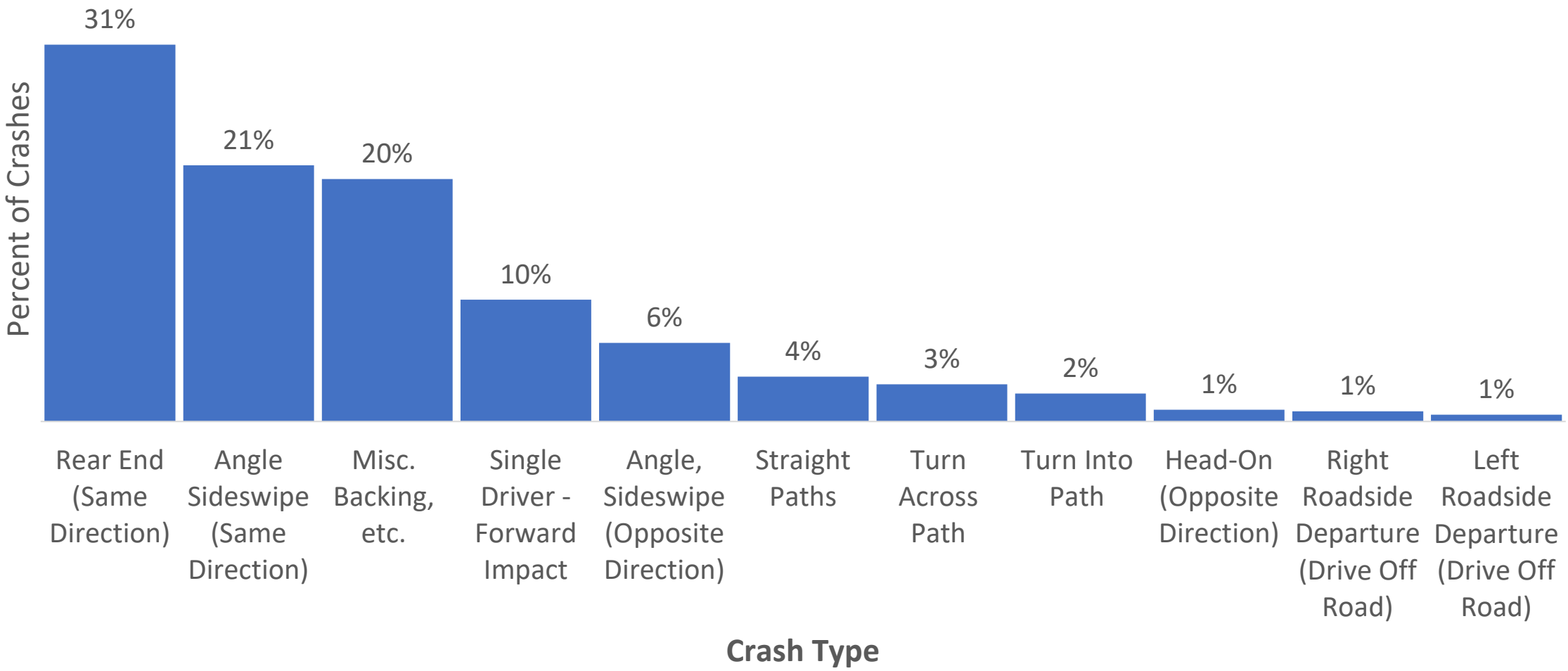
Results - Aggregate of SGO Data by Vehicle Type



Light Vehicle Crash Trends by ADS Engagement at Impact



Results - Light Vehicle Crash Types (N=1437)



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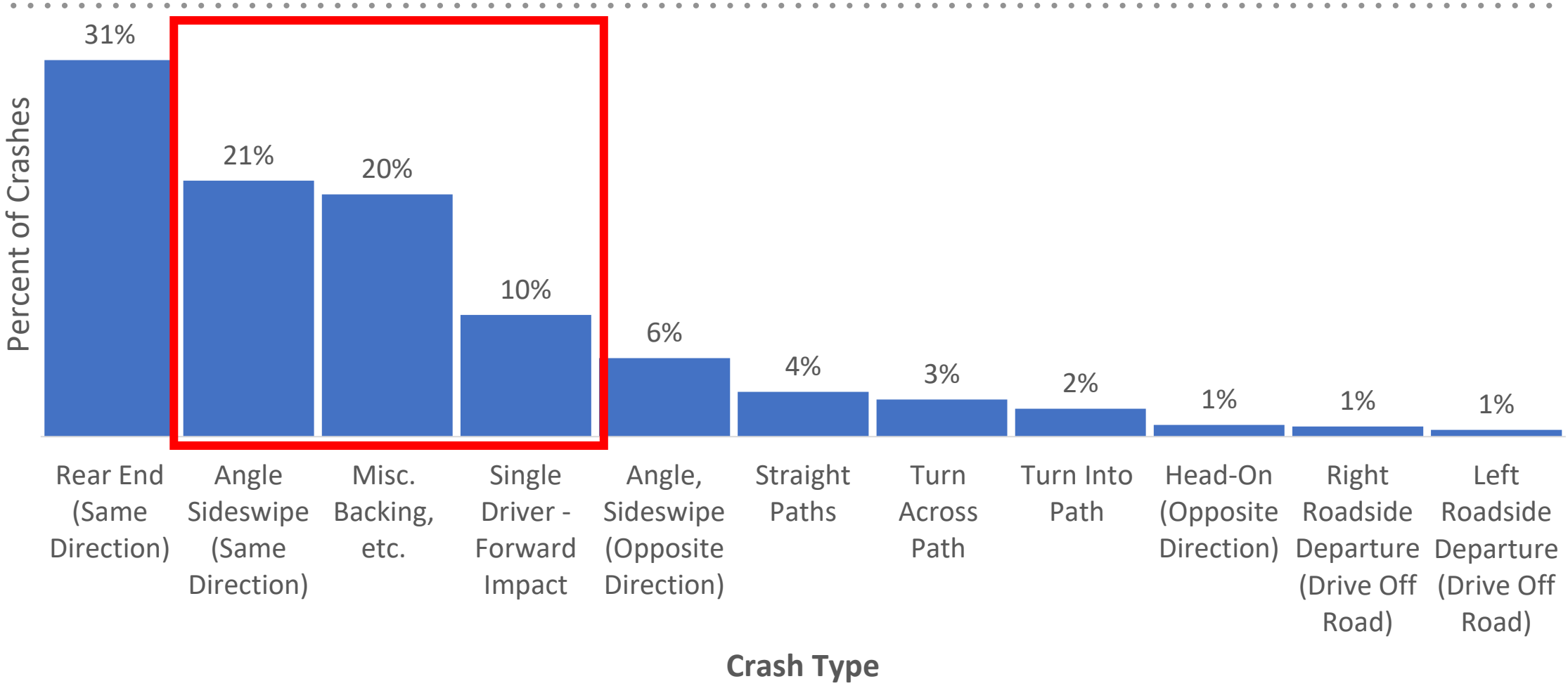
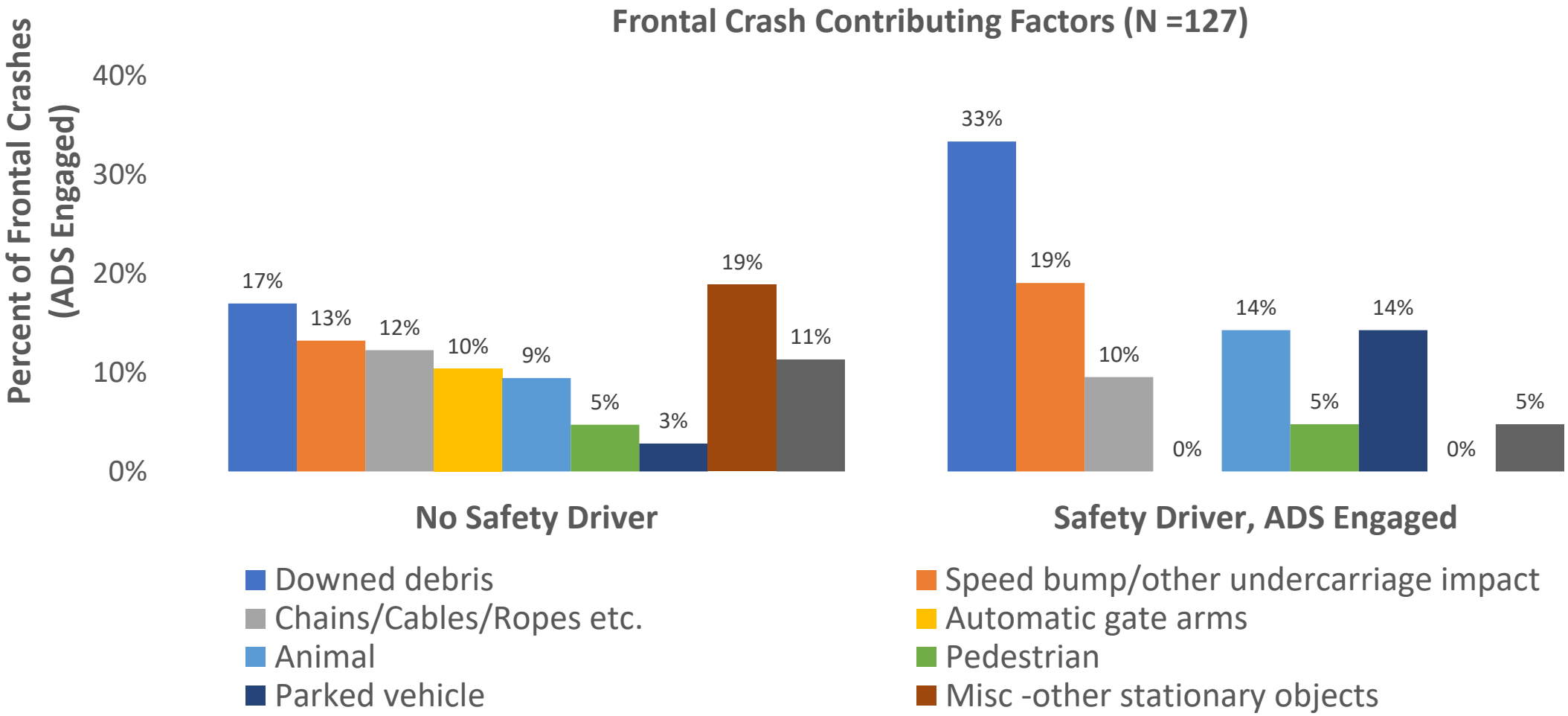


Single Driver – Forward Impact

Crash Type Coding	No Safety Driver	Safety Driver, ADS Engaged	Safety Driver, ADS Disengaged Intentionally	Safety Driver, ADS Not Engaged	% of all Frontal Impact Crashes
Stationary Object / Other	88	14	5	4	77%
Pedestrian / Animal	15	4	1	1	15%
Parked Vehicle	3	3	4	2	8%
Total	**106**	**21**	**10**	**7**	**144 (100%)**

Single Driver – Forward Impact



Single Driver – Forward Impact

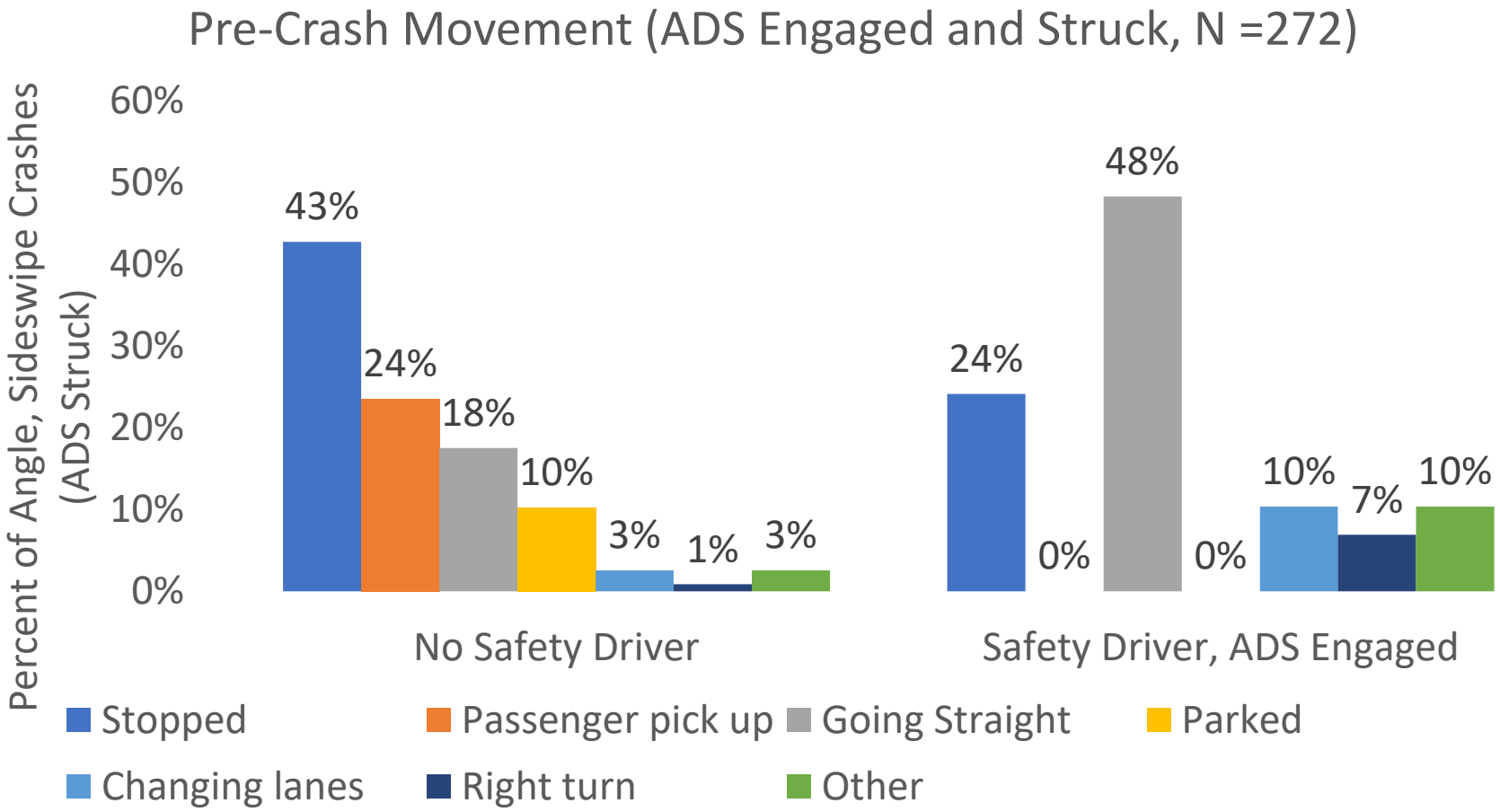
"The [subject vehicle] was traveling southbound on the right lane of [XX] when the front driver side of the [subject vehicle] made contact with a piece of debris within its lane of travel. The debris became lodged within the front driver side wheel well of the [subject vehicle] and as the [subject vehicle] continued driving, the lodged debris ignited, causing a fire within the wheel well of the [subject vehicle]. At the time of the impact, the [subject vehicle's] Level 4 ADS was engaged in autonomous mode."

"The [subject vehicle] was traveling in a parking lot … when it made contact with a hanging chain separating a section of the parking lot. At the time of the impact, the [subject vehicle's] Level 4 ADS was engaged in autonomous mode."

Angle Sideswipe (Same Direction)

ADS Engaged on Impact	No Safety Driver	Safety Driver, ADS Engaged	Safety Driver, ADS Disengaged Intentionally	Safety Driver, ADS Not Engaged	% of all Same Direction Angle Side Swipe Crashes
Struck	234	29	16	6	94%
Striking	8	1	8	1	6%
Total (Striking or Struck)	242	30	24	7	303 (100%)

Angle Sideswipe (Same Direction)



Same Direction – Angle, Sideswipe

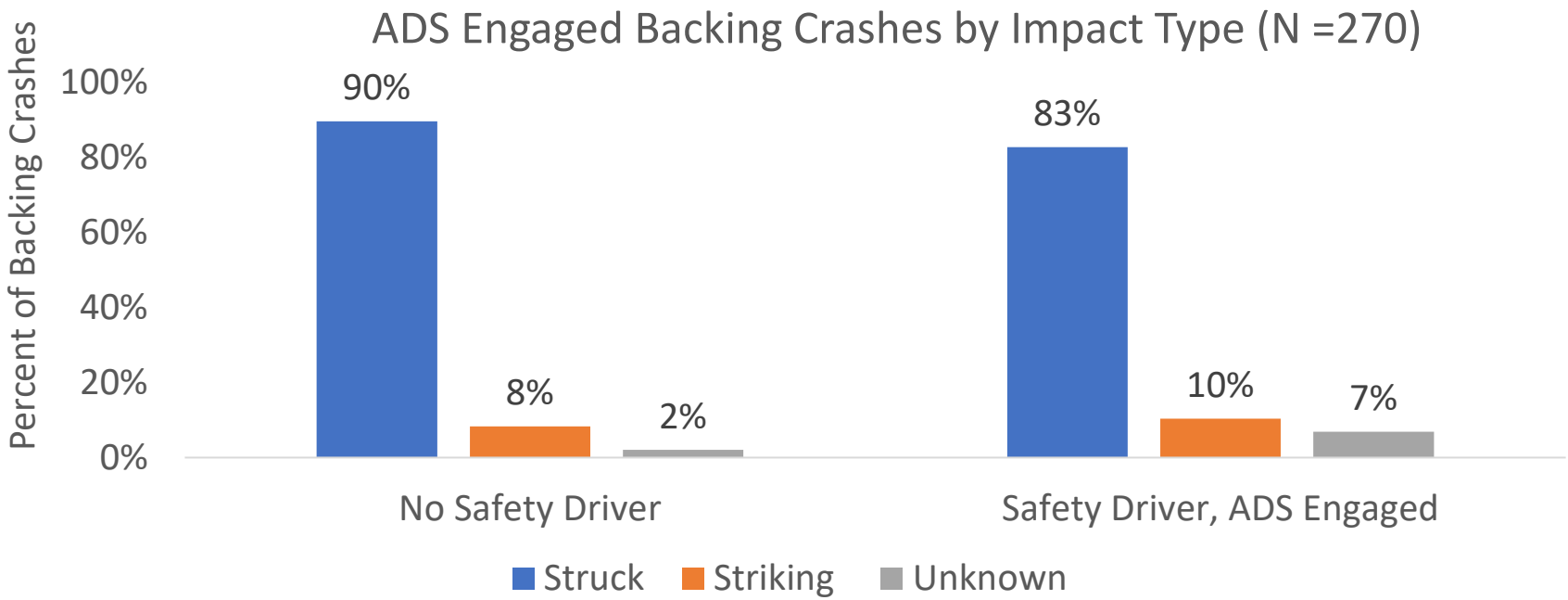
"The [subject vehicle] was traveling westbound on [XX] Street in a one lane road and came to a stop at the curb for a passenger drop off. A rider in the [subject vehicle] opened the rear driver side door to exit as an SUV was passing the [subject vehicle] on the left, and the front passenger side of the SUV made contact with the opened rear driver side door of the [subject vehicle]. The passenger that was in the vehicle was not belted at the time of the collision, likely because they were at a drop off location and preparing to exit. At the time of the impact, the [subject vehicle's] Level 4 ADS was engaged in autonomous mode."

Same Direction – Angle, Sideswipe

"The [subject vehicle] was parked at the curb with hazard lights activated, facing eastbound on [XX] for a passenger pickup. The [subject vehicle] passenger opened the rear driver side door as a passenger car was traveling eastbound on [XX]in the adjacent lane. As the passenger car passed by the [subject vehicle], the front passenger side of the passenger car made contact with the open driver side rear door of the [subject vehicle]. The passenger was not belted at the time of the collision as they were still in the process of entering the [subject vehicle]. At the time of the impact, the [subject vehicle's] Level 4 ADS was engaged in autonomous mode."

Misc. (Backing) Crashes

Struck	163	18	6	4	95%
Striking	5	1	2	2	5%
Total	168	19	8	6	201 (100%)



Backing Crashes

"The [subject vehicle] was traveling westbound in a parking lot near [XX] when it stopped for a rider pick-up. While the [subject vehicle] remained parked with hazard lights activated, a passenger car in a parking spot to the left of the [subject vehicle] reversed and the rear of the passenger car made contact with the driver side of the stationary [subject vehicle]. At the time of the impact, the [subject vehicle's] Level 4 ADS was engaged in autonomous mode."

"The [subject vehicle] was traveling in autonomy through a parking lot and comes to a stop due to a vehicle backing up. Vehicle begins to reverse further so the operator in the [subject vehicle] takes over and manually reverses. The other vehicle continues backing up and does not stop, contacting the front of the [subject vehicle]. Other vehicle then proceeds to drive away."

Conclusions

- This presentation provides descriptive statistics; no safety claims are being made.
- As there are more vehicle miles traveled for ADS-equipped vehicles, observing an increasing number of driverless crashes.
- As driverless operations become more prevalent, human factors considerations may assist in identifying unique incident factors for ADS vehicles.

Questions?

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