

# Sorry, My Car Didn't See You!

## The State of Automation and Motorcycling

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# Today's Discussion



- ▶ Crash Statistics
- ▶ What is ADS & ADAS
- ▶ Federal Policy
- ▶ Federal Law
- ▶ Research

# 2020 Motorcycle Crash Statistics



- ❑ 5,579 fatalities - highest number of motorcyclists killed since FARS started in 1975
  - ❑ Motorcycles are 14% of all traffic fatalities & are only 3% of all registered vehicles
- ❑ 82,528 motorcyclists were injured nationwide
- ❑ 55% of fatalities were multi-vehicle accidents (3,138)
  - ❑ 1,158 of these crashes, the other vehicles were turning left while the motorcycles were going straight, passing, or overtaking other vehicles
  - ❑ Both vehicles were going straight in 575 crashes
- ❑ ***Motorcyclists are 28 times more likely than passenger vehicle occupants to die in a motor vehicle crash and were 4 times more likely to be injured***

# What does AV - HAV - ADS - ADAS mean?

## ▶ Understanding the Differences: ADS vs Level 2 ADAS

- ▶ Highly Automated Vehicles, still in development, encompass SAE Levels 4 and 5 and require no intervention from the human driver. – only on the road for research and testing
- ▶ Level 2 advanced driver assistance systems 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. – Available to consumers from most automakers
- ▶ Level 3 system allow the driver to disengage from the driving task but require the driver be prepared to take over – available to consumers but on very few vehicles



# SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You <b>are</b> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <b>are not</b> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
What do these features do?	These are driver support features			These are automated driving features		
	These features are limited to providing warnings and momentary assistance	These features provide steering <b>OR</b> brake/acceleration support to the driver	These features provide steering <b>AND</b> brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features	<ul style="list-style-type: none"> <li>• automatic emergency braking</li> <li>• blind spot warning</li> <li>• lane departure warning</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering <b>OR</b></li> <li>• adaptive cruise control</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering <b>AND</b></li> <li>• adaptive cruise control at the same time</li> </ul>	<ul style="list-style-type: none"> <li>• traffic jam chauffeur</li> </ul>	<ul style="list-style-type: none"> <li>• local driverless taxi</li> <li>• pedals/steering wheel may or may not be installed</li> </ul>	<ul style="list-style-type: none"> <li>• same as level 4, but feature can drive everywhere in all conditions</li> </ul>



# FEDERAL POLICY

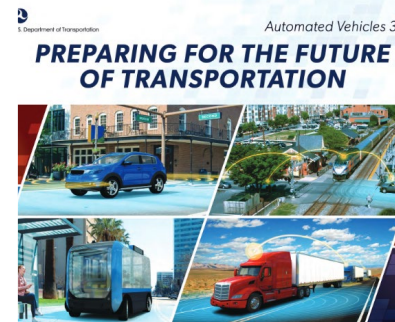
2016



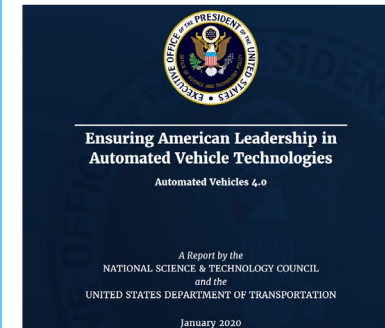
2017



2018



2020



# FEDERAL POLICY

- ❑ 2017 - Voluntary Safety Self-Assessment Template
  - ❑ SAE Levels 3-5
- ❑ 2020 - Automated Vehicle Transparency and Engagement for Safe Testing
  - ❑ Level 3 & Higher
  - ❑ As part of the AV TEST initiative, states and companies can voluntarily submit information about testing of automated driving systems to NHTSA, and the public can view the information using NHTSA's interactive tool.
- ❑ 2021 Standing General Order
  - ❑ NHTSA has issued a Standing General Order requiring identified manufacturers and operators to report to the agency certain crashes involving vehicles equipped with automated driving systems or SAE Level 2 advanced driver assistance systems.

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# FEDERAL LAW

## 2021 – Infrastructure Investment & Jobs Act (IIJA)

- ▶ FMVSS
  - ▶ Complete a rulemaking to require automatic emergency braking on heavy vehicles subject to FMVSS 136
  - ▶ Complete a study on equipping vehicles not subject to FMVSS 136 with automatic emergency braking,
- ▶ NCAP update – (RFC in March 2022 – No Final Rule Issued yet)
  - ▶ Complete rulemakings that require the following on new passenger vehicles:
    - ▶ lane departure warning
    - ▶ lane keeping assist
    - ▶ forward collision warning
    - ▶ automatic emergency braking
  - ▶ 10 year Plan - Roadmap for NCAP

# RESEARCH

## 2016 - Preliminary Study of the Response of Forward Collision Warning Systems to Motorcycles by Dynamic Research, Inc.

### ▶ **Conclusions**

- ▶ Motorcycle was inadequately detected in 40% of trials
- ▶ If motorcycles are not correctly identified by these systems, an unintended consequence of broad ADAS implementation may be an increase in the frequency of car-motorcycle accidents even as car-car accidents decrease

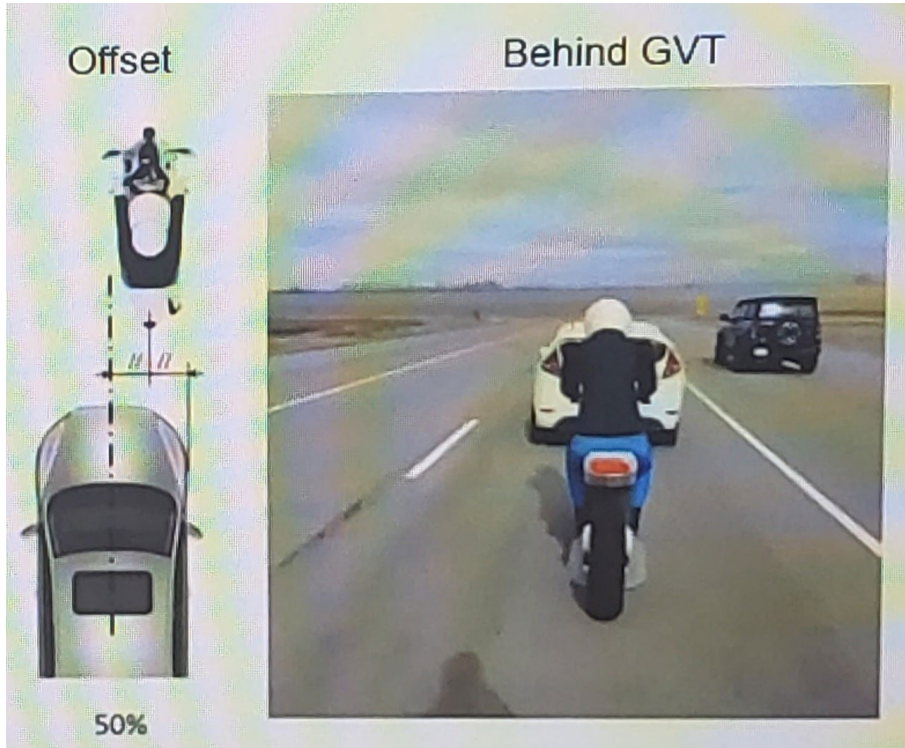
### ▶ **Recommendations**

- ▶ Develop crashable motorcycle targets and delivery systems
- ▶ Identify and rank the most commonly occurring motorcycle car accident scenarios and develop specific test scenarios to address those

## 2018 - RDW (the Netherlands Vehicle Authority) adaptive cruise control responding to motorcycles

- ▶ A common observation from the results presented is that the test vehicles struggle to detect or otherwise follow the motorcycle when riding in the far left and right sides of the lane.

# RESEARCH



## 2022 - Motorcycle and Bicycle AEB Performance Testing (NHTSA Funded)

Motorcycle (Lead Vehicle) test scenarios:

- ▶ Lead Vehicle Stopped (LVS)
- ▶ Lead Vehicle Moving (LVM)
- ▶ Lead Vehicle Decelerating (LVD)

Lead position

- ▶ Centered
  - ▶ Offset 50%
- 
- ▶ Vehicle speeds of up to 100 km/h
  - ▶ Day and night conditions (for LVS)
  - ▶ Alone and behind Global Vehicle Target (LVS)



# RESEARCH

## 2022 - Motorcycle and Bicycle AEB Performance Testing (NHTSA Funded)





# RESEARCH

## 2022 - Motorcycle and Bicycle AEB Performance Testing MOTORCYCLE LEAD VEHICLE STOPPED



### Example results

LVS Daylight Matrix										
			Subject Vehicle							
Principal Other Vehicle	Offset	Speed (km/h)	10	20	30	40	50	60	70	80
GVT	Center	0							20.2	X
Motorcyclist	Center	0		13.5	X	X	X	X	X	X
	50%	0		15.3	X	X	X	X	X	X
Motorcyclist 2m Behind GVT	Center	0			26.1	X	X	X	X	X
	50%	0	10.1	X	X	X	X	X	X	X

LVS Dark Matrix										
			Subject Vehicle							
Principal Other Vehicle	Offset	Speed (km/h)	10	20	30	40	50	60	70	80
GVT	Center	0								24.1
Motorcyclist	Center	0							21.0	X
	50%	0		17.2	X	X	X	X	X	X
Motorcyclist 2m Behind GVT	Center	0				32.8	X	X	X	X
	50%	0		17.2	X	X	X	X	X	X

Color Guide	
	Complete
	Complete with target impact, Relative impact speeds Noted
	Not attempted due to previous run performance



# RESEARCH

## 2022 - Motorcycle and Bicycle AEB Performance Testing MOTORCYCLE LEAD VEHICLE MOVING



Example results

LVM							
			Subject Vehicle				
Principal Other Vehicle	Offset	Speed (km/h)	60	70	80	90	100
GVT	Center	20				13.5	X
Motorcyclist		20			3.3	X	X
Motorcyclist	50%	20			4.4	X	X

# RESEARCH

## 2022 - Motorcycle and Bicycle AEB Performance Testing MOTORCYCLE LEAD VEHICLE DECELERATING



Example Vehicle

LVD 12m with 0.5g Decel						
			SV			
POV	Offset	Speed (km/h)	50	60	70	80
Motorcyclist	Center	50				
		60		4.7		
		70			X	
		80				X

LVD 12m with 0.5g Decel						
			SV			
POV	Offset	Speed (km/h)	50	60	70	80
Motorcyclist	50%	50	19.9			
		60		X		
		70			X	
		80				X

LVD 12m with 0.5g Decel						
			SV			
POV	Offset	Speed (km/h)	50	60	70	80
GVT	Center	50				
		60				
		70			2.8	
		80				X



# Contact Info



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