

# Autonomous Vehicles



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1958 IMPERIAL CROWN 4-DOOR SEDAN, CYPRESS GREEN



1958 IMPERIAL CROWN CONVERTIBLE, AZTEC TURQUOISE

# 1958 Chrysler Imperial



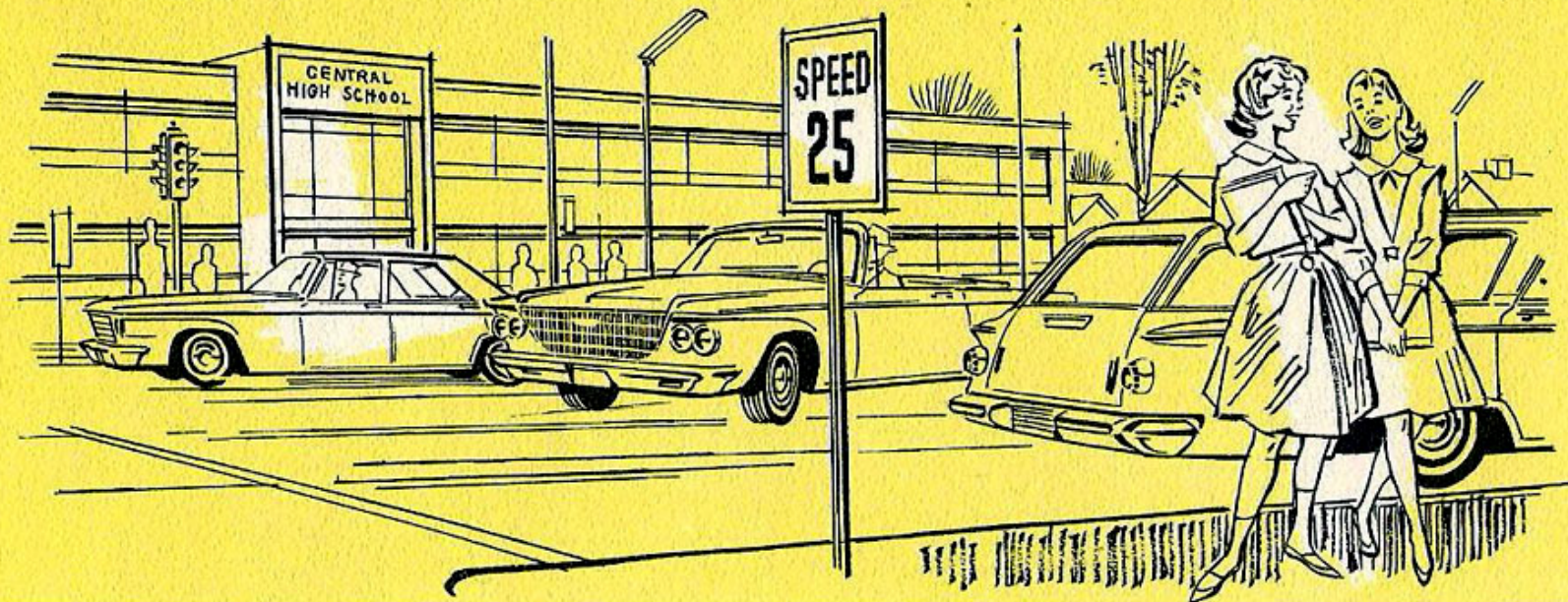
Acclaimed by experts as one of the greatest automotive inventions ever developed

# AUTO-PILOT



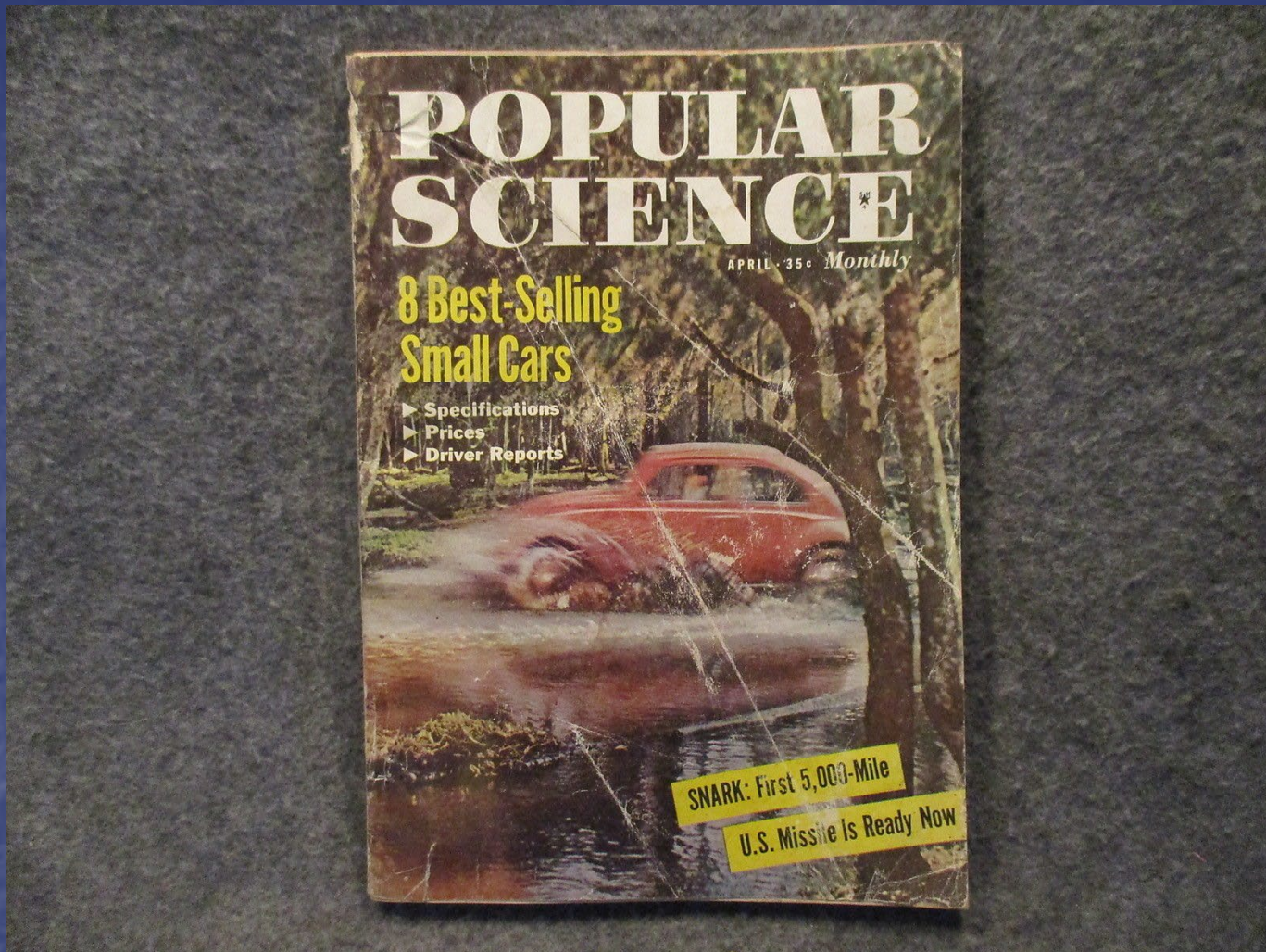
1958 IMPERIAL AUTO-PILOT CONTROL DIAL

*... an amazing new device that helps you maintain a constant speed and warns you of excessive speed ... available only on 1958 CHRYSLERS and IMPERIALS*



## **THE DRIVING IS EASIER . . .**

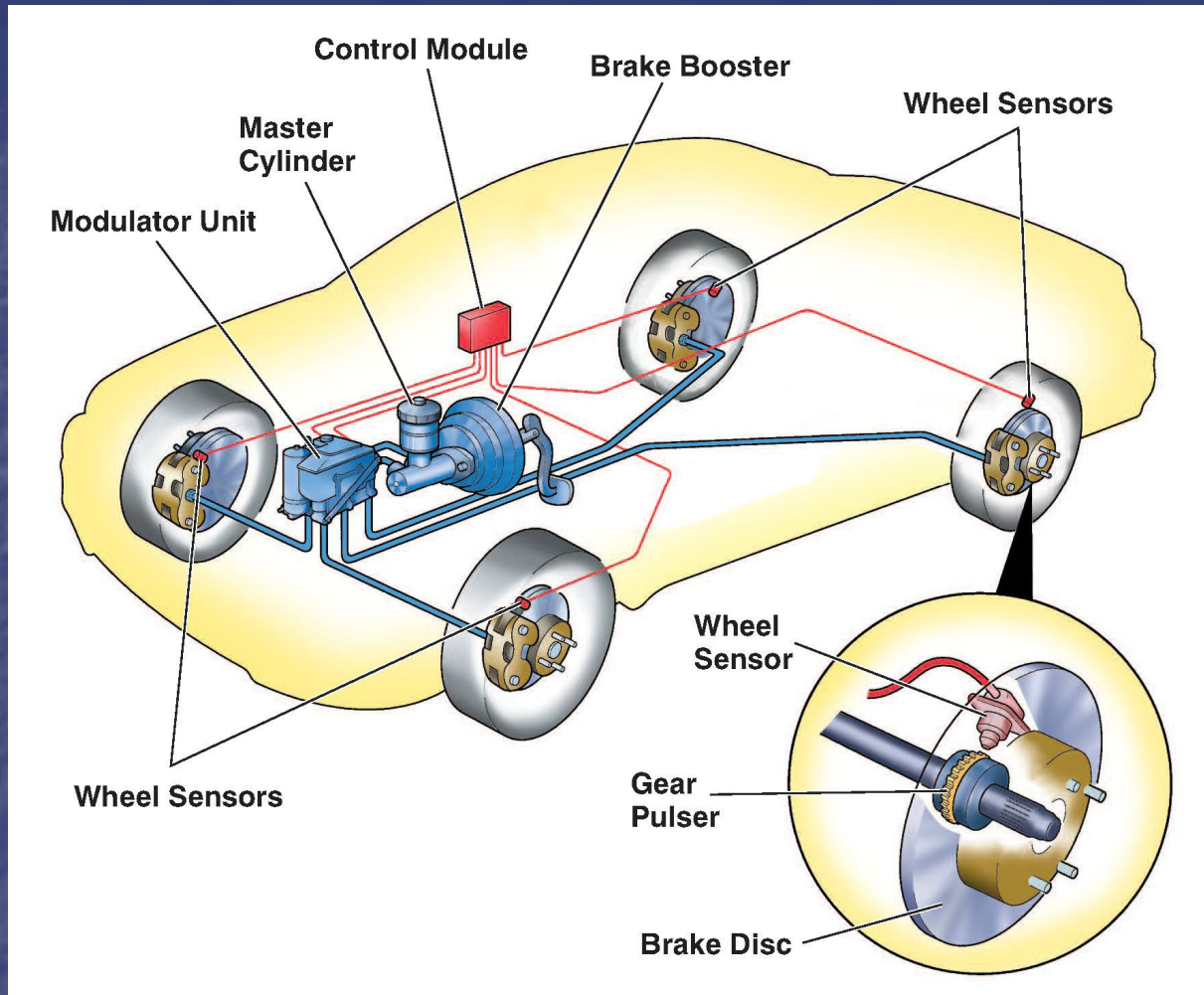
When driving in city traffic, you keep alert. You don't watch your speedometer. You have complete confidence in your superb new Chrysler or Imperial. Auto Pilot does the speed watching for you and reminds you accurately and quietly when you reach your desired speed.



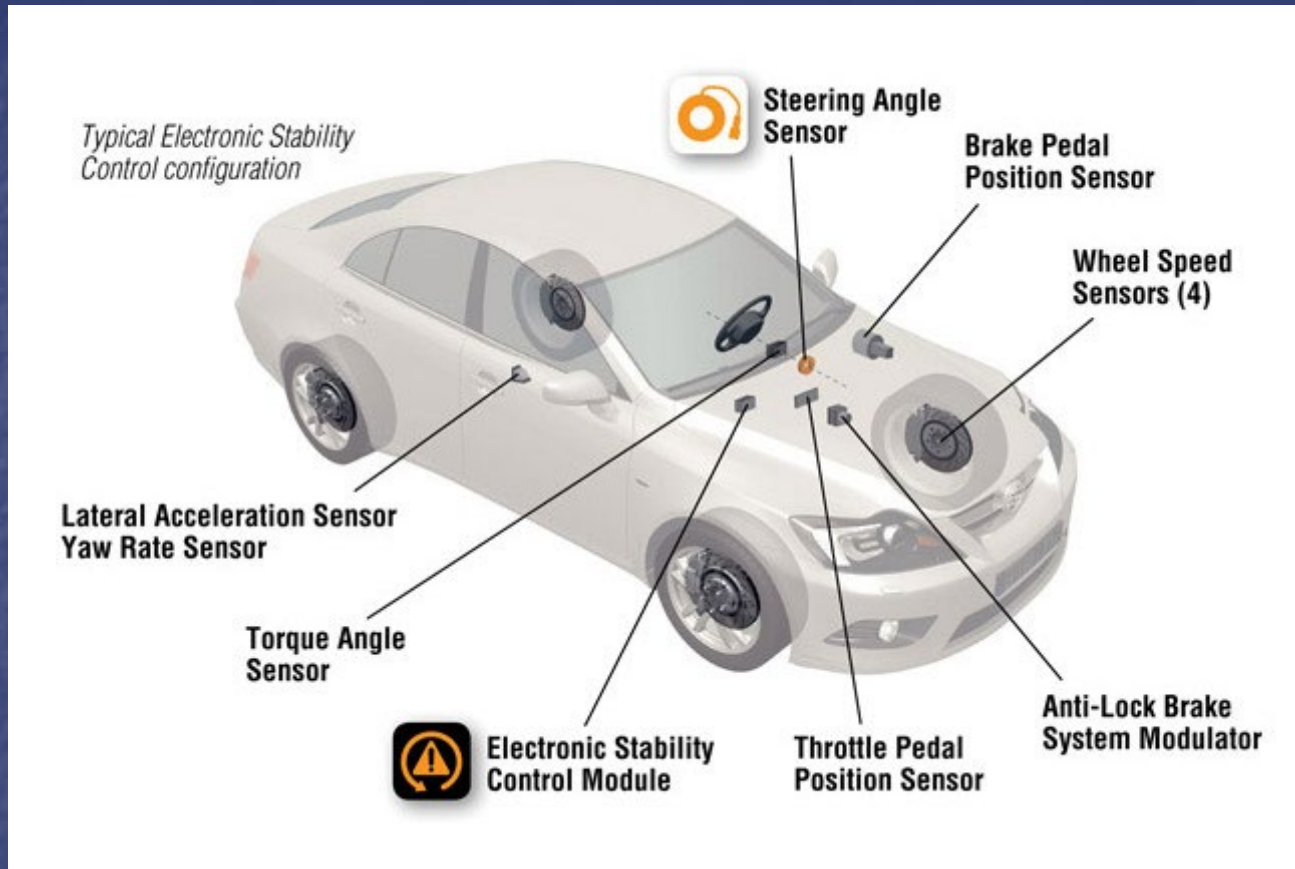
April 1958

## *Popular Science* – April 1958

- Auto-pilot “certainly promotes safety by reducing fatigue.”
- “Like it or not, the robots are slowly taking over a driver’s chores.”

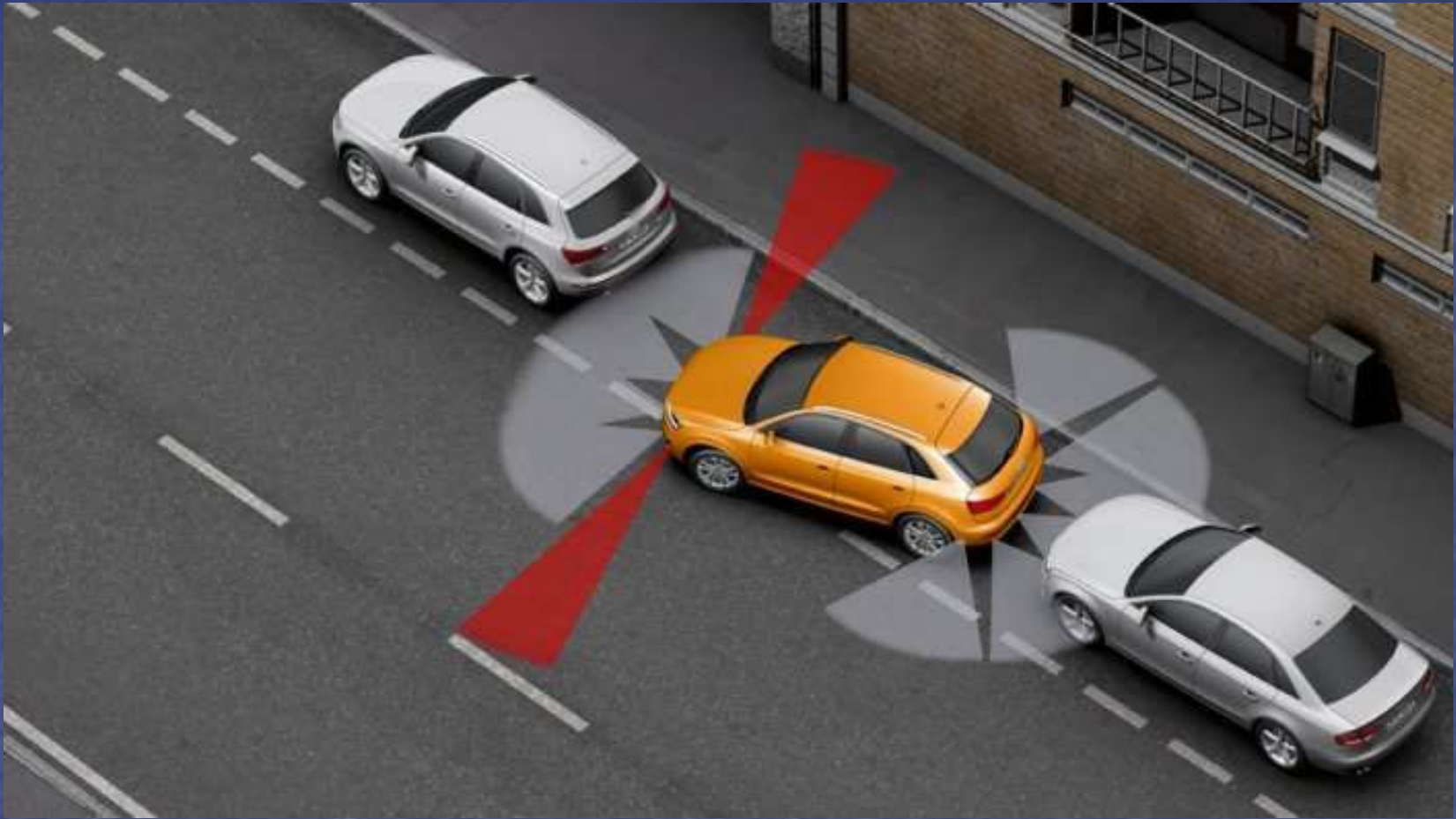


# Anti-Lock Brakes – 1970's

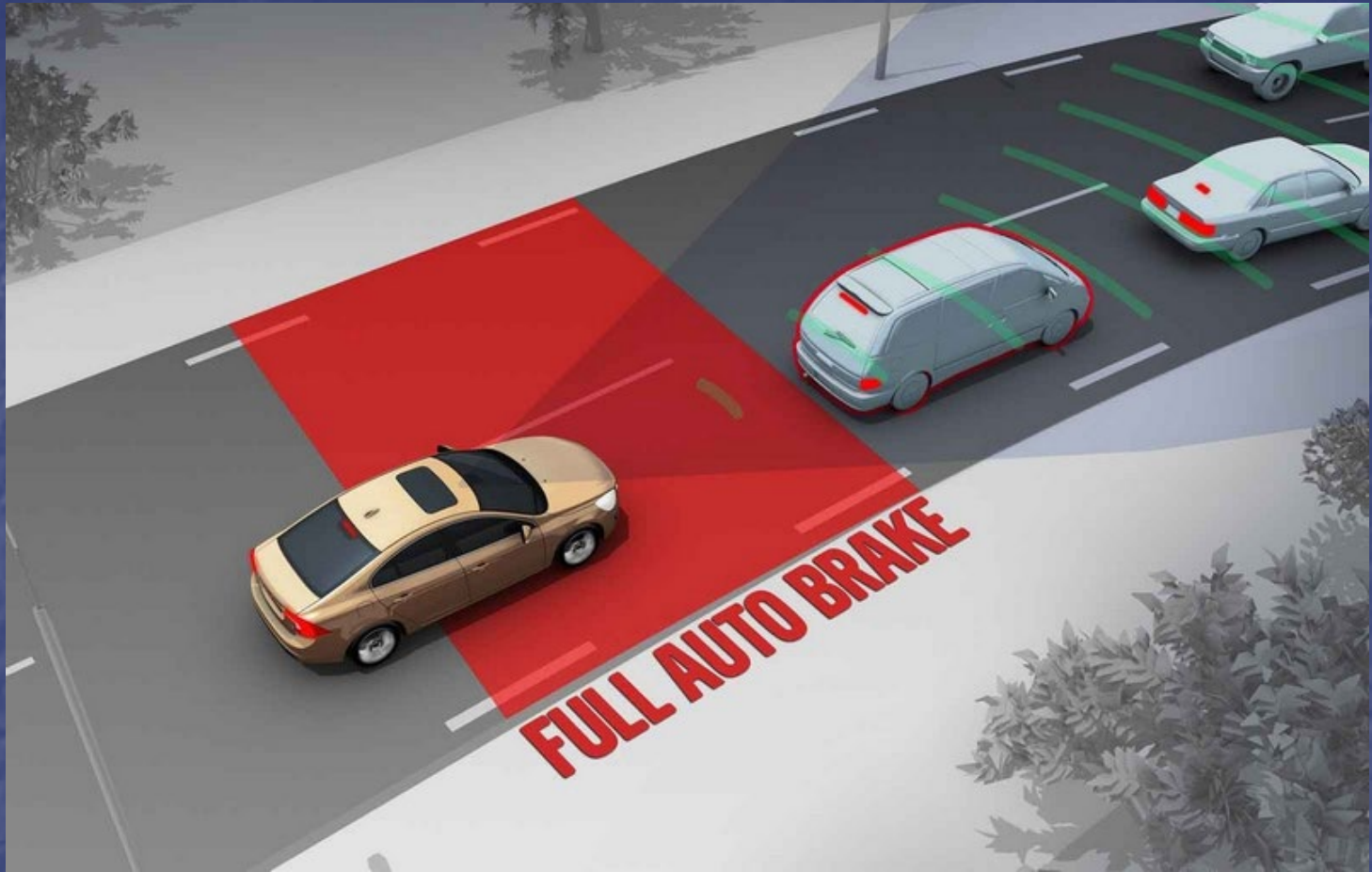


# Electronic Stability Control (ESC)- 1990s

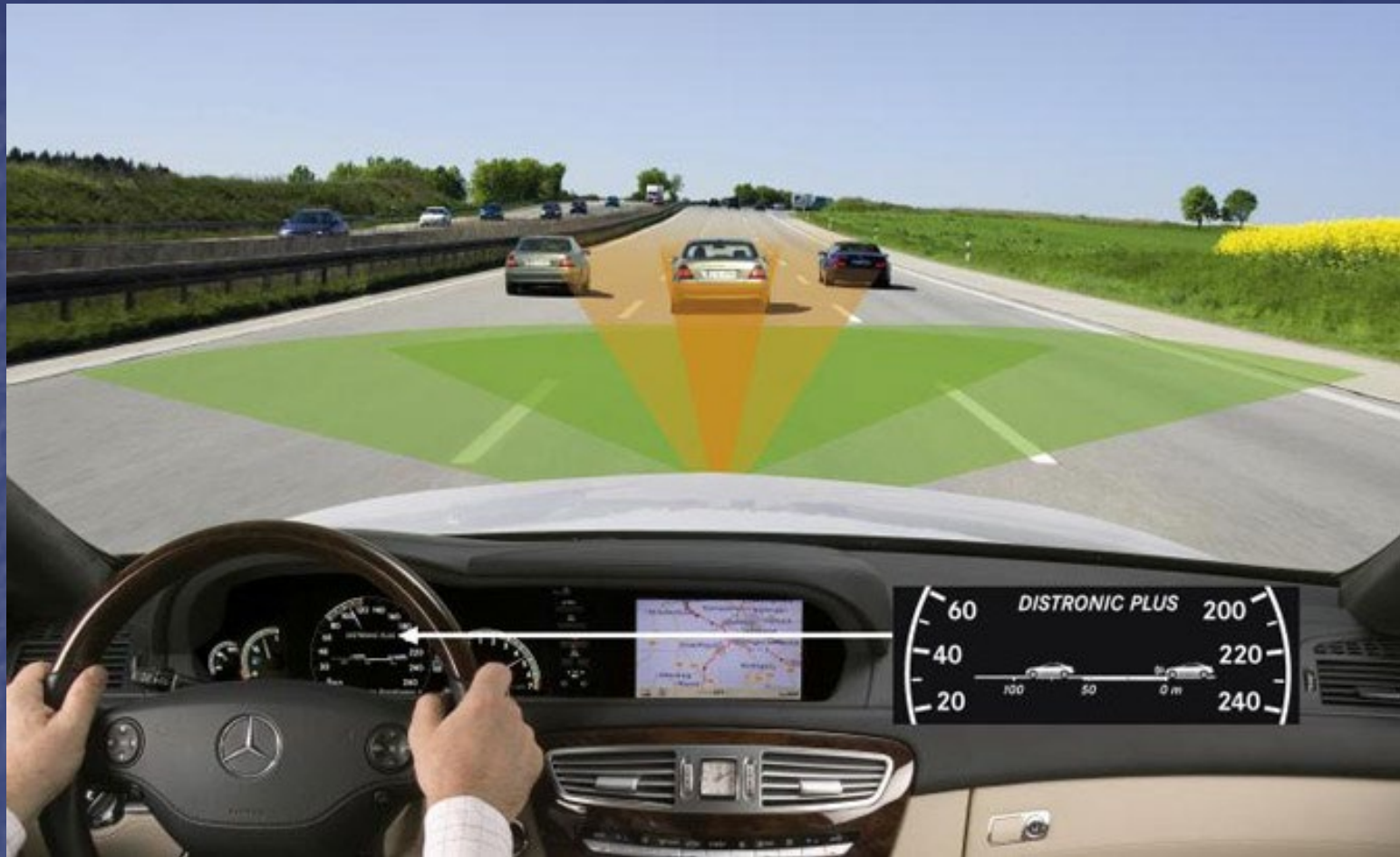




Automated Parallel Parking – 2000s



# Volvo City Safety System



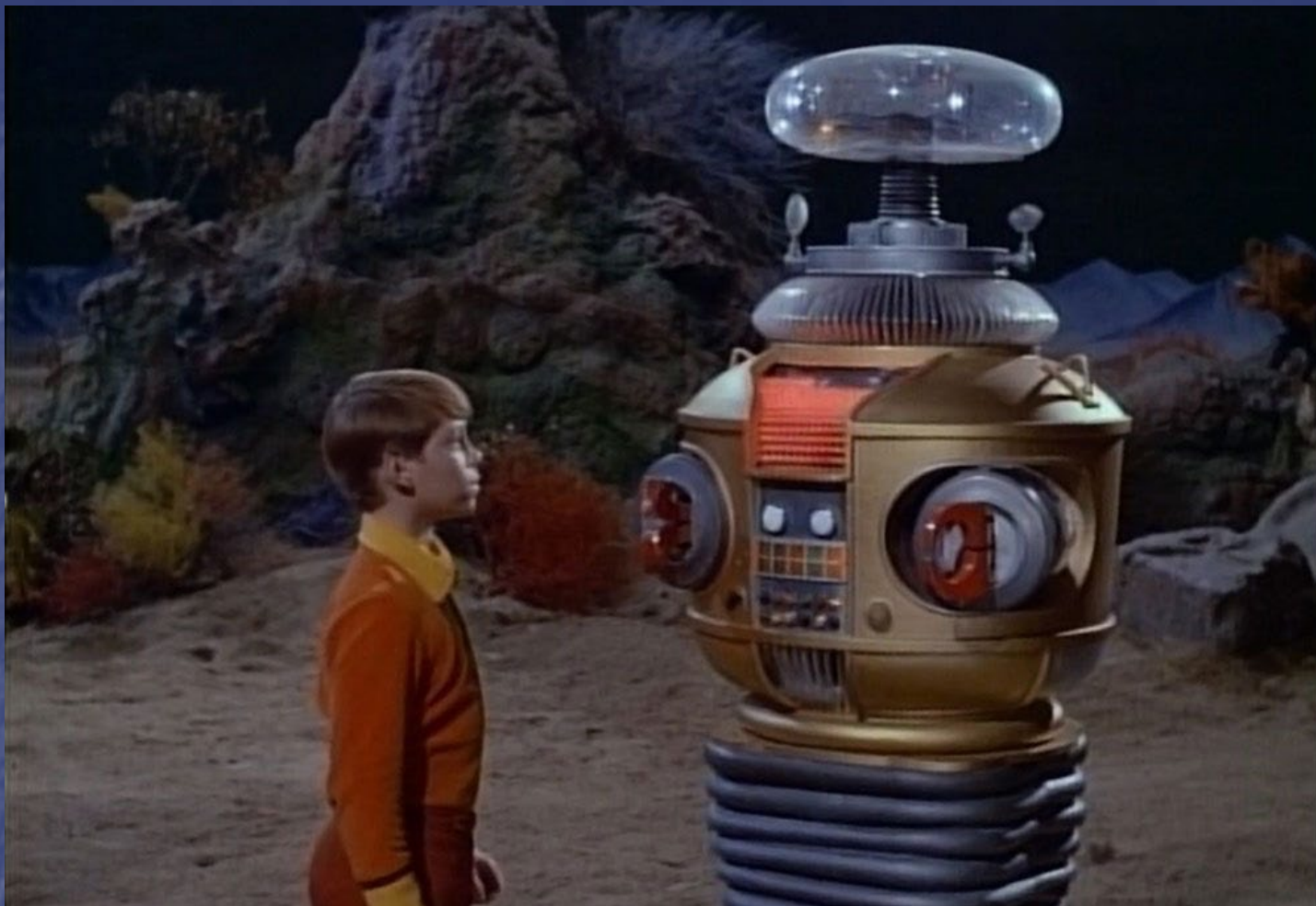
# Mercedes-Benz Distronic System



# Autonomous Vehicles

## NHTSA Website

- “The continuing evolution of automotive technology aims to deliver even greater safety benefits and Automated Driving Systems (ADS) that—one day—can handle the whole task of driving when we don’t want to or can’t do it ourselves. Fully automated cars and trucks that drive us, instead of us driving them, will become a reality.”



Lost in Space – 1965-1968

## Pew Research Center – AVs - 2017

- 75% will help elderly & disabled.
- 81% will cause drivers' job losses.
- 39% will decrease traffic accidents.
- 30% will *increase* traffic accidents.
- 56% would not ride in an AV.
- 44% *would* ride in an AV.
- 65% most cars will be AVs in 50 yrs.

# Companies Developing AVs





# HOW UBER'S FIRST SELF-DRIVING CAR WORKS

Top mounted **LiDAR** beams 1.4 million laser points per second to create a 3D map of the car's surroundings.

There are **20 cameras** looking for braking vehicles, pedestrians, and other obstacles.

A **colored camera** puts LiDAR map into color so the car can see traffic light changes.

**Antennae** on the roof rack let the car position itself via GPS.



**LiDAR modules** on the front, rear, and sides help detect obstacles in blind spots.

A **cooling system** in the car makes sure everything runs without overheating.

# LiDAR

**How it works:** Light pulses are sent out, reflected off objects and received for interpretation.

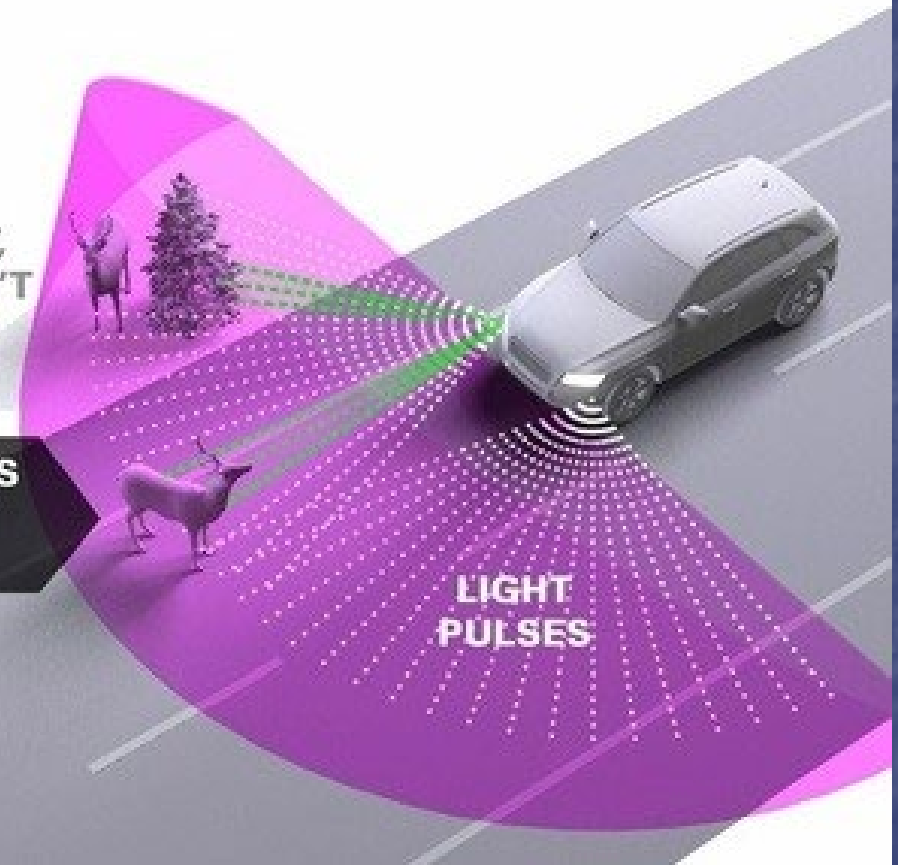
**What it can see:** Day or night, specific objects, such as a deer can be defined, as well as its distance from the car. Because paint reflects differently than the road surface, lines can be seen as well.

IF NOT IN THE  
LINE OF SIGHT,  
OBJECTS CAN'T  
BE DETECTED

LIGHT PULSES  
REFLECT OFF  
OBJECTS

LIGHT  
PULSES

**DELPHI**





## Level 4

Vehicle is self-driving; occupants never need to take control.



## Level 3

Vehicle is autonomous; driver takes control only in emergencies.

## Level 2

Automated controls function in unison (e.g. adaptive cruise control with lane-keeping).



## Level 1

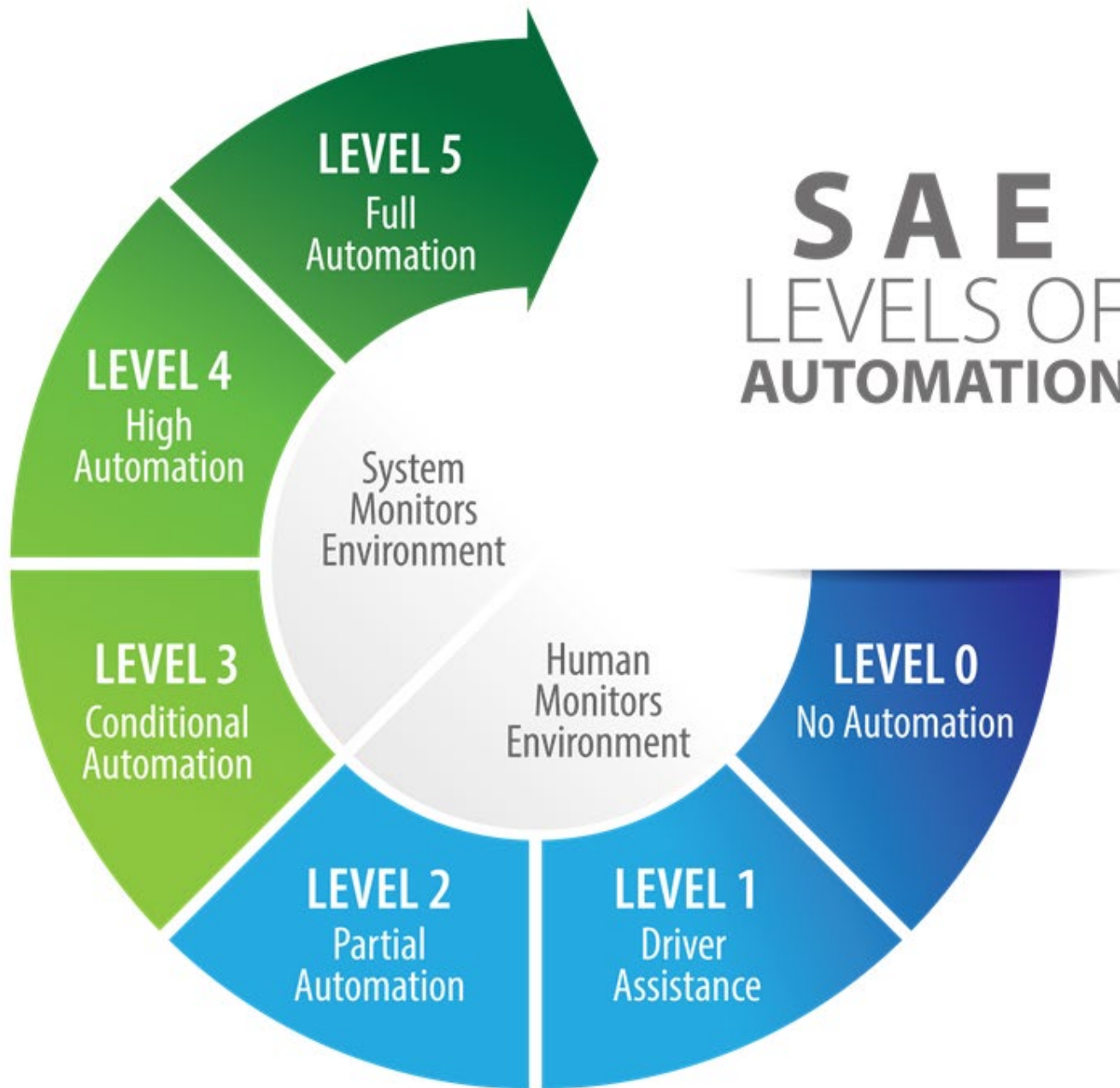
Individual vehicle controls are automated (e.g. electronic stability control, automatic braking).

## Level 0

Driver is in complete control of the vehicle at all times.

# NHTSA Levels of Vehicle Automation

# SAE LEVELS OF AUTOMATION





**SELF-DRIVING TRUCKS**

*Hit the Road*



Over a Half Dozen Companies Road Testing

Why AV Trucks?



## Why AV Trucks?

- Trucks carry > 70% of U.S. freight.
- Severe shortage of drivers: 175k by 2026.
- \$700 mi/year industry.
- 1/3 of costs spent on drivers.
- Increase safety.
- Now Beta-tested on passenger cars.





- 4,000 killed annually.
- 100,000 injured annually.



Annual Deaths = 9 to 10  
Fully-Loaded 747s



Annual Deaths = 1,000 More  
People Than in 9/11




Annual Injuries = American  
Korean War Casualties

**Bloomberg  
Businessweek**

October 14, 2019 • SPECIAL DOUBLE ISSUE

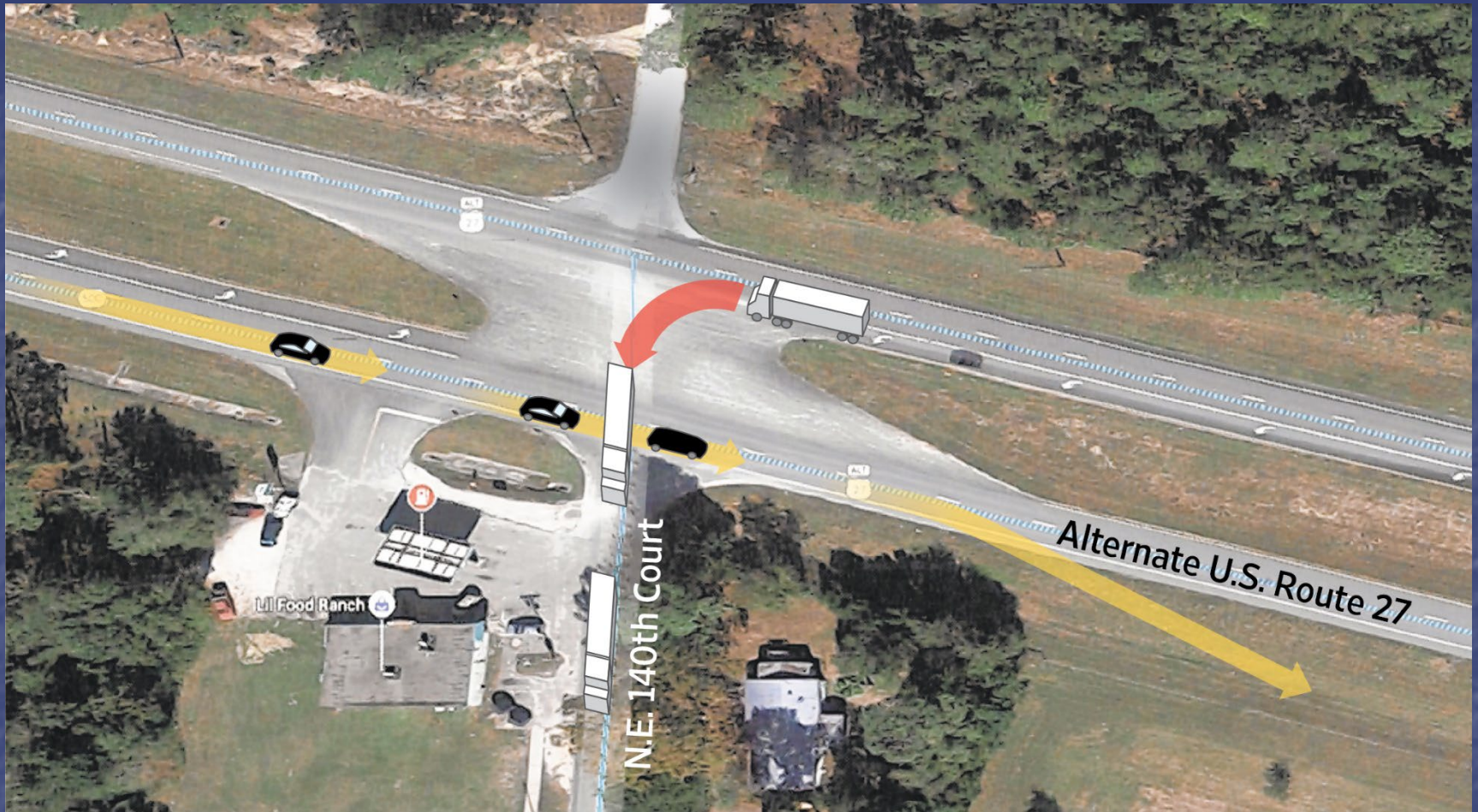
**Tesla's Autopilot  
could save millions  
of lives. How many  
people will it kill first?**



**The complicated  
ethics of Elon Musk's  
grand experiment**



# AV Crashes



Tesla – Florida - May 2016



Tesla – Florida - May 2016





Tesla – Florida - May 2016

## Tesla Crash – Florida – May 2016

- Tesla: Cars sensors spotted rig, but may have “tuned it out” because system is designed to tune out overhead structures such as bridges and highway signs.

## Tesla Crash – Florida – May 2016

- Mobileye, manufacturer of Tesla's camera and computer system, had warned Tesla not to let drivers use Tesla system without hands on steering wheel.

## Tesla Crash – Florida – May 2016

- NTSB's Robert Sumwalt: "System safeguards [were] lacking," and "Tesla allowed the driver to use the system outside of the environment for which it was designed and the system gave far too much leeway to the driver to divert his attention."



Uber – Arizona – March 2018



Uber – Arizona – March 2018



Uber – Arizona – March 2018



# Uber's Truck Venture - Otto





Tesla – California - March 2018

## Tesla Crash – California – March 2018

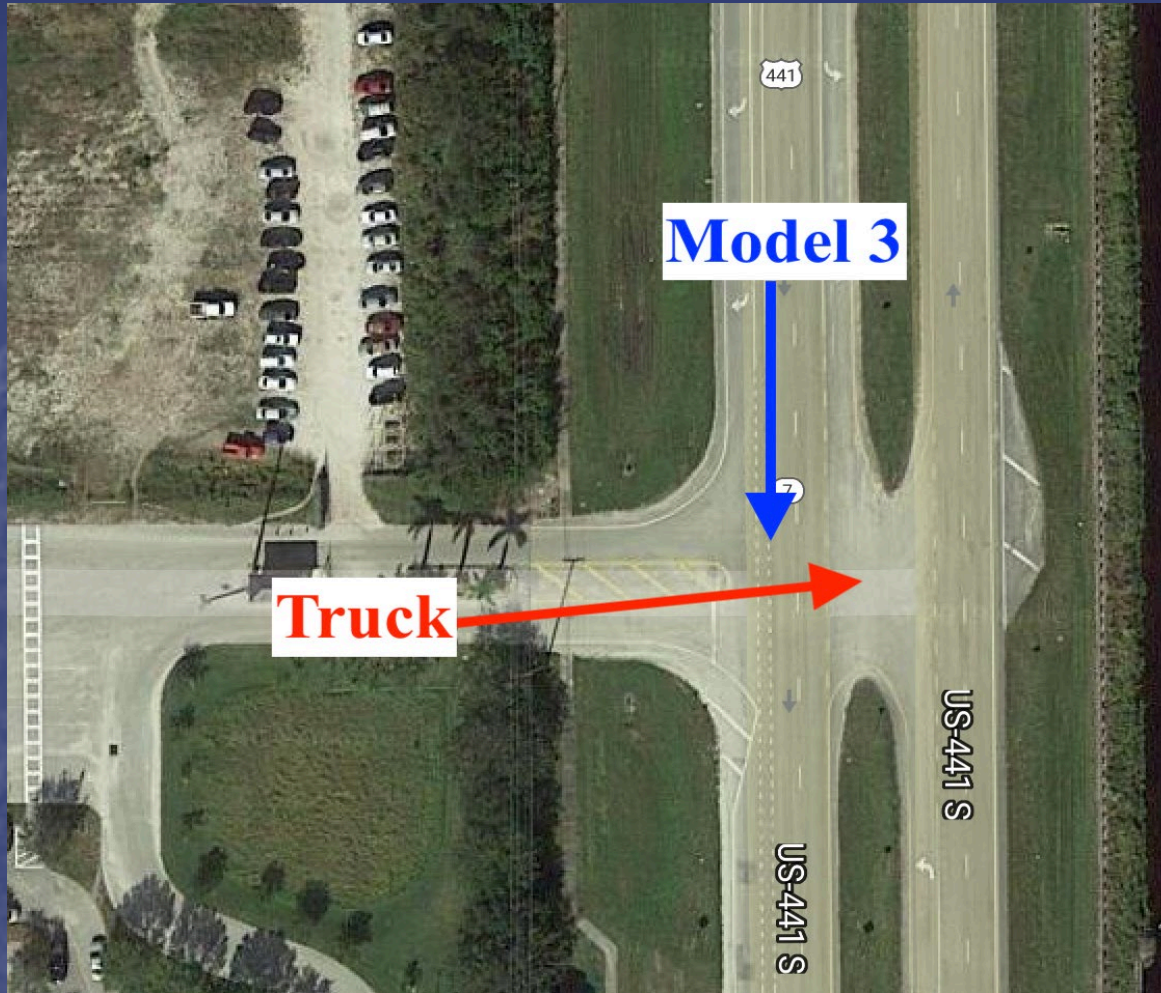
- Tesla: “The only way for this accident to have happened is if [the driver] was not paying attention to the road, despite the car providing multiple warnings to do so.”

## Tesla Crash – California – March 2018

- Bryant Smith, University of South Carolina AV Professor: This crash illustrates the “mushy middle” of automation, where *partial* AV systems “work unless and until they don’t.”



Tesla – Florida – February 2019



Tesla – Florida – March 2019



Tesla – Florida – March 2019

## Bottom Line on Tesla Crashes

- Inadequate battery & fire protection.
- Ignores false positives and focuses on moving objects.
- Tesla ignored warnings by Mobileye et al.
- System gives false sense of security.
- Over-hyped and marketed.

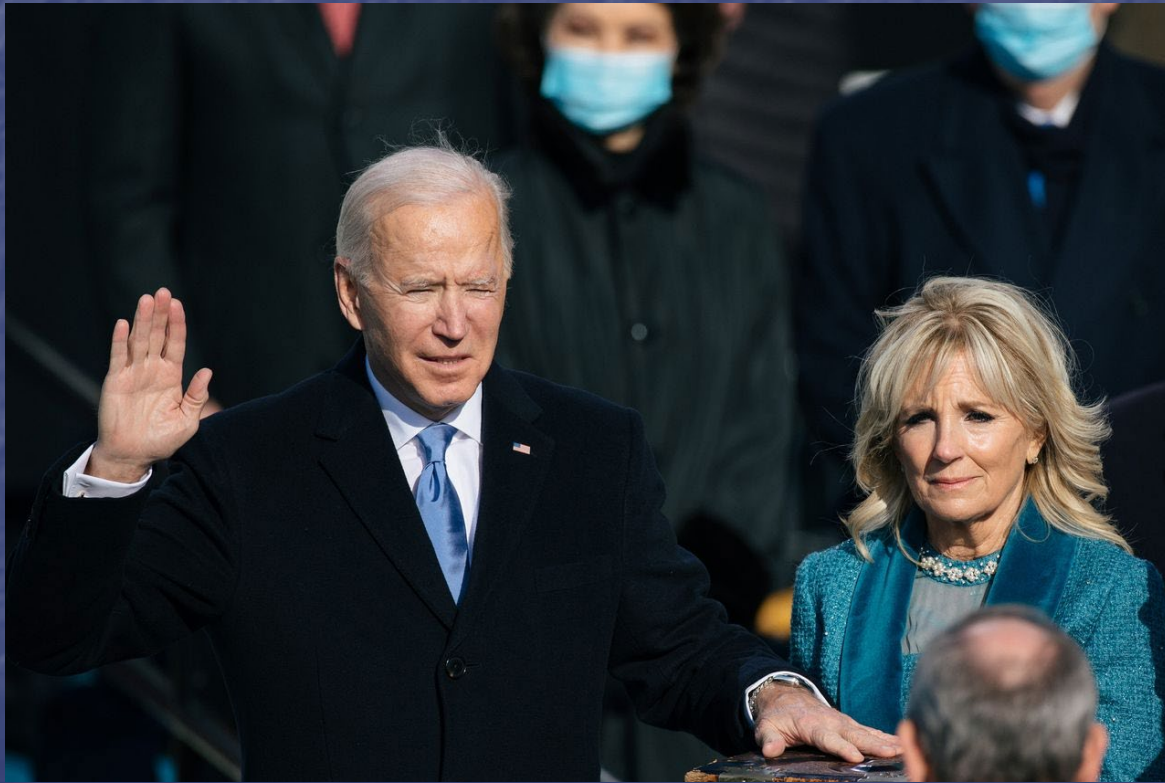
# Bottom Line on Tesla Crashes

- Mushy middle – partial autonomy.
- NHTSA: Tesla's "system [gives] far too much leeway to the driver to divert his attention."





# January 2021: A New Cop on the Beat



# 8/21 - NHTSA opens extensive Tesla Autopilot investigation



# 9/21 – NTSB pumps brakes on Tesla's Full Self-Driving (FSD) rollout



9/21 - NHTSA orders Tesla to hand over detailed Autopilot data or face \$115 Fines



2/22 – Senators Ed Markey & Richard Blumenthal raise concerns about Tesla's Autopilot & FSD



3/22 – Tesla admits both systems require “constant monitoring and attention of the driver”



# 5/22 - NHTSA opens probe into fatal Newport Beach, CA crash



6/22 - NHTSA Releases 1<sup>st</sup>  
AV Summary Report: Almost 400 AV  
Crashes 6/1/21- 5/15/22

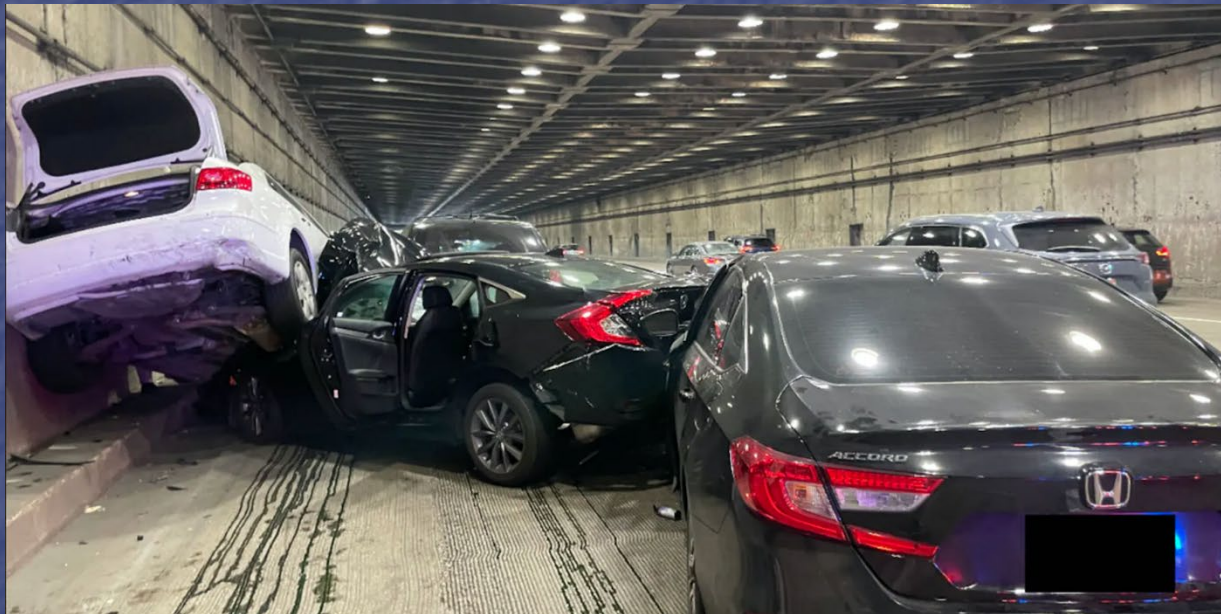




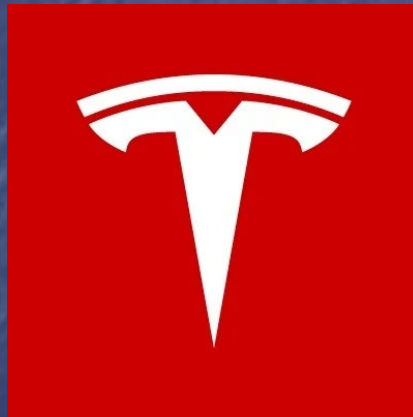
7/22 – Florida jury awards \$10.5 million for death of two teens in 5/18 Florida crash



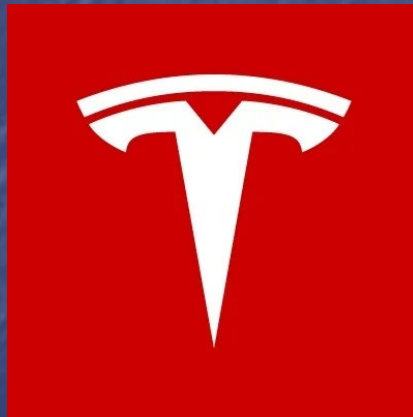
# 11/22 – Tesla crash involving 8 vehicles on San Francisco-Oakland Bay Bridge



12/22 – Tesla’s response to class  
action’s claims that Tesla  
misrepresented Autopilot and FSD:  
“Mere failure to realize a long-term  
aspirational goal is not fraud”



12/22 – Tesla attempts to send  
class action claiming that Tesla  
misrepresented Autopilot and  
FSD to arbitration



1/23 - NHTSA says extensive  
Tesla Autopilot investigation opened in  
8/21 is proceeding "really fast"



# 1/23 – Justice Department asks Tesla for self-driving software documents



2/23 – NHTSA pushes Tesla to recall over 362,000 vehicles with FSD as “crash risk”



# Causes of Action





# Federal Versus State Court?



# Can the Existing Regime Adapt?



# Federalize Everything?



# The Common Law: Malleable in the Face of New Technologies



## Potential AV Defendants

- 1. AV operator.
- 2. AV manufacturer.
- 3. Mfr of AV's component parts.
- 4. Developer of AV's software.

# AV Products Theories

- Manufacturing Defects.
- Design Defects.
- Marketing Defects.
- Misrepresentations.
- Negligence.

# AV Products Theories

- Breaches of Implied Warranty of Merchantability.
- Breaches of Implied Warranty of Fitness for a Particular Purpose.
- Breaches of Express Warranty.

# Collision Avoidance Technology (CAT)





# Passive Systems

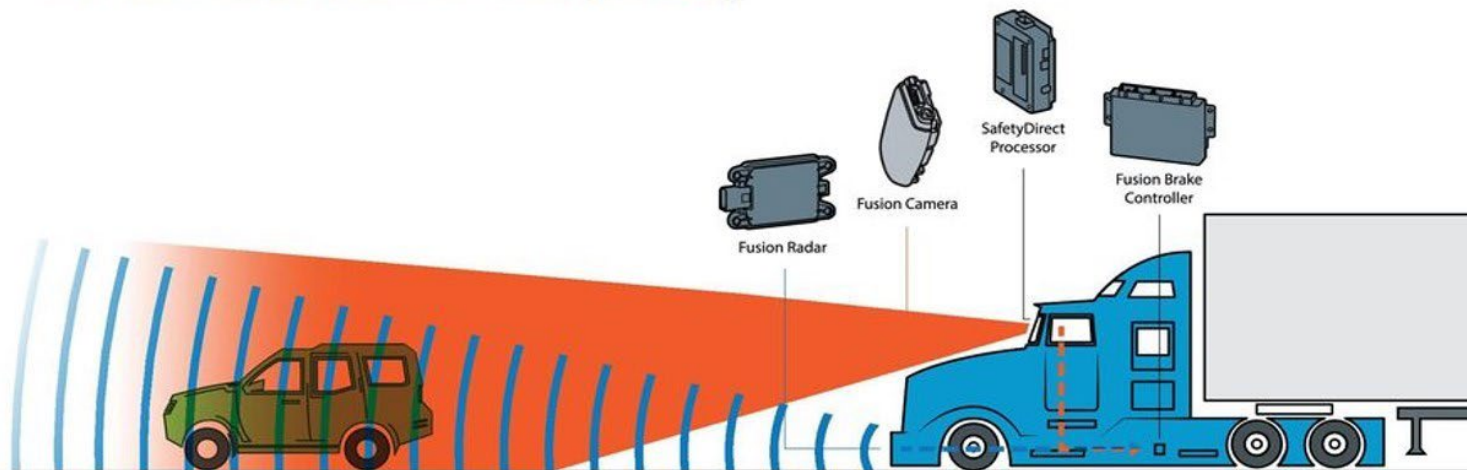
- 1. Lane Departure Warning (LDW)
- 2. Forward Collision Warning (FCW)
- 3. Side View Assistance.

# Active Systems

- 1. Automatic Emergency Braking (AEB).
- 2. Autonomous or Adaptive Cruise Control (ACC).
- 3. Electronic Stability Control (ESC).

# OUR NEW FLAGSHIP DRIVER ASSISTANCE SYSTEM

Bendix® Wingman® Fusion™ integrates next-generation advanced safety technologies (radar, camera, brakes, and SafetyDirect®) into one comprehensive driver assistance system that's more powerful than other safety system technology combinations in the North American commercial vehicle marketplace today.





## **Peterbilt to make collision mitigation standard on Model 579**

Decision comes after five years of “positive feedback” from Peterbilt customers regarding the Bendix Wingman Advanced system.

Peterbilt Motor Co. plans to make the Bendix Wingman Advanced collision mitigation safety system a standard feature on its Model 579 highway tractor starting July 1, 2017.

# KEEP AN EXTRA EYE ON THE ROAD WITH MOBILEYE

The Mobileye Collision Avoidance System helps drivers by acting as a “third eye”, constantly monitoring the road in front.



**FIT A MOBILEYE  
SAFETY KIT NOW AND RECEIVE**

**FREE INSTALLATION IN JULY**

CONTACT OUR DEALERS TO FIND OUT MORE.  
OFFER ENDS JULY 31, 2020



WESTERN STAR TRUCKS™

[WESTERNSTAR.COM.AU](http://WESTERNSTAR.COM.AU)

# CAT - Aftermarket

## E.U. vs. U.S.

- E.U.: AEB & FCW mandated for 2013.
- U.S.: No mandate, but voluntary accord for *passenger* cars beginning 2022.



NTSB 2017-2018

# MOST WANTED LIST

OF  
TRANSPORTATION SAFETY IMPROVEMENTS



AVIATION



HIGHWAY



MARINE



RAIL

**MWL**

MOST WANTED LIST



PIPELINE



**Increase implementation of collision avoidance technologies**

NTSB





- Forward Collision Warning (FCW): Could prevent 8,597 to 18,013 rear-end crashes.
- Lane Departure Warning (LDW) trucks: 1/2 the crashes.



Insurance Institute for  
Highway Safety

- 1. Side View Assistance: mitigate 39k crashes/year.
- 2. Truck Stability Control & Forward Collision Warning: each prevent up to 31k crashes/year.
- 3. Lane Departure Warning: prevent up to 10k crashes/year.



- Forward Collision Warning: 22% fewer crashes.
- Automatic Emergency Braking: 12% fewer crashes.



- “The potential benefits are great enough that these crash avoidance systems should be standard equipment on all new large trucks.”

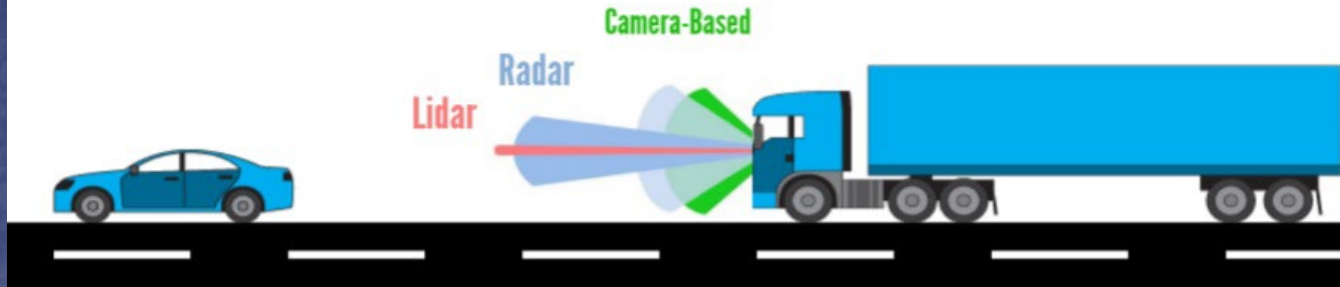
IIHS President David Harkey



“This study provides evidence that forward collision warning and AEB greatly reduce crash risk for tractor-trailers and other large trucks. That’s important information for trucking companies and drivers weighing the costs and benefits of these options.”

IIHS Dir. of Statistical Services Eric Teoh

## Automatic Emergency Braking



**Truck Drivers Operating Tractor Trailers with Collision Avoidance Systems\*  
(Automatic Emergency Braking, Electronic Stability Control, and Lane Departure Warning)  
Experienced:**



\*Study Collected Data Over 30 Months on More than 12,500 Tractor Trailers

# The Truck Safety Coalition Study



Rear-end crashes reduced 69%  
after CAT systems installed

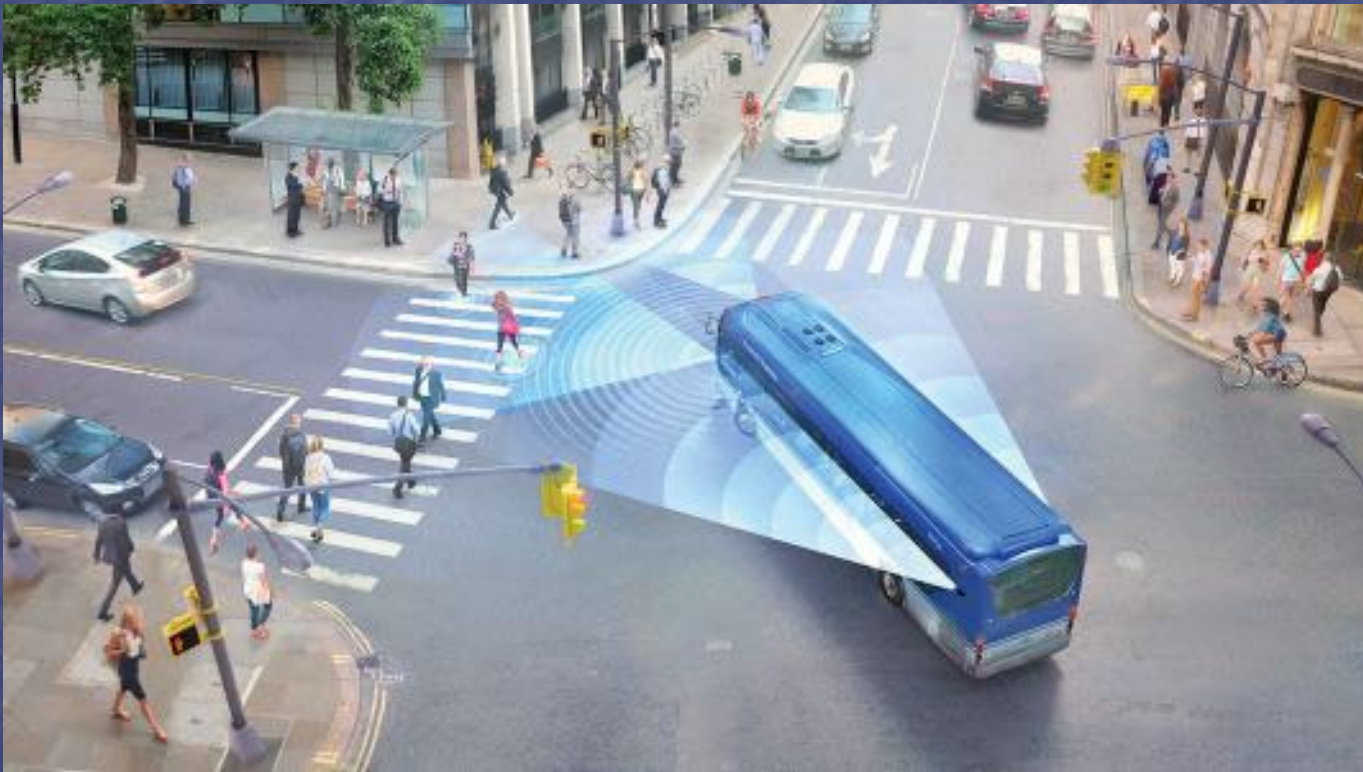


***2018 Winner  
Green Cross for Safety  
Excellence Award***

Schneider National



# CAT – Liability Theories



## CAT Liability Theories – NOT Installed

- Early: Failure to install (airbags, ESC)
- Later: Making optional vs. standard

## CAT Liability Theories – Installed

- Defective because failed to prevent.
- Defective because *caused*.
- System defects include defects in components (sensors), design and software.

# Conclusion

