

ADAS testing with motorcycles

Emerging insights and research

Texas Motorcycle Safety Forum

April 11, 2026



Eric Teoh
Director of Statistical Services





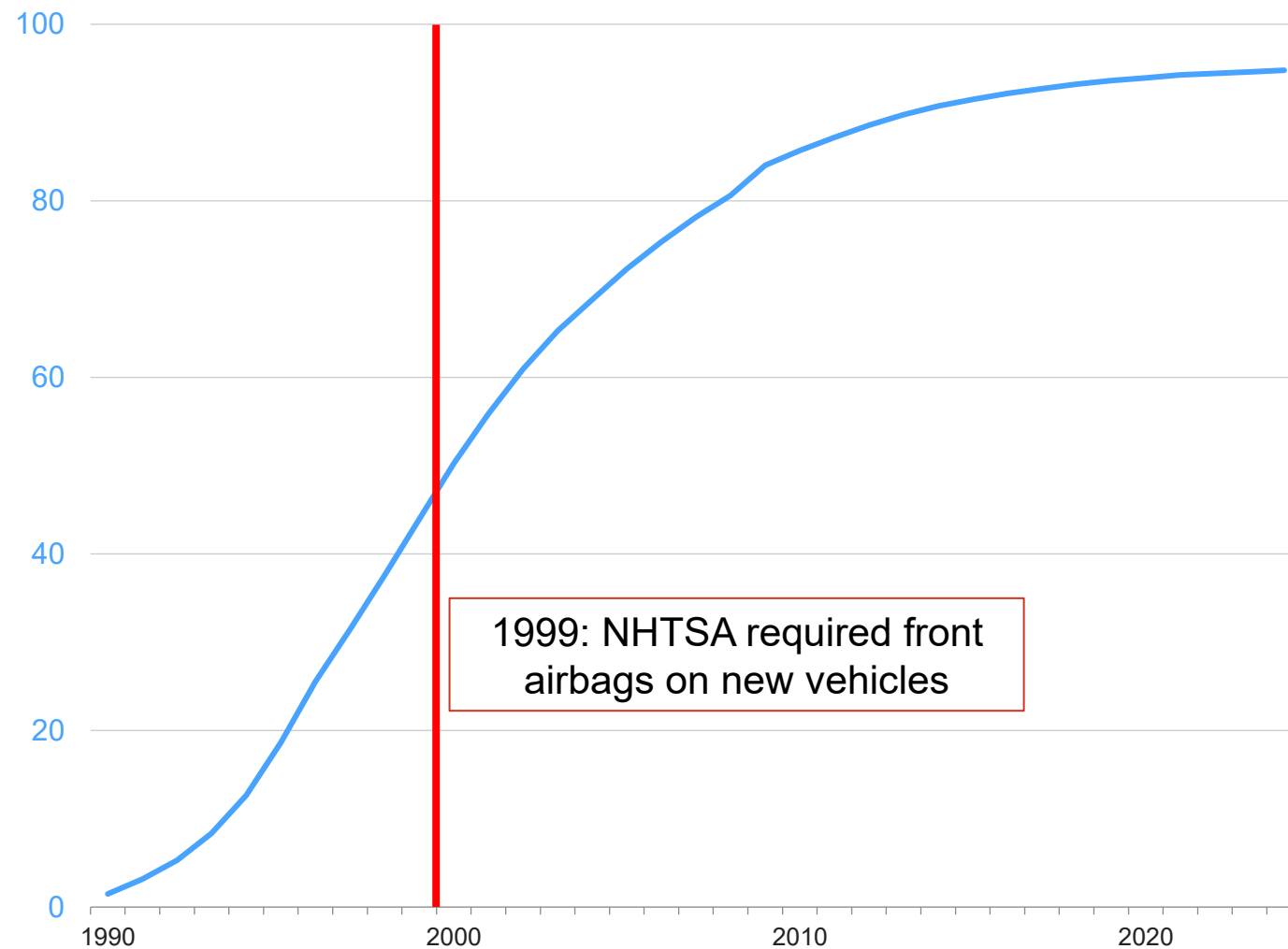
Motorcycle ABS demo test
on IIHS test track



It takes decades for features on new vehicles to become ubiquitous in our fleet

Percent with driver frontal airbag

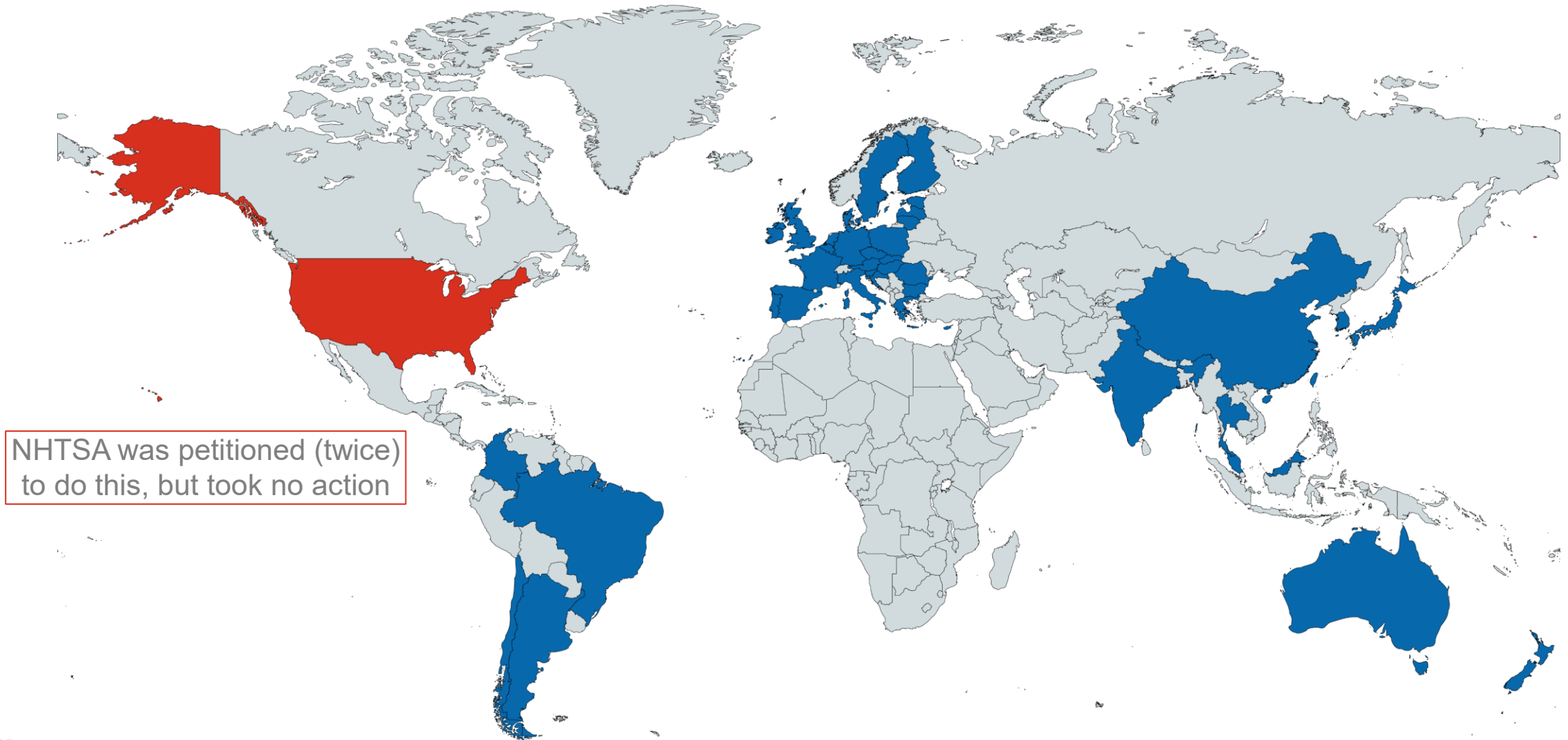
US passenger vehicle registrations, 1990-2024



1999: NHTSA required front airbags on new vehicles

Countries requiring ABS on new motorcycles

>125cc (usually), on-road



NHTSA was petitioned (twice) to do this, but took no action

www.iihs.org/motorcycleABS
Lookup tool for consumers

Motorcycle ABS availability

https://www.iihs.org/topics/motorcycles/motorcycle-abs

The Residences at Li... Composite Interchange NCSA data Google Flights Google Maps EarthCam - Washin... Potomac temp

IIHS
HLDI

VEHICLE RATINGS NEWS TOPICS ▾ ABOUT ▾ Search website

Home / Topics / Motorcycles / Motorcycle ABS availability

Motorcycle ABS availability by make and model

Whether you're buying your first motorcycle or your 10th, consider purchasing one with an antilock braking system. These systems can be as light as a pound and a half and intervene only in an emergency.

With ABS, riders can brake fully without fear of locking up. The technology has been shown to reduce fatal crash rates by about a third. More information on the benefits of ABS is available in the [motorcycle topic area](#).

Model year **Make**

2023 ▾ All makes ▾

Key: ● Standard ● Optional — Not available

Results for 2023 All makes

Model	Availability
Aprilia RS 660	●
Aprilia RS 660 Limited Edition	●
Aprilia RSV4 1100	●
Aprilia RSV4 1100 Factory	●
Aprilia SR 50	●
Aprilia Tuono 660	●



Front crash prevention technology needs to detect motorcyclists

- ▶ Failure to see/perceive motorcyclist is a common factor in crashes
- ▶ Technology can help, if it works. But is it already helping?
- ▶ Incremental improvement



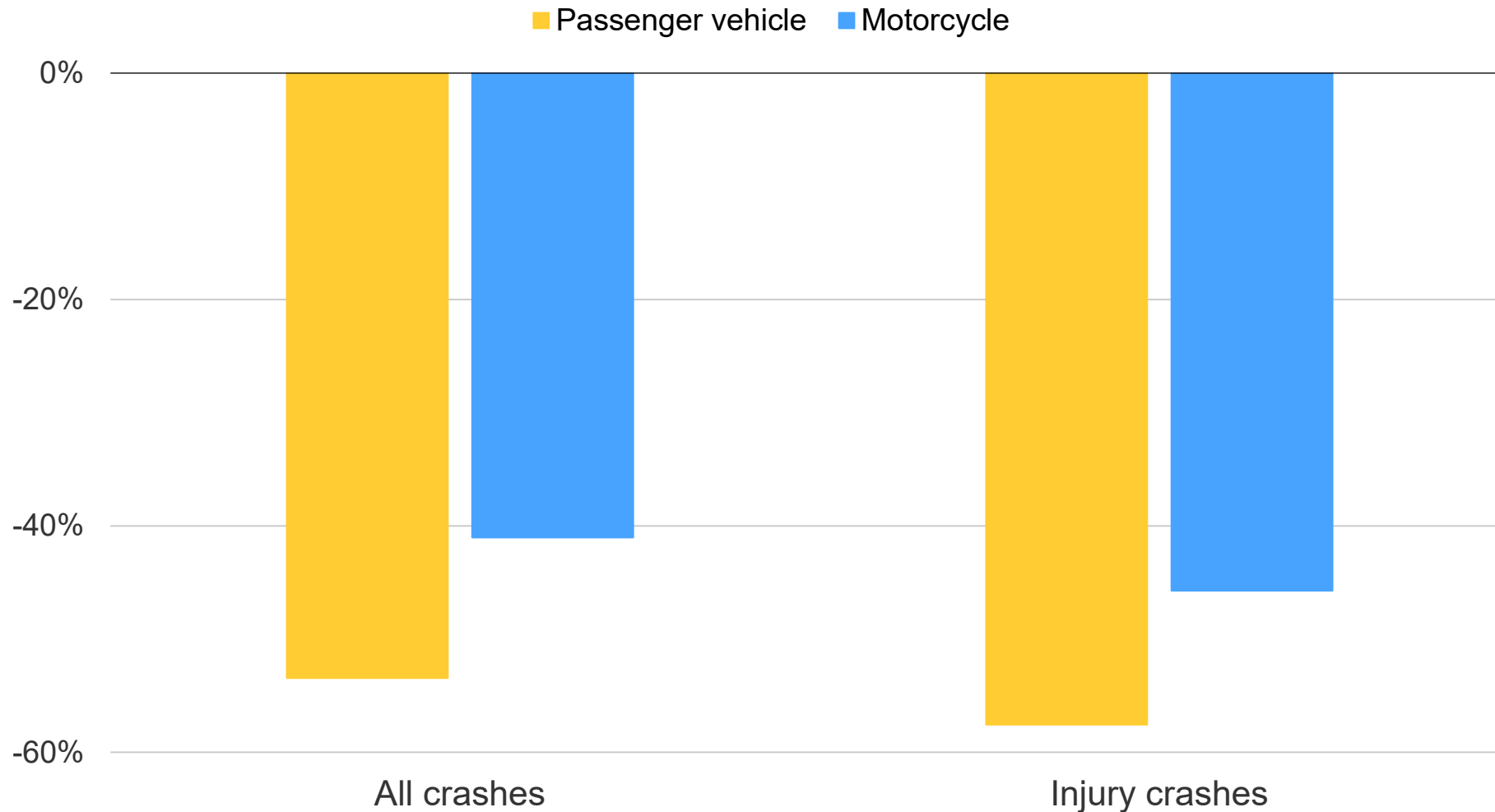


62 Ave S

Jacob's mom rear-ends him,
might not have if she had
FCW/AEB

AEB already benefits motorcyclists, but can improve

Effects of AEB on passenger vehicles in police-reported rear-end-striking crashes by type of struck vehicle



Motorcycle crashes potentially preventable by three crash avoidance technologies on passenger vehicles

Eric R. Teoh

Insurance Institute for Highway Safety, Arlington, Virginia

ABSTRACT
Objective: The objective of this study was to identify and quantify the motorcycle crash population that would be the potential beneficiaries of 3 crash avoidance technologies recently available on passenger vehicles.
Methods: Two-vehicle crashes between a motorcycle and a passenger vehicle that occurred in the United States during 2011–2015 were classified by type, with consideration of the functionality of 3 classes of passenger vehicle crash avoidance technologies: frontal crash prevention, lane maintenance, and blind spot detection. Results were expressed as percentages based on all known types.
Results: Frontal crash prevention prevented 3 passenger vehicles. The 3 technologies prevented 23% of police-reported crashes, fewer than half of all motorcycle or motorcycle crashes and 90% of all police-reported crashes.
Discussion: Refining the ability of passenger vehicles to detect and avoid collisions presents an even greater opportunity to reduce the frequency of motorcycle crashes and does not require universal helmet laws, a

ARTICLE HISTORY
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Accepted 11 February 2018

KEYWORDS
Motorcycle crashes; crash avoidance technology; crash

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Taylor & Francis
Taylor & Francis Group

Left-turn crashes and motorcycle safety

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ABSTRACT
Objective: To provide updated statistics on crashes in which another vehicle turns left in front of an oncoming motorcycle and discuss the potential of left turn assist technology.
Methods: Motorcycle driver involvements in 2-vehicle fatal and police-reported crashes during 2017–2021 were tabulated by crash type, with a focus on crash types involving vehicles turning.
Results: Crashes in which another vehicle turned left in front of an oncoming motorcycle were, by far, the most frequent type of fatal 2-vehicle motorcycle crash, at 26%.
Conclusion: There is a large opportunity to reduce the number of motorcycle crashes in which another vehicle turns left in front of an oncoming motorcycle simultaneously.

ARTICLE HISTORY
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KEYWORDS
Motorcycle safety; crash avoidance technology; left turn; left turn assist; crash avoidance; motorcycle

Introduction

Motorcycles present their riders with a unique set of challenges. They lack structural occupants in crashes, and their small other road users to see. Moreover, they lack the speed of oncoming motor vehicles, and because they typically travel in traffic lanes, they are more likely than passenger vehicles to be involved in crashes and nearly 29 times more likely than passenger vehicles to be killed in crashes (NHTSA 2017).

Efforts to improve motorcycle safety have included helmet use laws, which have reduced the risk of death and injury, so-called anti-lock braking systems help motorcyclists to position themselves in more vulnerable areas of the road (Safety Foundation 2014), but this does not address the problem that the limited characteristics of motorcycles, limited visibility, and the proliferation of crash avoidance technologies represents an opportunity to improve motorcycle safety.

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Introduction

While much progress has been made in the development of crash avoidance technologies, these technologies remain overrepresented in fatal and countermeasures is motorcycle safety (AAS), which have been proliferating and have been shown to reduce fatalities by nearly a quarter (Teoh 2022). The active safety systems under development that show promise as an alternative to passive countermeasures are crash avoidance technologies, which have the potential to reduce the number of motorcycle deaths and injuries in the United States (2021). A study from France also examined the impact of crash avoidance technologies on crashes in which a passenger vehicle struck a motorcycle (2018) discussed crashes in which a passenger vehicle struck a motorcycle in front of an oncoming motorcycle. It was not the first study to examine the impact of crash avoidance technologies on motorcycle safety. The purpose of the current study was to provide updated statistics on this crash type and to examine the potential of left turn assist technology on improving road

Methods

Data on motorcycle driver involvement during 2017–2021 were obtained from the National Highway Traffic Safety Administration's (NHTSA's) Fatality Analysis Reporting System (FARS) and the National Police Reporting System (NPRS).

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How can front crash prevention systems address more police-reported crashes in the United States?

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ARTICLE INFO

Keywords:
Front crash prevention
Automated emergency braking
Forward collision warning
Police-reported crashes
FARS

ABSTRACT

Government and consumer information organizations can motivate automakers to address additional crash types through front crash prevention (FCP) testing programs. This study examined the current state of crashes potentially relevant to current and future FCP systems to provide a roadmap for the next crash types that vehicle testing programs in the United States should evaluate. Crash records from 2016 to 2020 were extracted from the Crash Report Sampling System (CRSS) and the Fatality Analysis Reporting System (FARS). Crashes were examined to see involving an aware rear vehicle whose striking or path intruding vehicle was a passenger vehicle and a vehicle defect was not coded. Percentage of police-reported crashes, nonfatal injury crashes, and fatal crashes were computed for different crash types and circumstances. Rear-end and pedestrian crashes exhibited an existing FCP testing program accounted for 27% of all police-reported crashes, 19% of nonfatal injury crashes, and 10% of fatal crashes. The remaining crash types relevant to FCP accounted for 25% of police-reported crashes, 31% of nonfatal injury crashes, and 23% of fatal crashes. A striking passenger vehicle occupying the path of an oncoming vehicle accounted for the largest proportion of the remaining police-reported (19%) and nonfatal injury crashes (13%). Head-on crashes accounted for the largest proportion of remaining fatal crashes (9%). Most FCP-related police-reported crashes occurred on roads with a posted speed limit between 30 and 50 mph. Medium-heavy trucks were the crash partner in a disproportionate number of fatal head-on and rear-end crashes and motorcycles in a disproportionate number of fatal rear-end and turning crossing path crashes. Fatal bicyclist and pedestrian crashes were overrepresented at night. The findings from this study indicate that testing organizations should evaluate FCP performance at higher speeds, with non-passenger vehicles and vulnerable road users, during the night, and in more complex head-on and turning crossing path crashes. Fatal bicyclist and pedestrian crashes are currently assessed by other testing organizations and can be readily adopted by U.S. programs or possibly addressed with new approaches like virtual testing.

1. Introduction

Front crash prevention (FCP) technologies like forward collision warning (FCW), which notifies the driver of a potential collision threat ahead, and automatic emergency braking (AEB) which automatically applies the brakes to mitigate a collision (and typically includes FCW functionality as well), are preventing crashes (e.g., Fildes et al. 2012; Teoh et al. 2021). Cichowicz (2017) examined rear-end crash involvements for vehicles with and without FCW from six manufacturers. Rear-end crash rates were reduced by 27% for vehicles with FCW and reduced by 50% for vehicles with AEB. Leslie et al. (2021) examined the

crash involvement of 2013–2019 General Motors vehicles with various crash avoidance features. Vehicles with only a FCW system had a 20% reduction in relevant police-reported crashes while vehicles with camera-based AEB or camera-radar fusion-based AEB had a 30% and 43% reduction, respectively. The Highway Loss Data Institute (HLDI) (2020) compared insurance losses for vehicles from various manufacturers with FCW or AEB relative to the same vehicles without the systems. The presence of FCW was associated with a significant 9% reduction in property damage liability claim frequency, which covers damage to a third-party vehicle or property, and AEB was associated with a 14% reduction.

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If all passenger vehicles had perfect ADAS systems... (2-vehicle crashes)

- ▶ 10% fewer fatal motorcycle crashes
- ▶ 22% fewer police-reported motorcycle crashes
- ▶ Adding left turn assist functionality could further reduce motorcycle crashes

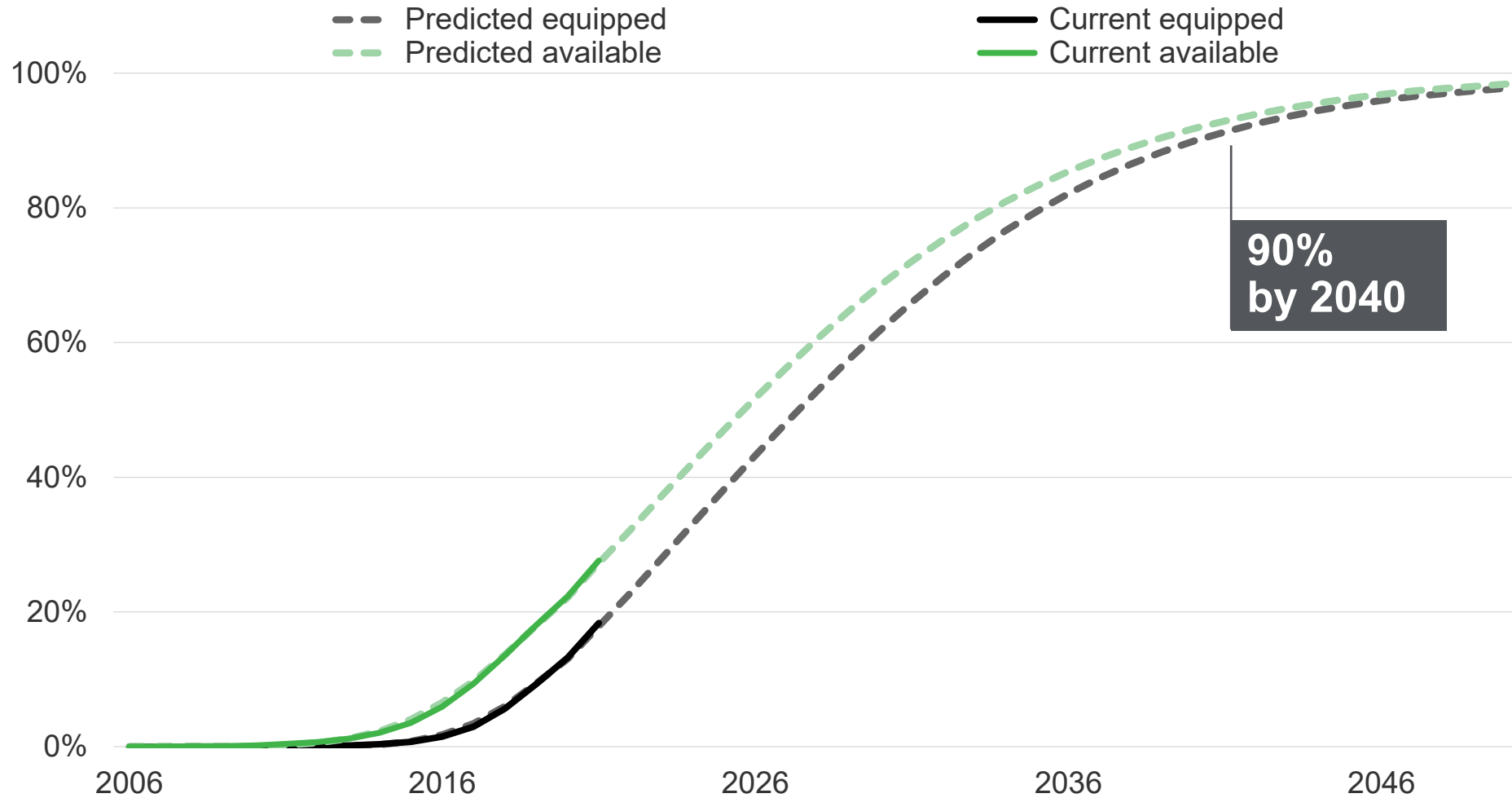
26% fatal, 13% police-reported

Where technology could improve based on real-world crashes

- ▶ Higher speeds than old test (12-24 mph)
- ▶ Motorcycle and truck struck vehicle

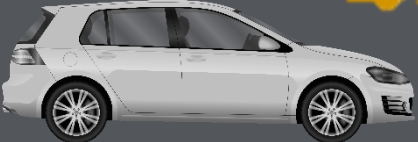
Predicted percentage of registered vehicles with automatic emergency braking

By calendar year

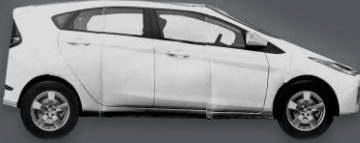
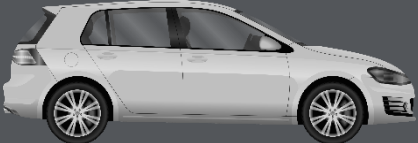


Updated front crash prevention system evaluation

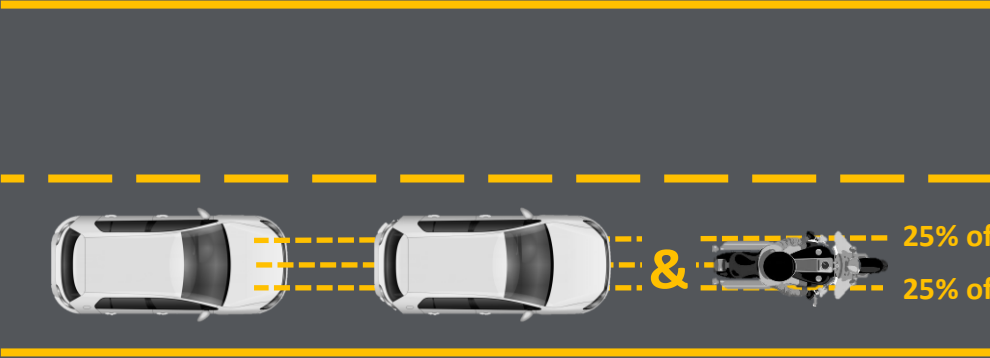
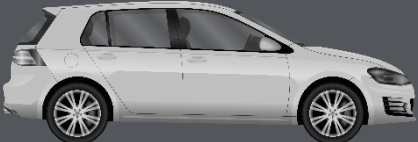
50 km/h



60 km/h



70 km/h



25% of vehicle width
&
25% of vehicle width

Video of large truck detection
FCW test



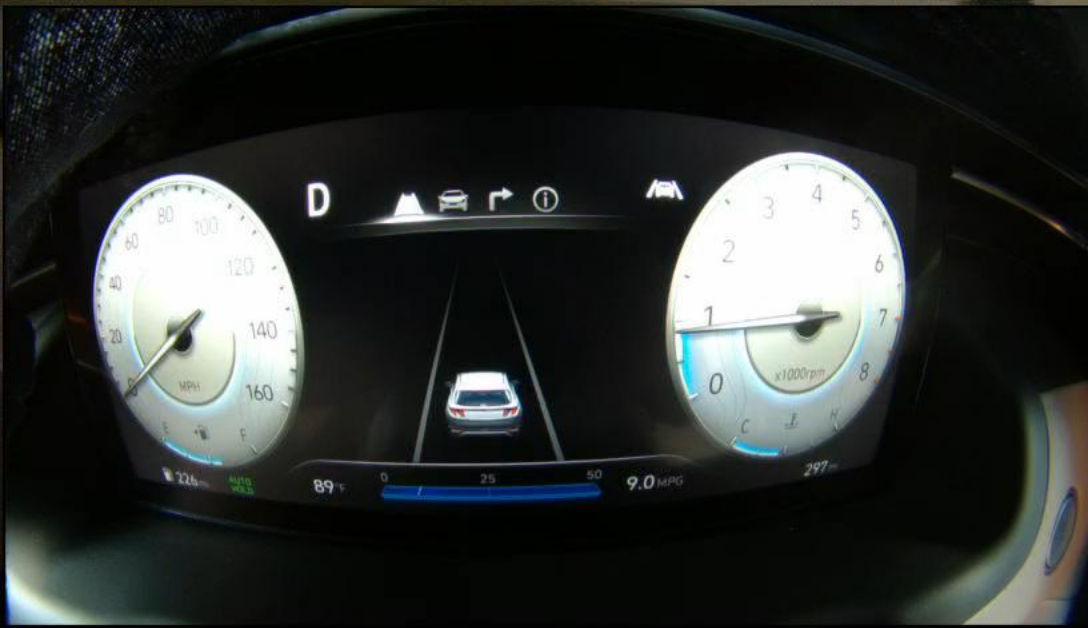




Video of motorcycle detection
FCW/AEB test

IHS

2023 Hyundai Tucson



Velocity 0.0
+284.3 Fwd
-0.2 Lat
0.000 TTC

Video of motorcycle detection
FCW/AEB test

IHS

2023 Chevrolet Equinox





P

Chevrolet Equinox



M

Ford Escape



A

Honda CR-V



M

Hyundai Tucson



M

Jeep Compass

Ratings for small SUVs

G Good **A** Acceptable **M** Marginal **P** Poor



P

Mazda CX-5



P

Mitsubishi Outlander



G

Subaru Forester



A

Toyota RAV4

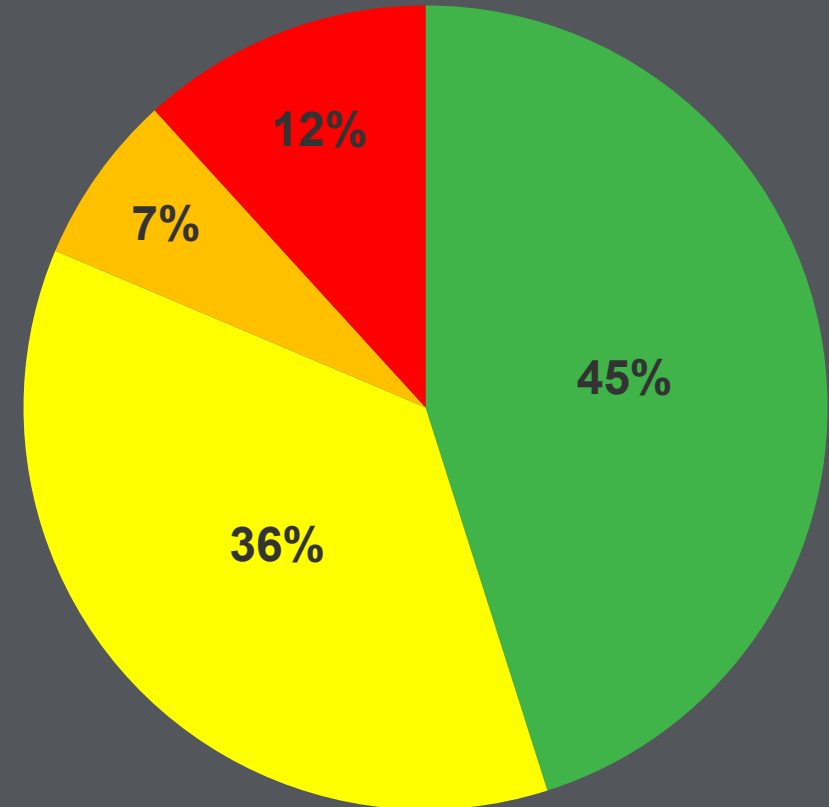


P

Volkswagen Taos

Front Crash Prevention 2.0 Ratings

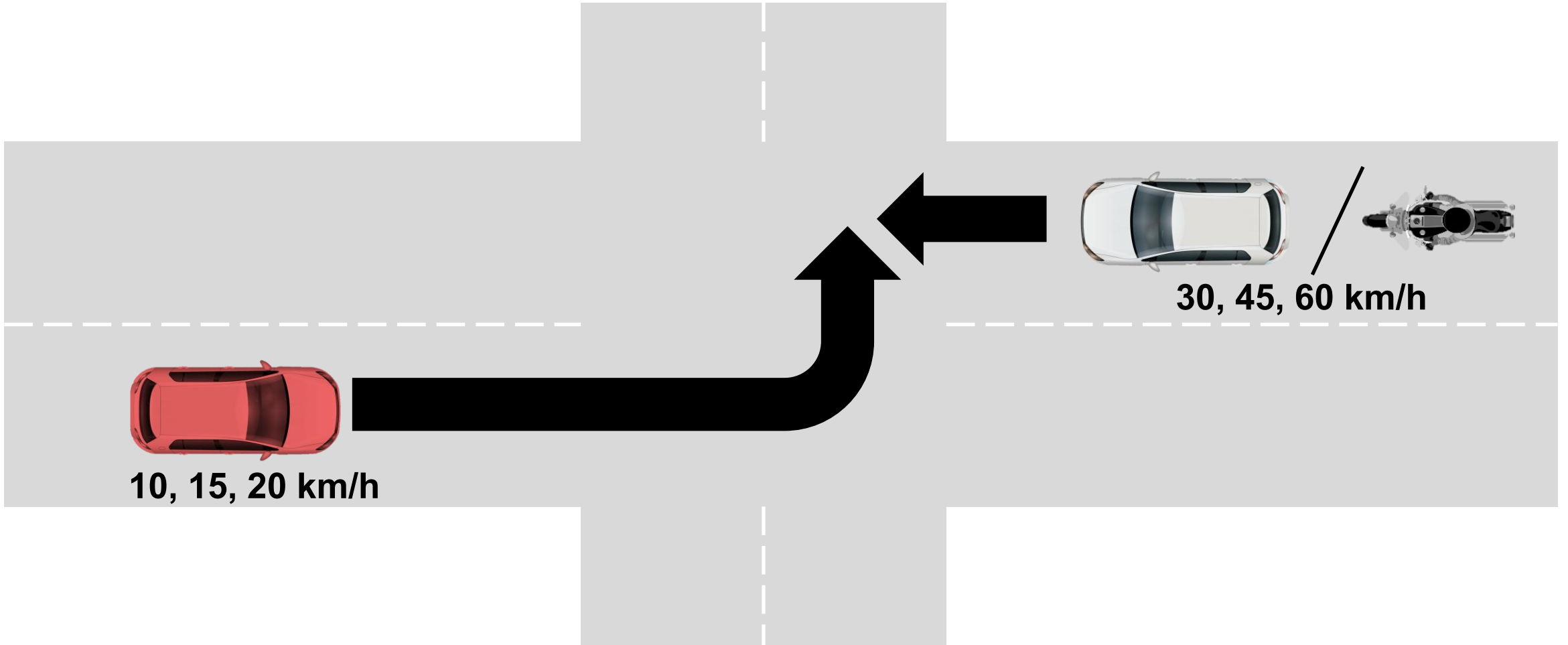
2026 Model Year (102 vehicles)



G Good **A** Acceptable **M** Marginal **P** Poor

Left turn assist is hugely promising

Euro NCAP, ASEAN NCAP, C-NCAP, C-IASI, ANCAP testing
IIHS is considering



Video of left turn assist test



Video of left turn assist test



Video of left turn assist test



Video of left turn assist test



Insurance Institute for Highway Safety
Highway Loss Data Institute

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THANK YOU



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