Safe Systems - Safe Vehicles

Leveraging Vehicle Safety Through a Holistic Approach

August 22, 2022

ALLIANCE FOR AUTOMOTIVE INNOVATION

Our Members

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Transforming Personal Mobility

Vision

Cleaner, safer and smarter personal transportation that helps transform the U.S. economy, and sustain American ingenuity and freedom of movement

Safe Systems Approach

- Road safety is a shared responsibility
- Vehicle safety improvements are leveraged by improvements in the other elements
- The Safe Systems Approach is scalable and can be applied at all levels from local to Federal
- Effective communication and collaboration between stakeholders at all levels is important
- Availability and utilization of crash and other safety data is important.
- Federal and State leadership and resources are necessary to maximize effectiveness
- From a vehicle development perspective, it is critical that DOT/NHTSA identify and communicate their mid-to-long term safety opportunities and objectives.

Collision Avoidance

https://www.orcad.com/cn/node/6581

Crash Avoidance

ADAS/Advanced Crash Avoidance Technologies

https://www.gilbertbaughford.com/blogs/2815/albertville-ford-dealer/what-your-blind-spot-warning-system-does/

Blind Spot Warning

https://roadsafetyfacts.eu/lane-departure-warning-ldw-what-is-it-and-how-does-it-work/

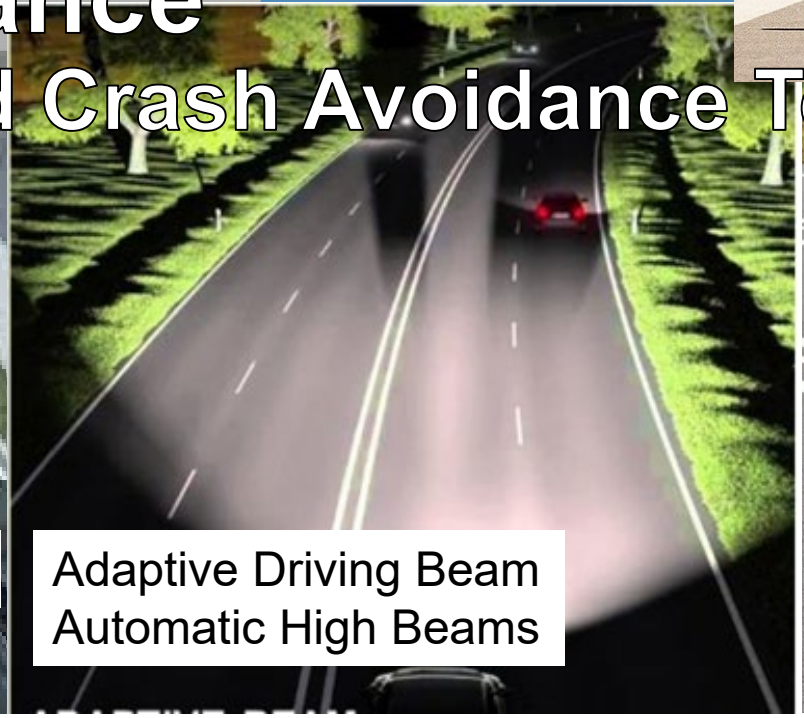
Lane Departure Warning
Lane Keeping Assist

FCW/AEB/PAEB

https://www.messring.de/en/products/active-safety/astero-active-safety-robot/

Rear Cross Traffic Warning

https://www.volkswagen-newsroom.com/en/rear-traffic-alert-3934



Adaptive Driving Beam
Automatic High Beams

Rear AEB

https://thebrakereport.com/hyundai-mobis-reveals-first-radar-applied-r-aeb/

Crash Avoidance - Safe Speeds

Speed limit information

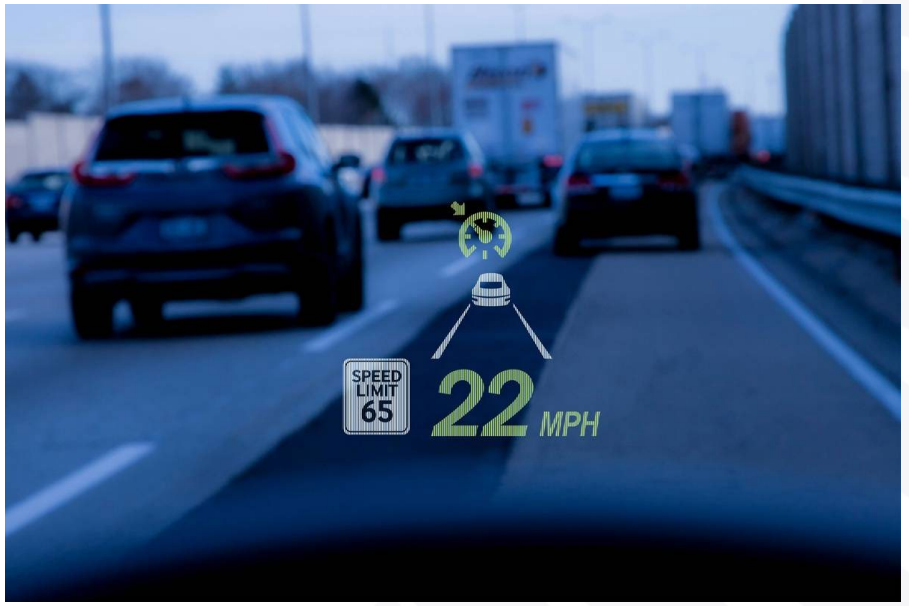
- Works to help detect speed limit using cameras to read street signs and/or GPS information
- Displays speed limit information to driver

Programmable speed limiters

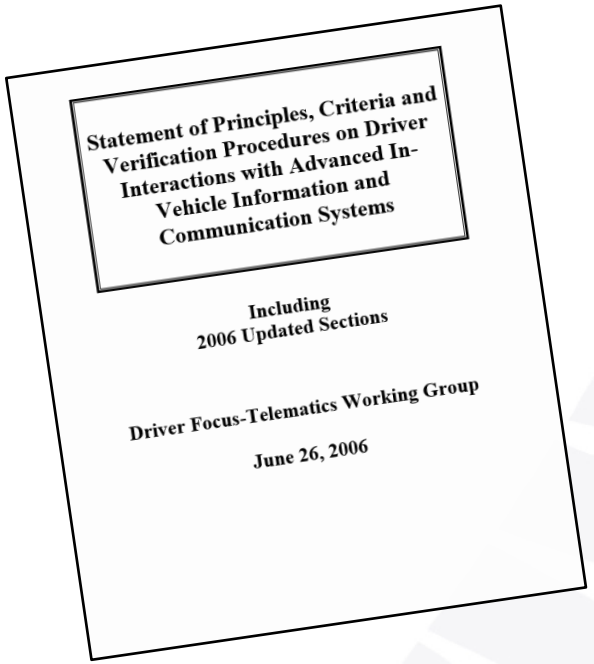
- Drivers can select a certain speed at which the vehicle will not exceed regardless of throttle input

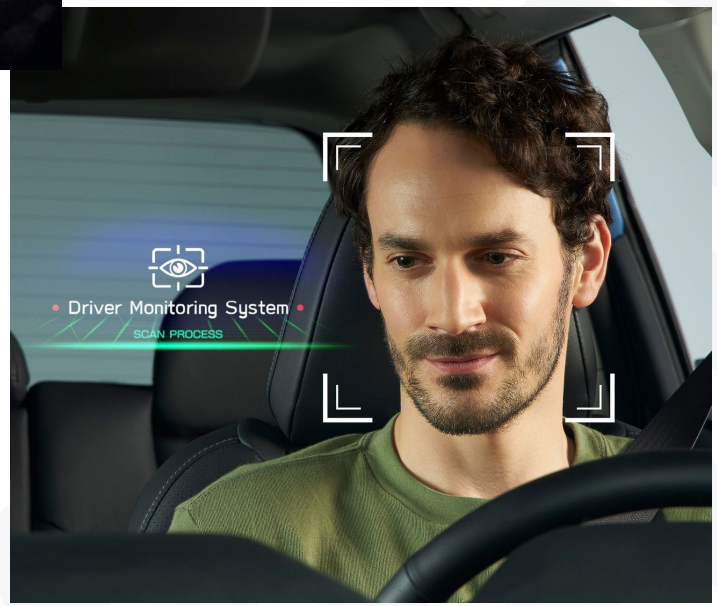
Adaptive Cruise Control

- Some systems utilize the same speed limit information to automatically adjust the vehicle speed when set to ACC



Crash Avoidance - Driver Impairment





Distraction

- Visual/Manual Guidelines
- Smart Phone Pairing – Voice Controls/Text to Voice
- Driver Attention Monitoring

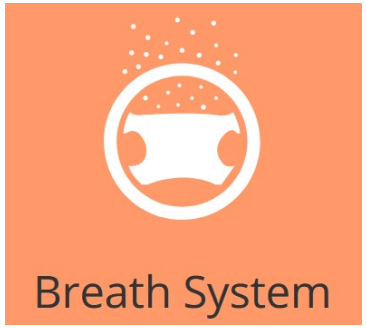
https://www.driversalert.com/10-terrifying-facts-about-texting-and-driving/

Crash Avoidance - Driver Impairment

Drunk Driving Prevention –
DADSS system in development for passenger vehicles and breath-based system is currently available for fleet deployment.

dadss

https://www.dadss.org/



Fatigue Detection - Different technologies can help infer driver drowsiness; by monitoring steering pattern, drivers face and eye, physiological and the position of the vehicle on the lane.

https://stopsleepsystem.wordpress.com/2016/02/08/driver-fatigue-detection-system-on-vehicles/

ADAS L2 – Driver Monitoring

Consumer Information

The Level 2 system name should reasonably reflect the functionality of that Level 2 system and not imply greater capability.

Driver Monitoring as a Standard Feature

A driver monitoring system should be provided as a standard feature in any vehicle that is equipped with a Level 2 system in which both lane centering and ACC can be simultaneously engaged.

Driver Warnings

If a driver monitoring system determines or infers that the driver is not engaged in the driving task, then an initial warning should be issued within a reasonable amount of time from when a system detects the driver is not engaged.

Re-engaging the Driver

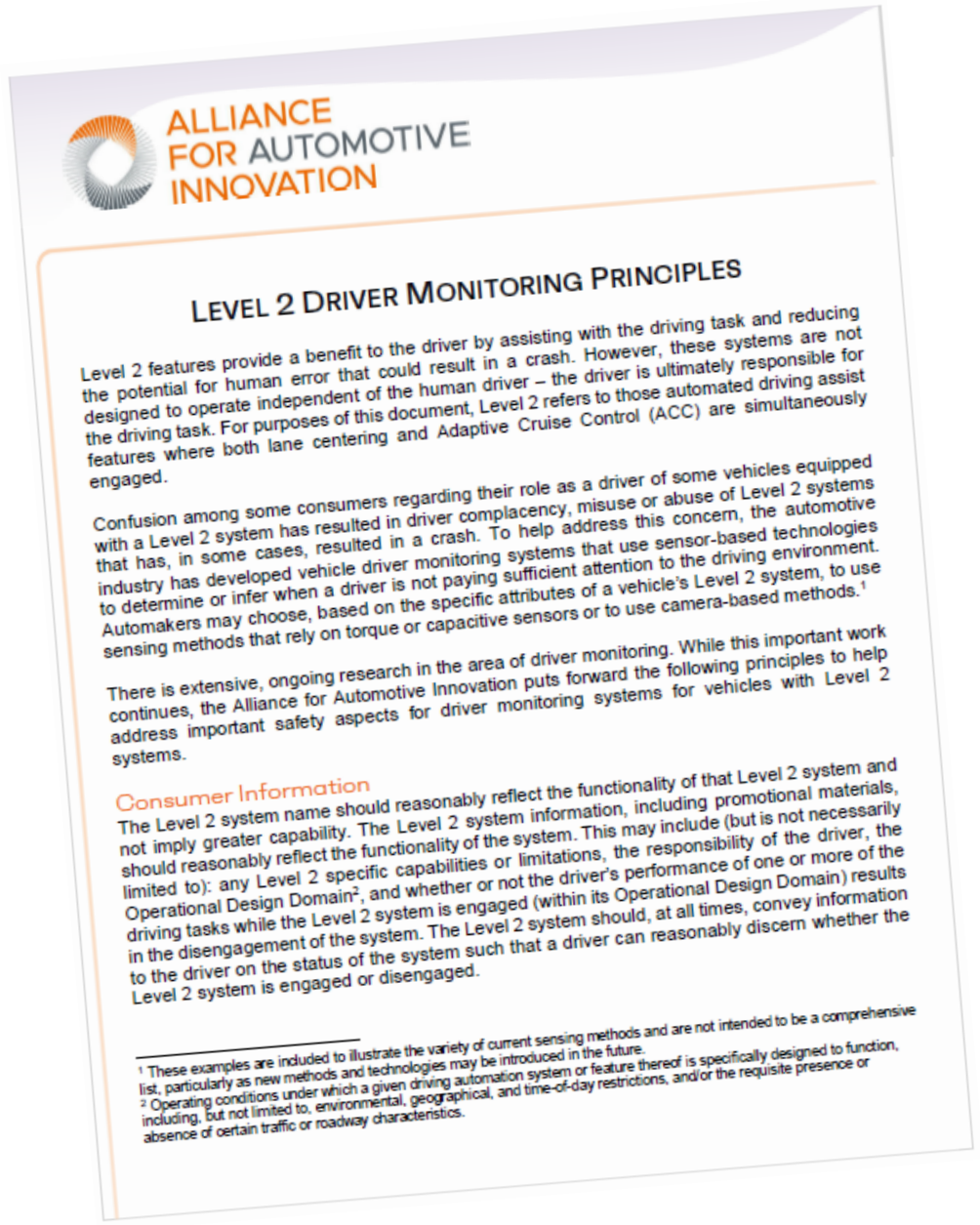
The driver monitoring system should only terminate the warning(s) if the system detects that the driver has appropriately re-engaged based on the system design.

Misuse and Abuse

The potential for driver misuse or abuse of a system should be evaluated as part of the design process for driver monitoring systems.

Camera-Based Systems

An in-vehicle camera should be further considered as a component of a driver monitoring system for vehicles with Level 2 systems.



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LEVEL 2 DRIVER MONITORING PRINCIPLES

Level 2 features provide a benefit to the driver by assisting with the driving task and reducing the potential for human error that could result in a crash. However, these systems are not designed to operate independent of the human driver – the driver is ultimately responsible for the driving task. For purposes of this document, Level 2 refers to those automated driving assist features where both lane centering and Adaptive Cruise Control (ACC) are simultaneously engaged.

Confusion among some consumers regarding their role as a driver of some vehicles equipped with a Level 2 system has resulted in driver complacency, misuse or abuse of Level 2 systems that has, in some cases, resulted in a crash. To help address this concern, the automotive industry has developed vehicle driver monitoring systems that use sensor-based technologies to determine or infer when a driver is not paying sufficient attention to the driving environment. Automakers may choose, based on the specific attributes of a vehicle's Level 2 system, to use sensing methods that rely on torque or capacitive sensors or to use camera-based methods.[1]

There is extensive, ongoing research in the area of driver monitoring. While this important work continues, the Alliance for Automotive Innovation puts forward the following principles to help address important safety aspects for driver monitoring systems for vehicles with Level 2 systems.

Consumer Information

The Level 2 system name should reasonably reflect the functionality of that Level 2 system and not imply greater capability. The Level 2 system information, including promotional materials, should reasonably reflect the functionality of the system. This may include (but is not necessarily limited to): any Level 2 specific capabilities or limitations, the responsibility of the driver, the Operational Design Domain[2], and whether or not the driver's performance of one or more of the driving tasks while the Level 2 system is engaged (within its Operational Design Domain) results in the disengagement of the system. The Level 2 system should, at all times, convey information to the driver on the status of the system such that a driver can reasonably discern whether the Level 2 system is engaged or disengaged.

[1] These examples are included to illustrate the variety of current sensing methods and are not intended to be a comprehensive list, particularly as new methods and technologies may be introduced in the future.
[2] Operating conditions under which a given driving automation system or feature thereof is specifically designed to function, including, but not limited to, environmental, geographical, and time-of-day restrictions, and/or the requisite presence or absence of certain traffic or roadway characteristics.

https://www.autosinnovate.org/about/advocacy/L2Driver Monitoring principles.pdf

Crash Avoidance – Automated Vehicles

- **Safer, Cleaner, Smarter**
  - Human error is a factor in significant number of crashes
  - Automation provides new mobility options
- **Need to ensure modernized approach to policy that supports innovation**
  - Auto Innovators released roadmap for accelerating deployment
  - States play a key role in long term success and realizing benefits

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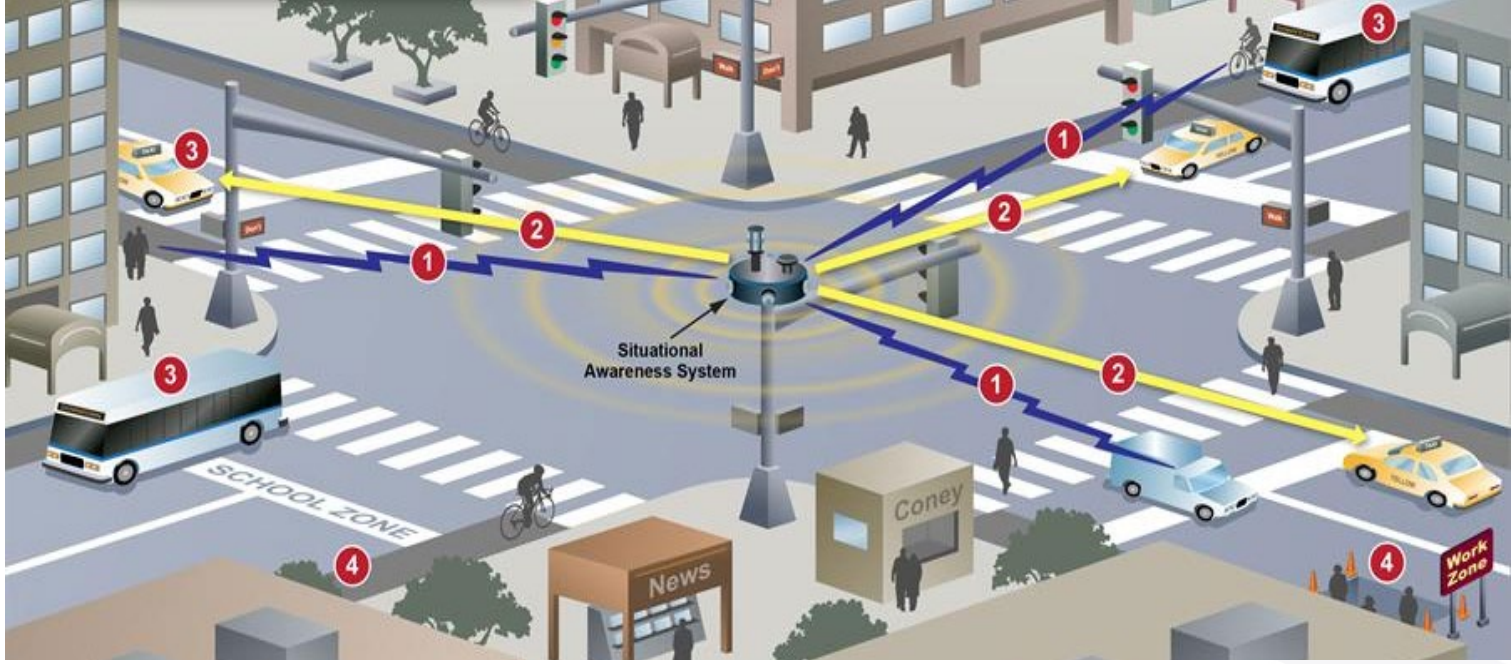
https://www.wired.com/2011/02/high-tech-car-allows-the-blind-to-drive/

Crash Avoidance
V2X

Connected vehicle technology (or V2X) allows vehicles to communicate with other vehicles and infrastructure in the roadway environment.



- Facilitates innovative safety and mobility solutions.
- Originally designed for 75MHz of radio spectrum in 5.9GHz band.
- Recent action by the FCC have reduced the amount of spectrum, limiting the number of safety applications that can be enabled through V2X.
- Auto Innovators filed Petition for Reconsideration to restore.
- Important for states to emphasize to the FCC the importance of V2X (with adequate spectrum) for future mobility.

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Crashworthiness

We’ve come a long way – and the there’s more to come!

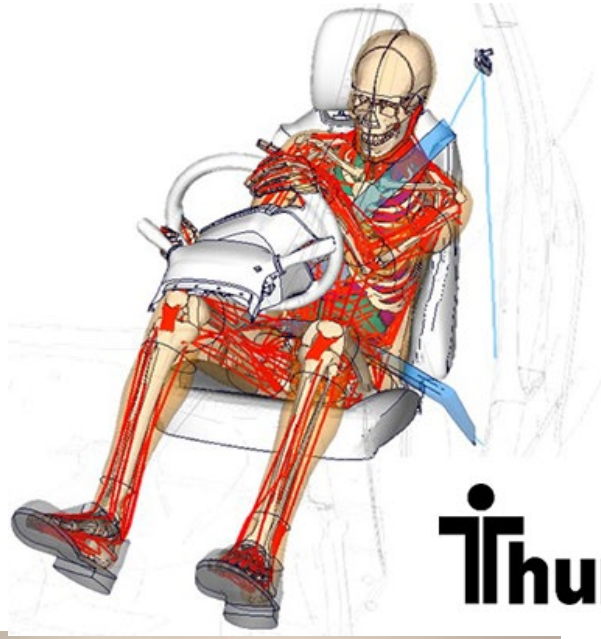
Crash Protection

Structural integrity, compatibility, and crash energy management

- Vehicles designed to help protect at a range of crash configurations and impact speeds
- Computer simulation enables further evaluation beyond physical testing

Improved Restraints Performance

- Broad suite of female and male crash test dummies, to address different occupant sizes, statures and genders



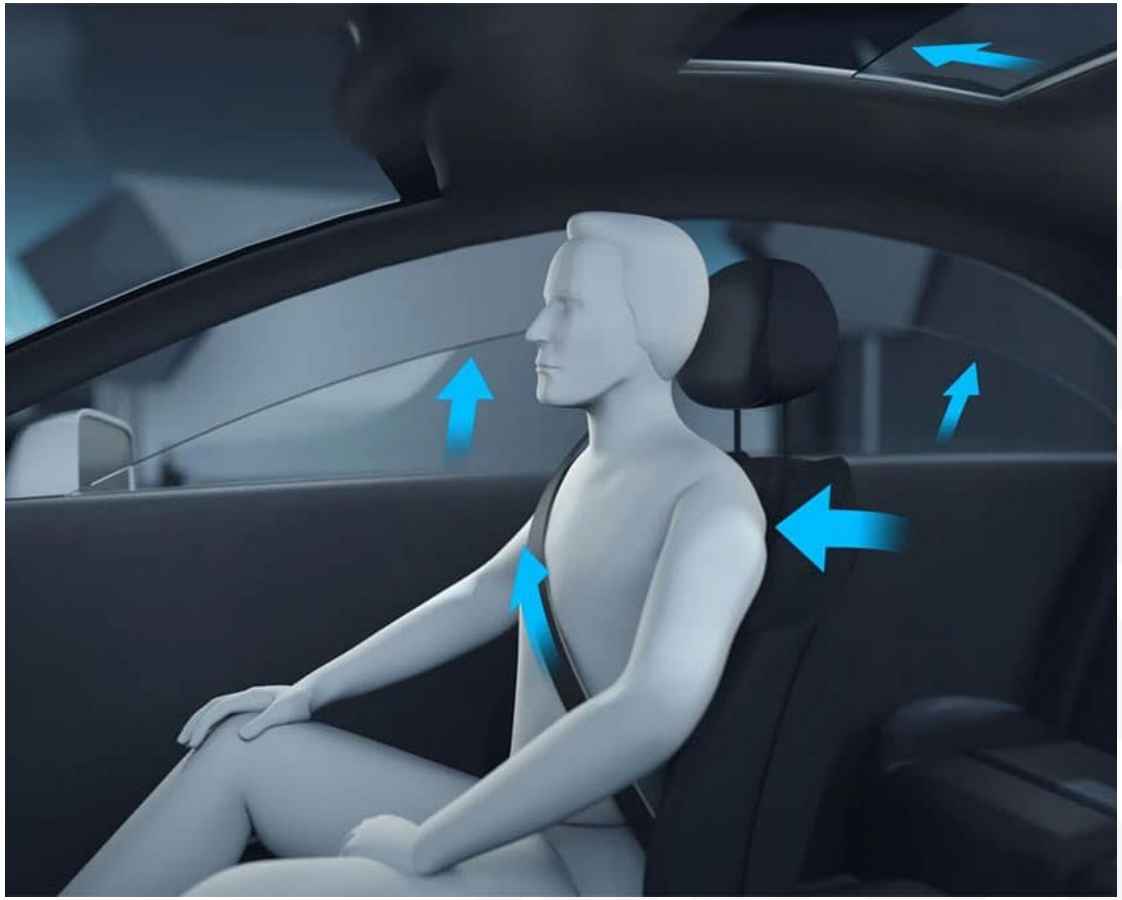
https://global.toyota/en/newsroom/corporate/32665896.html

https://www.parkergroup.com/crash-course-in-data-management-speeds-up-huge-simulation-task/

Vehicle Crashworthiness

Active Pre-Crash Vehicle Crashworthiness Systems

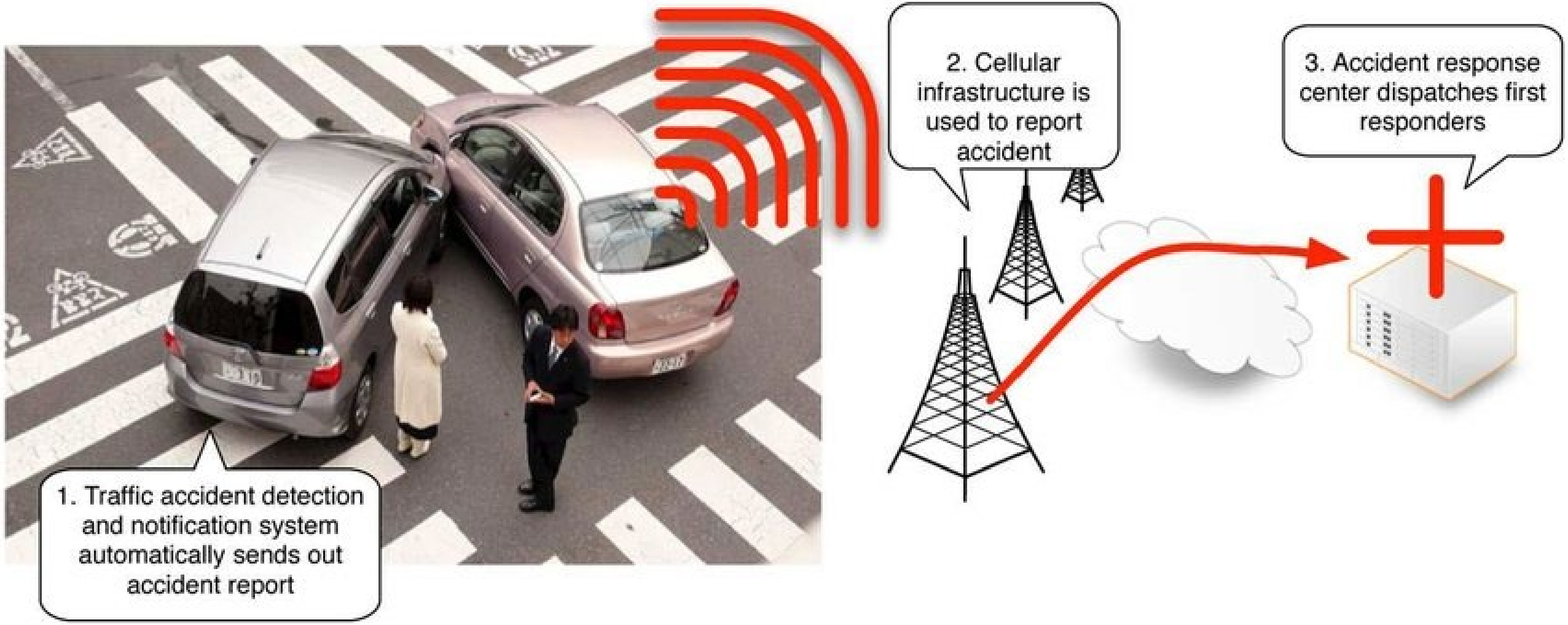
- Advanced sensor technologies work to sense imminent collision and prepare vehicle and restraint systems to enhance occupant protection



https://www.mercedesbenzofeaston.com/pre-safe-system/

Post Crash Safety

Post-Crash Safety – ACN/AACN



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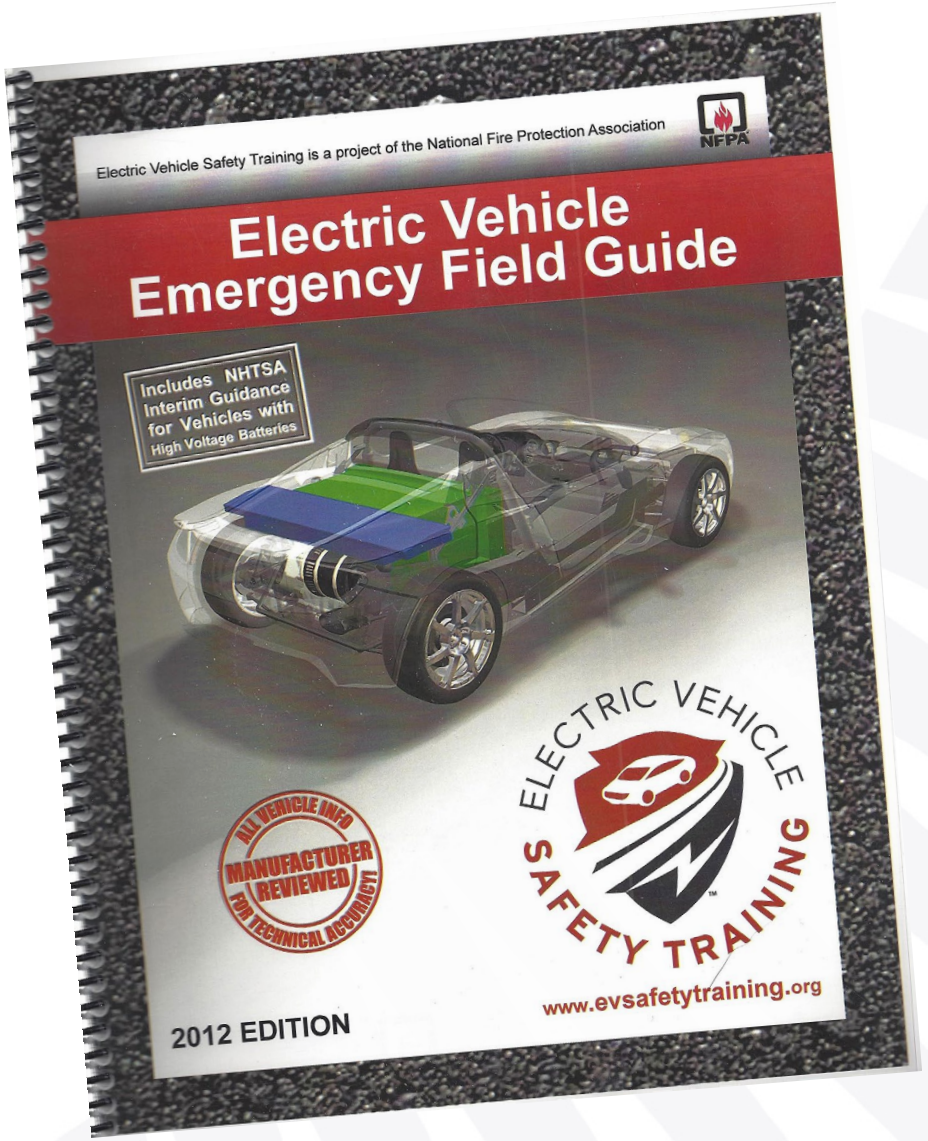
https://www.researchgate.net/figure/A-Vehicle-based-Accident-Detection-and-Notification-System_fig5_220133799

Post-Crash Safety

EMS information and training support

- Emergency Response Guidebooks
  - EV high voltage system handling
  - High strength steel identification and guide for extricating occupants
- Fire protection and mitigation support
  - EV battery information and handling
  - Alternative fuel information and handling



https://catalog.nfpa.org/Emergency-Field-Guide-P13872.aspx

DRAFT

Non-Crash Safety

Pediatric Heatstroke

Non-Crash Safety

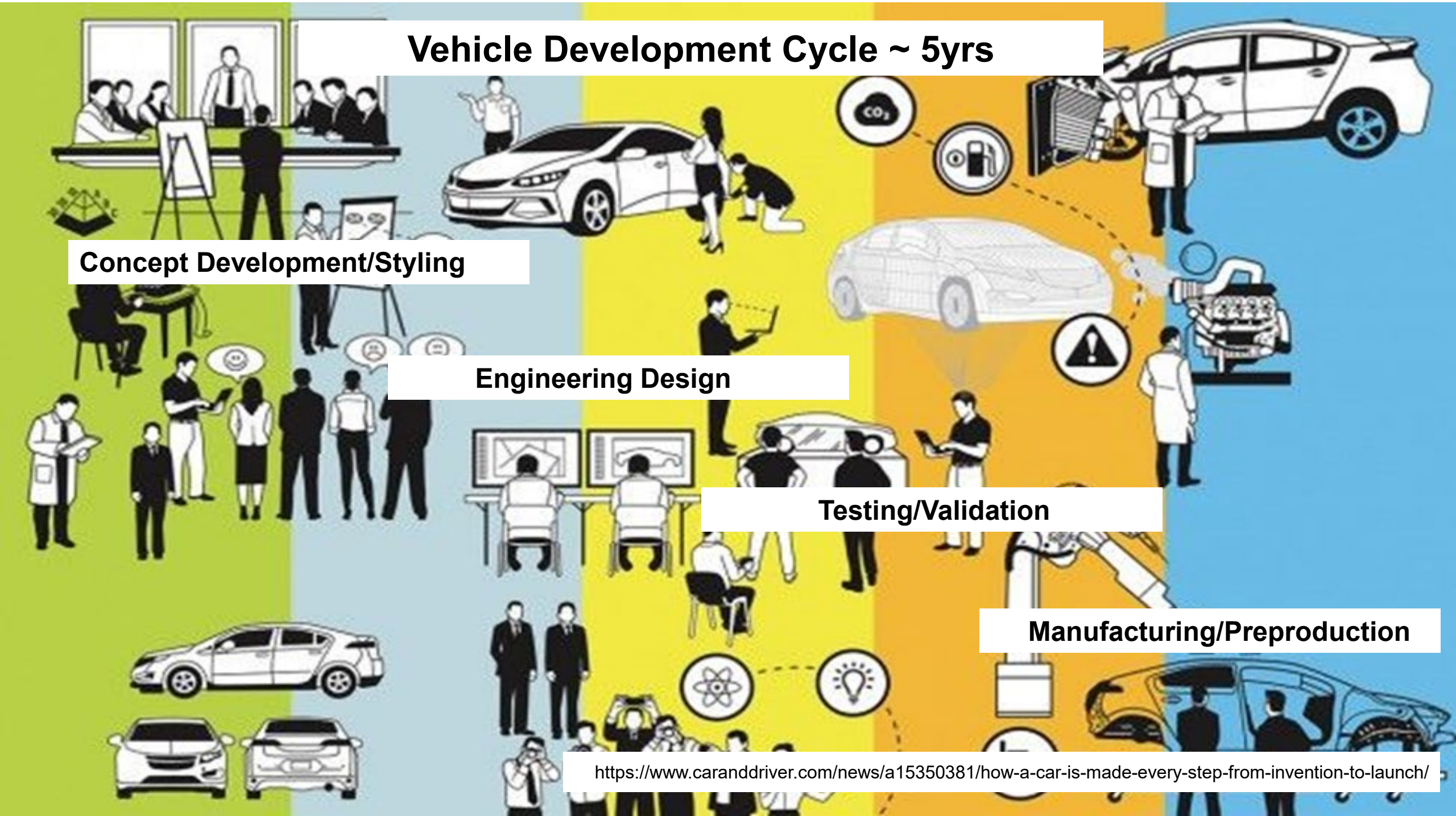
Heatstroke

- Auto Innovators has been proactive in its efforts to help reduce instances of pediatric heatstroke in vehicles
- Members made a commitment to provide rear seat reminder systems designed to provide an alert when the system infers, or otherwise determines, the potential presence of an occupant(s) in a Rear Designated Seating Position, for a trip.
- We have filed comments in support of FCC waivers and related rulemaking that would further facilitate direct occupant sensing.

Moving Forward

Stimulating Investment in Safety Technologies & Performance

Vehicle Development Cycle ~ 5yrs

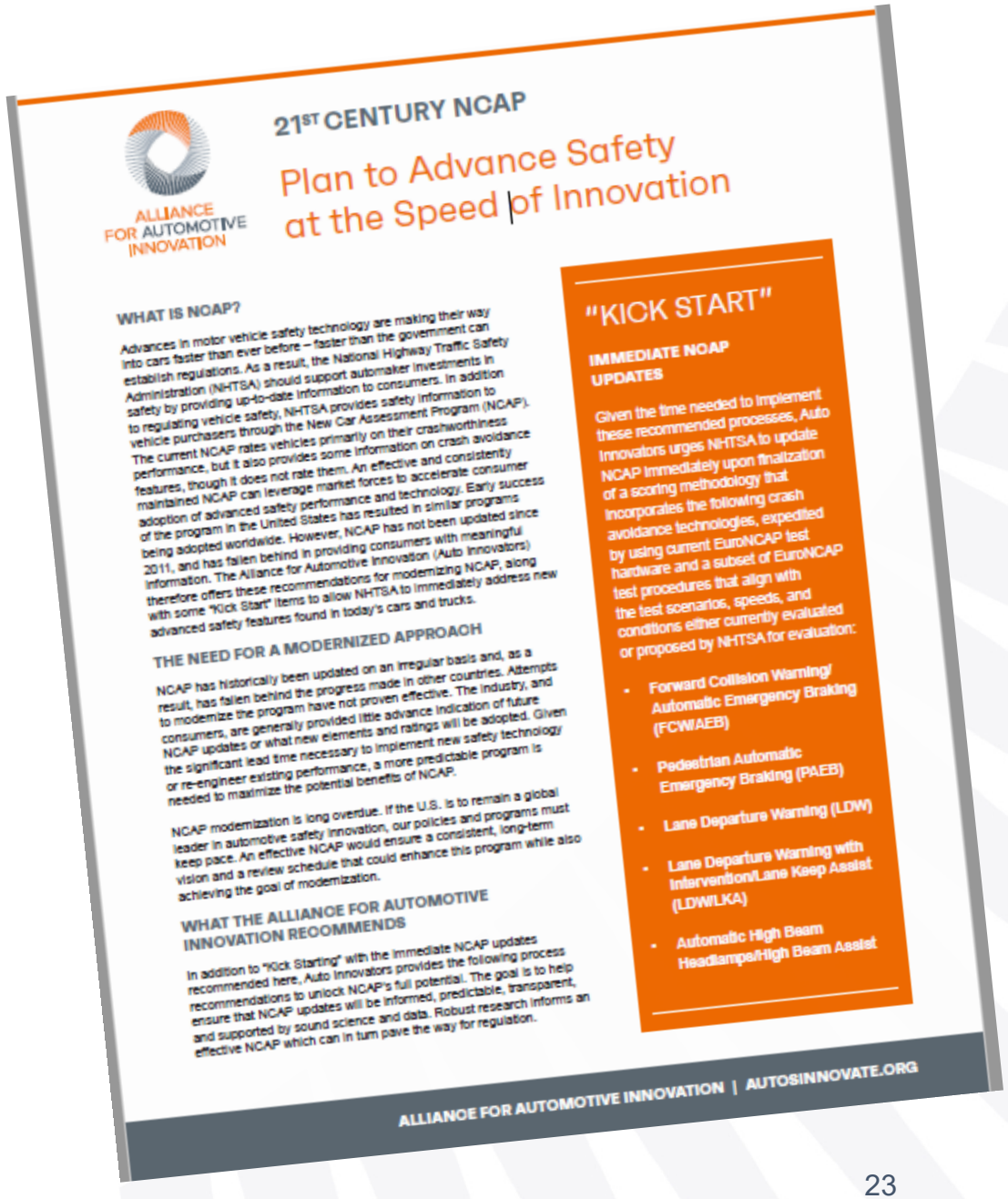


https://www.caranddriver.com/news/a15350381/how-a-car-is-made-every-step-from-invention-to-launch/

21st CENTURY NCAP

Plan to Advance Safety at the Speed of Innovation

- Manufacturers intensely compete to deliver advanced safety technology and performance to consumers
- Consumer information programs such as NCAP provide important safety performance information to consumers that serves to build demand for these systems.
- An effective and consistently maintained NCAP based on mid- to long-range safety opportunity roadmaps will **leverage market forces to accelerate** the development and deployment of advanced safety technologies and performance.



21ST CENTURY NCAP

Plan to Advance Safety at the Speed of Innovation

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WHAT IS NCAP?

Advances in motor vehicle safety technology are making their way into cars faster than ever before – faster than the government can establish regulations. As a result, the National Highway Traffic Safety Administration (NHTSA) should support automaker investments in safety by providing up-to-date information to consumers. In addition to regulating vehicle safety, NHTSA provides safety information to vehicle purchasers through the New Car Assessment Program (NCAP). The current NCAP rates vehicles primarily on their crashworthiness performance, but it also provides some information on crash avoidance features, though it does not rate them. An effective and consistently maintained NCAP can leverage market forces to accelerate consumer adoption of advanced safety performance and technology. Early success of the program in the United States has resulted in similar programs being adopted worldwide. However, NCAP has not been updated since 2011, and has fallen behind in providing consumers with meaningful information. The Alliance for Automotive Innovation (Auto Innovators) therefore offers these recommendations for modernizing NCAP, along with some "Kick Start" items to allow NHTSA to immediately address new advanced safety features found in today's cars and trucks.

THE NEED FOR A MODERNIZED APPROACH

NCAP has historically been updated on an irregular basis and, as a result, has fallen behind the progress made in other countries. Attempts to modernize the program have not proven effective. The industry, and consumers, are generally provided little advance indication of future NCAP updates or what new elements and ratings will be adopted. Given the significant lead time necessary to implement new safety technology or re-engineer existing performance, a more predictable program is needed to maximize the potential benefits of NCAP.

NCAP modernization is long overdue. If the U.S. is to remain a global leader in automotive safety innovation, our policies and programs must keep pace. An effective NCAP would ensure a consistent, long-term vision and a review schedule that could enhance this program while also achieving the goal of modernization.

WHAT THE ALLIANCE FOR AUTOMOTIVE INNOVATION RECOMMENDS

In addition to "Kick Starting" with the immediate NCAP updates recommended here, Auto Innovators provides the following process recommendations to unlock NCAP's full potential. The goal is to help ensure that NCAP updates will be informed, predictable, transparent, and supported by sound science and data. Robust research informs an effective NCAP which can in turn pave the way for regulation.

"KICK START"

IMMEDIATE NCAP UPDATES

Given the time needed to implement these recommended processes, Auto Innovators urges NHTSA to update NCAP immediately upon finalization of a scoring methodology that incorporates the following crash avoidance technologies, expedited by using current EuroNCAP test hardware and a subset of EuroNCAP test procedures that align with the test scenarios, speeds, and conditions either currently evaluated or proposed by NHTSA for evaluation:

- Forward Collision Warning/ Automatic Emergency Braking (FCW/AEB)
- Pedestrian Automatic Emergency Braking (PAEB)
- Lane Departure Warning (LDW)
- Lane Departure Warning with Intervention/Lane Keep Assist (LDW/LKA)
- Automatic High Beam Headlamps/High Beam Assist

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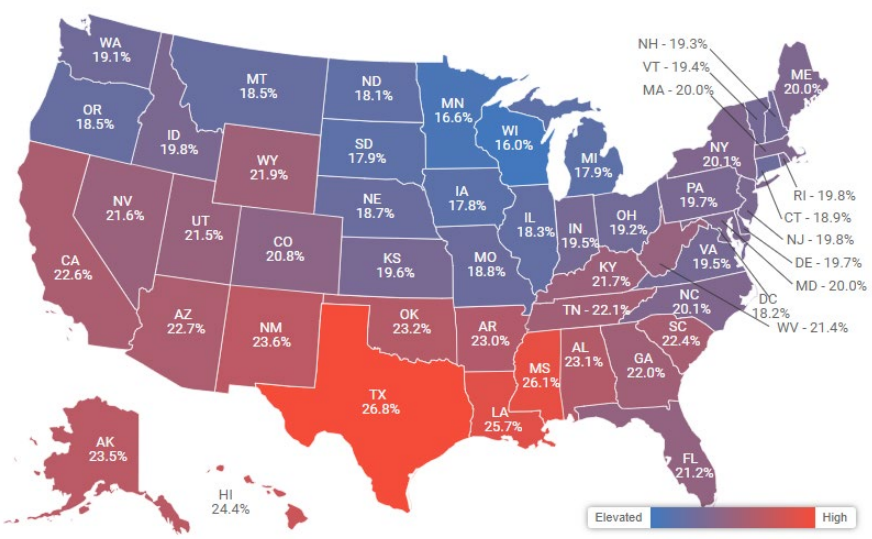
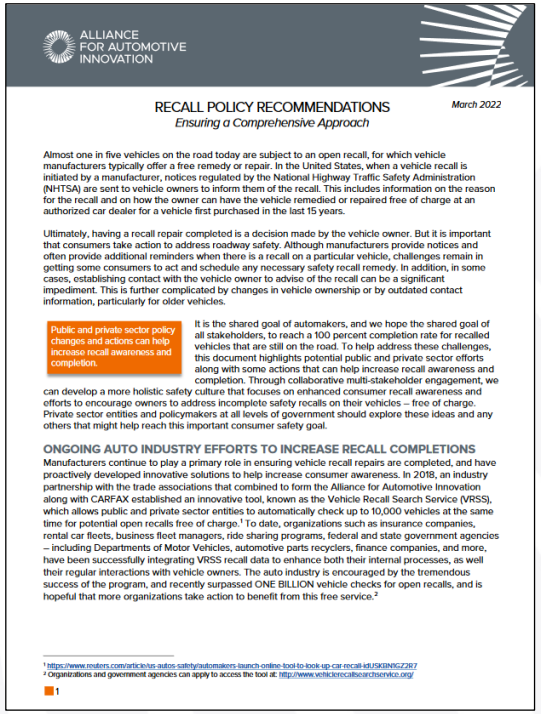
Improving Vehicle Recall Completion

- One in five vehicles has an open recall.
- Important that consumers take action to have vehicle repaired.
- Auto Innovators has partnered with CARFAX to develop a tool for government and private sector entities to check vehicle fleets and provide important recall information to consumers:
  - Vehicle Inspection
  - Registration
  - Insurance renewal notices, etc.





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RECALL POLICY RECOMMENDATIONS

Ensuring a Comprehensive Approach

March 2022

Almost one in five vehicles on the road today are subject to an open recall, for which vehicle manufacturers typically offer a free remedy or repair. In the United States, when a vehicle recall is initiated by a manufacturer, notices regulated by the National Highway Traffic Safety Administration (NHTSA) are sent to vehicle owners to inform them of the recall. This includes information on the reason for the recall and on how the owner can have the vehicle remedied or repaired free of charge at an authorized car dealer for a vehicle first purchased in the last 15 years.

Ultimately, having a recall repair completed is a decision made by the vehicle owner. But it is important that consumers take action to address roadway safety. Although manufacturers provide notices and often provide additional reminders when there is a recall on a particular vehicle, challenges remain in getting some consumers to act and schedule any necessary safety recall remedy. In addition, in some cases, establishing contact with the vehicle owner to advise of the recall can be a significant impediment. This is further complicated by changes in vehicle ownership or by outdated contact information, particularly for older vehicles.

Public and private sector policy changes and actions can help increase recall awareness and completion.

It is the shared goal of automakers, and we hope the shared goal of all stakeholders, to reach a 100 percent completion rate for recalled vehicles that are still on the road. To help address these challenges, this document highlights potential public and private sector efforts along with some actions that can help increase recall awareness and completion. Through collaborative multi-stakeholder engagement, we can develop a more holistic safety culture that focuses on enhanced consumer recall awareness and efforts to encourage owners to address incomplete safety recalls on their vehicles – free of charge. Private sector entities and policymakers at all levels of government should explore these ideas and any others that might help reach this important consumer safety goal.

ONGOING AUTO INDUSTRY EFFORTS TO INCREASE RECALL COMPLETIONS

Manufacturers continue to play a primary role in ensuring vehicle recall repairs are completed, and have proactively developed innovative solutions to help increase consumer awareness. In 2018, an industry partnership with the trade associations that combined to form the Alliance for Automotive Innovation along with CARFAX established an innovative tool, known as the Vehicle Recall Search Service (VRSS), which allows public and private sector entities to automatically check up to 10,000 vehicles at the same time for potential open recalls free of charge.[1] To date, organizations such as insurance companies, rental car fleets, business fleet managers, ride sharing programs, federal and state government agencies – including Departments of Motor Vehicles, automotive parts recyclers, finance companies, and more, have been successfully integrating VRSS recall data to enhance both their internal processes, as well their regular interactions with vehicle owners. The auto industry is encouraged by the tremendous success of the program, and recently surpassed ONE BILLION vehicle checks for open recalls, and is hopeful that more organizations take action to benefit from this free service.[2]

[1] https://www.reuters.com/article/us-autos-safety/automakers-launch-online-tool-to-look-up-car-recall-idUSKBN1GZ2R7

[2] Organizations and government agencies can apply to access the tool at: http://www.vehiclerecallsearchservice.org/

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Conclusions

Road Safety is a Shared Responsibility

Driver Responsibility is Still Important

Decisions Have to be Based on Science and Supported by Data

Members Commitment to Safety is “Job #1”

Backup Slides

Safe Road Users – Driver Behavior

Education

- Reinforce safe driving behavior – priority with emerging pandemic safety trends
- Increased awareness of new technology and its limitations

Strong laws and effective enforcement

- Seat Belt Use
- Speed
- Impairment

Safe Road Users – Vulnerable Road Users

Many pedestrians and other vulnerable road users do not wear reflective clothing and thus are difficult to spot in the dark.

While some people might not view such clothing as “cool”, there may be ways that the garment industry can integrate retro reflective characteristics that might be commercially acceptable to a wide range of consumers.

In addition, some people might be more willing to outfit their pets (for walking their dogs) with retroreflective collars and vests.

Efforts to promote use of these products should be encouraged.

https://www.chinareflective.com/news/How-to-protect-a-pedestrian-on-the-road-in-the-dark.html

Safe Roads

Road infrastructure Improvements (design/maintenance) Will:

- Facilitate faster ADS equipped vehicle deployment,
- Manage speeds,
- Reduce driver confusion,
- Increase critical sightlines,
- Improve lane keeping (clear lane marking and rumble strips), and
- Provide crash attenuation.

Safe Speeds

- Specification of rational engineering supported speed limits
- Enforcement tied to safety not “revenue generation”
- Infrastructure changes to reduce speeds/crash severities
- Work to promote “culture of safety” that will support speed reduction efforts.

https://napavalleyregister.com/news/local/roundabouts-are-coming-but-do-they-work/article_1bcfc39a-4309-5b2a-9df7-f85fe2c081ed.html

Haddon Matrix

- Useful tool to holistically evaluate crash and injury factors to identify potential safety opportunities and appropriate countermeasures/public policy.
- Illustrates the importance of human, social, and physical environment/road infrastructure factors.
- Illustrates the roles and influences that all road safety stakeholders have to reduce/eliminate crashes and improve outcomes if they happen.

	Pre-Crash	Crash	Post-Crash
Human Factors	• Education and licensing • Driver impairment • Crash avoidance maneuvers (braking, turning, etc.)	• Health at time of crash • Sitting properly in restraint • Impairment	• Response to EMS • Severity of injury • Type of injury
Vehicle/ Equipment Factors	• Crash avoidance equipment and technology (lights, tires, collision avoidance, etc.) • Vehicle design • Vehicle load	• Speed of travel • Functioning of safety equipment (seat belts, air bags, child restraints) • Energy absorption of vehicle	• Ease of extraction from vehicle • Integrity of fuel systems and battery systems
Physical Environment	• Road hazards • Distractions • Weather conditions	• Roadside features • Guardrails • Type and size of object struck	• Distance of EMS personnel • Notification of EMS personnel • Accessibility to crash victims
Social/ Economic	• Enforcement activities • Insurance incentives • Social norming • Ability to use safety equipment appropriately	• Laws concerning use of safety equipment	• Trauma system equipment, personnel, training • Information sharing