What do we need to know and do?

Children in Automated Vehicles

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Safe Kids Worldwide’s AV Efforts

- 2015: Recognizes no kids in AV studies
- 2016: Questions how kids in AV are to be safe: research, design, development, testing and marketing
- 2017: Develops expert panel to set guidance and best practice; GM provides seed money
- 2018: Blue Ribbon panel of high-level child and traffic safety experts; report has 5 Calls to Action and 8 Recommendations
- 2019: Launches 18 month Consortium to develop guidance per panel recommendations
- 2020: Progress from WGs; Consortium releases tool kit; Presentations and webinars begin
- 2021: COVID-19 Effects; Presentations and webinars begin
Blue Ribbon Panel Report

AV Developer Call to Action

Recommendations for Traffic Safety Community

Regulation, Legislation, Enforcement & Policy

Education & Outreach

Blue Ribbon Panel Report

Acknowledging children are not small adults and require special developmental consideration:

- Support safety standards that protect children
- Usability testing with families
- Inclusive design
- Conduct research on appropriate supervision
- Best safety practices in marketing

Recommendations for Traffic Safety Community

Regulation, Legislation, Enforcement & Policy

Education & Outreach

Additional Resources

2021 The Automated Vehicles Consortium is creating, publishing and adding resources

Policy, Legislation & Enforcement

Public Information & Education

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Public Information & Education

The Automated Vehicles Consortium works to ensure that child safety needs are actively reflected in new vehicle designs, regulations, laws and educational messaging.

We are encouraged by the expansion of advanced driver assistance technologies and automated driving features, and by their promising potential to prevent or mitigate crashes caused by human error.

Our priority is to ensure that stakeholders consider the safety needs of families as these technologies continue to evolve, thereby minimizing the risk of injury and death.
Driver Assistance & Autonomy

Safety and convenience features like anti-lock braking and cruise control have been developed since the 1950s.

Advanced safety, driver assistance and foundation systems have existed and evolved since the early 2000s and continue to advance.

On the Way to Automated Driving

Advanced Safety Features
- Electronic stability control
- Blind spot detection
- Forward collision warning
- Lane departure warning

Partially Automated Safety Features
- Lane keeping assist
- Adaptive cruise control
- Traffic jam assist
- Self-park

Advanced Driver Assistance Features
- Rearview video systems
- Automatic emergency braking
- Pedestrian automatic emergency braking
- Rear automatic emergency braking
- Rear cross traffic alert
- Lane centering assist

Fully Automated Safety Features
- Driverless vehicles

Moving Toward Full Automation

Safety of Automated Vehicles (SAE) Automation Levels

1. No Automation
   - No driving automation

2. Driver Assistance
   - Low-level assistance

3. Partial Automation
   - Moderate-level assistance

4. Conditional Automation
   - High-level assistance

5. High Automation
   - Full automation

The table above describes the levels of automation and their corresponding safety features. The table highlights the transition from manual driving to fully automated vehicles.
Level 1 – Driver Assistance

Vehicle assists the driver with a single task such as:
- braking
- lane-keeping
- adaptive cruise control

Increasingly common features of vehicle models for over a decade

(Many vehicles have had these features for the past several years.)

Level 2 – Partial Automation

Vehicle assists the driver with two or more Level 1 tasks
- braking
- lane-keeping
- acceleration
- steering
- adaptive cruise control

Not considered self-driving; Human driver still required

(Examples: Tesla Autopilot, Mercedes-Benz Drive Pilot, Volvo Pilot Assist)

Level 3 – Conditional Automation

- Vehicle can self-drive from point A to point B under certain conditions
- Driver must take control in a moment’s notice in an emergency or when conditions change.

Driver must be present and attentive at all times and ready to take control

(No current examples exist on the consumer market.)
**Level 4 – High Automation**

- Vehicle operates autonomously, but in limited situations, such as:
  - Within a set geographical area
  - Up to a maximum speed
  - In favorable weather conditions
- Driver or remote operator may be required for some models and situations

(No current examples exist on the consumer market.)

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**Level 5 – Full Automation**

- Vehicle can self-drive from point A to point B regardless of weather condition or speed
- No driver required
- All humans are passengers
- Some vehicles could be occupantless

(No current examples exist on the consumer market.)

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**How Do New Technologies Help?**

94% of serious crashes are due to human error.

By reducing or eliminating human error, AVs are expected to significantly reduce crashes, injuries and fatalities.
AV: Safety Advantages

  - 119,095 children ages 0–14 visited an ER
  - 7,908 children ages 0–14 were hospitalized
  - 280 children ages 0–14 died
- 94% of serious crashes are due to human error
- AV technologies remove human error from crashes
- Fewer crashes mean fewer deaths & injuries
- Reductions in pedestrian and other non-occupant injuries and deaths are also expected.

AV: Economic Advantages

- Societal costs of child passenger traffic fatality and injury include medical, work loss, and quality of life loss costs:
  - $4.1 Billion – Emergency Department Visits
  - $4.8 Billion – Child Hospitalizations
  - $2.9 Billion – Child Deaths
- $11.38 Billion TOTAL per year in the United States
- Economic costs are accompanied by devastating social impacts for road users, their families, and the broader community
- Elimination of crash-related deaths and serious injuries is an urgent priority.

AV: Additional Possibilities

- AV Rideshare and other options for families
  - More accessible mobility for unlicensed individuals
  - More accessible mobility for people with disabilities
  - Independent possibilities for older children
- Cost Savings
  - Likely shift in family insurance costs
  - Reduced product costs due to improved delivery efficiency
- Further Potential
  - Less need for parking space if vehicles are share/active
  - Further technological advances and robotics
Are AVs Safe?

Current regulations, vehicles and laws make the driver or attending parent responsible for child safety.

Regulations, laws and education must adapt to the changing technology and continue to assure child safety.

AV Risk Area Unknowns

- Forces in crashes—lower, greater, same?
- Forces in crash avoidance maneuvers?
- Incident rate during transition?
- Will today’s child restraints be effective?

- Known risks in/around cars
- New risks in/around cars?

- How risk tolerant/averse will caregivers be?
- What rules will govern riders?
- How will the public be taught?
- How will rules be enforced?

Requiring Safety for Occupants & More

Recent U.S. Regulatory Actions:
- Removing Regulatory Barriers for Vehicles With Automated Driving Systems (2019 ANPRM)
- Occupant Protection for Automated Driving Systems (2020 NPRM)
- Framework for Automated Driving System Safety (2020 ANPRM)
AV: An Expanding Field

Currently in Use for Real-World Testing

Identifying the Waymo Fully Self-Driving Vehicle

“Self-driving Shuttles” Also Being Tested

Shown: Zoox bi-directional shuttle
Interior: Seating Possibilities

Example AV Child Safety Considerations

**Seat Configuration**
- Require front-facing seat for CR use?
- Can directional misuse be mechanically prevented?
- Instruction label on vehicle seats or belts?
- Labels for booster seat use facing front?
- Mechanical block to force compliance?

**Compatibility**
- Differences in lower or tether anchors?
- Differences in air bags?

**Other**
- Front seat installation?
- Potential crash interaction among occupants?
- How will bi-directional vehicles address CRs?

Appropriate Restraints for All Occupants
What Guidance Is Needed by Families?

- Clear Laws
  - (Current laws focus on drivers)

- Best Practice Guidance
  - (Using clear, consistent terminology)

- CRS Product Regulations

- Vehicle Design & Regulations

Children Must Be Supervised for Safety

- Current vehicles and laws make the driver or attending parent responsible for child safety
- Who is responsible when the potential exists for no parent/caregiver to be present or alert?
  - children may unbuckle themselves or others
  - bored children may play unsafely with unused seat belts
- What is the appropriate age when a child can ride alone?

**Children under 13 must not be transported without appropriate adult supervision.**

AV: Time Efficiency Discussion

- What are some potential benefits to families being “driven” compared with an adult needing to drive?
- What are some of the related safety considerations?
EMS Possibilities

Fewer crashes and significant injury reduction

Benefits for emergency vehicles
• Collision avoidance technologies
• Features for braking, parking, etc.
• Communicate with other vehicles
• Less divided attention for patients
• Rideshare for non-emergent transport

Who is responsible for patient-care decisions?
Will any AV systems require special deactivation training?

Law Enforcement and AV

Fewer crashes and significant injury reduction

• Human error crashes
• Distracted driver crashes
• Impaired driver crashes
• Officers multitask in patrol vehicles

Did the driver assume emergency control in a Level 2 or 3 vehicle?
Who is responsible for crashes in vehicles with no driver?
Have laws been updated to include autonomous vehicles?

Laws Must Guide Safe Practices

Model Law for Child Transport in AV
• Responsible party duties
• Supervision requirements
• Restraint requirements
• Vehicle requirements
• Definitions

In addition to requiring compliance, usage laws are a crucial part of educating road users.
Model Law for State Use

- Applies to children under 13
- Requires that a responsible party be present
- Requires restraint use
- Requires technological verification of compliance
- Provides definitions for state consistency

Child Safety at the Forefront

AV Developers, Vehicle Manufacturers, Car Seat Manufacturers, Regulators and Safety Experts...
MUST COMMUNICATE THROUGHOUT PROCESS!

CPS Techs Need Updated Info

2017 survey: 1300 certified CPS Technicians
- 131 actively following and 811 “know a little” about AV
- 975 have never started a conversation about AV
- Child supervision (1005) is the biggest AV concern
- Believe AV is in distant future

AV design & development have been progressing for decades, but widespread visibility is now increasing
Safety Is Important for All Uses

Multiple User Vehicles Becoming More Common
- Rideshare, rentals, shared vehicles
- Certain car seats are becoming more portable, lightweight
- Easy use, accessible instructions and dexterity are needed
- Labels—pictorial

Standardized, harmonized terms for a new field
- 10 years ago, no one talked about GOOGLING, for example

Vehicle Differences – Cars, trucks, shuttles
- Interior designs
- Swivel seats
- Number of rows and configurations

Will Common Crash Types Shift?

Will frontal crashes continue to be the most common type?

Regulatory and Testing Consideration in the United States:
- FMVSS 213 requires frontal crash protection for car seats
- Near-side lateral testing is anticipated
- No rear or rollover testing is required

What do CPS Advocates Need to Know?

Advocates play an important role in family education
- Restraint use for all
- Car seat selection, installation and use
- Air bag interaction and warnings
- Supervision for children under age 13

Advocates can also play a role in state legislation. Familiarity with basic vehicle features is important. Vehicle owner’s manuals and online resources must be consulted.
Get Involved & Stay Updated

Online Toolkit:
- Presentations
- Webinars
- Useful information
- Links to additional information sources
- Visit: https://www.safekids.org/AV

Join our Automated Vehicles Interest Group:
- New information will be communicated
- Opportunities for input
- Educational resources
- URL TO JOIN: https://www.safekids.org/AV

The Infographic Sums it up!

Consider Kids on the Road Ahead

We must ensure CRs are compatible with AVs
Kids need supervision to ensure they’re safe and buckled up.

Kids count on us in case of emergencies.

And, kids need protection in and around parked cars.
Questions?

www.safekids.org/AVs