SKAVA Mission: To prevent child injuries in and around automated vehicles

Introduction:

Safe Kids Worldwide and most highway safety stakeholders agree that Advanced Driver Assistance Systems (ADAS) and Automated Driving Systems (ADS) have the potential to improve roadway safety, both for the vehicle occupants and other road users. These systems are being developed to compensate for the shortfalls of human drivers. Automated systems cannot be distracted, impaired, or fatigued. They are designed to make fewer mistakes than humans, and their intelligence is enhanced over time by the data they collect.

However, as new technology transforms vehicles, the unique safety needs of children must be recognized during all phases of development, regulation, and implementation in order to ensure that families can continue to properly protect their child passengers.

This means that, prior to the introduction of new vehicle environments and functionality, children and families must be considered and prioritized in the designs, development, marketing, and utilization of such vehicles. With self-driving test vehicles already on the road in communities nationwide, researchers, manufacturers, regulators and educators must prioritize studying child-specific safety needs in these vehicles, and take proactive steps to ensure these needs are met. To do that effectively, open communication and agreement among these and other stakeholders is crucial.

The unintended consequences of well-intentioned efforts in the past provide just cause for unwavering vigilance as we prepare for the automated era. Since the 1980s, vehicle restraints have been upgraded to better protect adults, but often in ways that conflict with the safety of children and the use of child restraints. For example, the universal child restraint attachment system, introduced in the early 2000s promised to improve compatibility and ease of use for child restraints, but the resulting Lower Anchors and Tethers for CHildren (LATCH) system did not resolve all child restraint installation issues, and its usefulness was further diminished by weight limits imposed in the mid-2010s. Today, while LATCH allows vehicle engineers to be freer in designing seat belts to optimize adult safety, it has not achieved its full potential for child safety. And, in the most tragic example of failure to consider child safety, when air bags were introduced to protect adults in the mid-1990s, they killed over 100 children and injured countless others, despite the fact that this risk had been recognized as early as the 1970s.

Children deserve better as the next era of vehicle technology unfolds. For this reason, the Safe Kids in Automated Vehicles Alliance (SKAVA) was formed to encourage and facilitate voluntary collaboration toward necessary and safe industry standards. It is the third phase of Safe Kids Worldwide Children in Automated Vehicles efforts.

Brief History of Children in Automated Vehicles Efforts:

Phase 1: Blue Ribbon Panel on Children in Automated Vehicles (BRP)

Safe Kids Worldwide convened a Blue Ribbon Panel (BRP) of nationally recognized child safety advocates and transportation experts in 2018 to discuss the unique safety considerations of children in automated vehicles. The BRP Children in Automated Vehicles recommendations report (October 2018) serves as a call to action for automated vehicle developers to evaluate and ensure their products are created with the protection of child passengers in mind. In the 2018 press release, the BRP specifically asked the automated vehicle industry to:

- Support child-focused regulations,
- Test automated vehicles in ways that consider child passengers,
- Design vehicles that are family-friendly,
- Conduct research on the appropriate level of supervision in automated vehicles, and
- Ensure all marketing and advertising shows children riding in automated vehicles according to best practices.

Phase 2: Children in Automated Vehicles Consortium

As recommended by the Blue Ribbon Panel, Safe Kids Worldwide convened a multi-year consortium to monitor research and progress, and to generate ongoing tools, policy statements and advocacy guidance that reflect an evolving field. The Children in Automated Vehicles Consortium was formed to monitor developments in the AV field and implement the BRP recommendations. The Consortium, a network of subject matter advocates and specialists, was organized into two broad working groups, which worked to gather relevant information and curate these materials into useable forms:

- Policy/Legislation and Enforcement Working Group
- Public Information and Education Working Group

The consortium's efforts were instrumental and largely responsible for the subject matter for the www.safekids.org/AVs launch, providing a public website for engagement on this topic.

Phase 3: Safe Kids in Automated Vehicles Alliance (SKAVA)

As the next phase of Safe Kids Worldwide's commitment to the safety of children in automated vehicles, Safe Kids in Automated Vehicles Alliance (SKAVA) works to ensure that child safety needs are actively reflected in new automated feature designs, through voluntary industry standards, 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 facilitate stakeholder discussion, collaboration, and action toward enhancing the safety of children as these technologies evolve, thereby reducing the risk of injury and death.

Current Priority Topic Areas

This list is part of a living document. In addition to items that could challenge the usefulness of current child passenger safety concepts and products, we also list existing child safety concerns that new automated vehicle technologies could potentially improve. As we learn more about planned designs, technologies, research and emerging issues, we will continue to add appropriate topics.

Direction of Travel Differences

- Bi-directional vehicles will travel in either forward or rearward directions equally, and this must be considered to facilitate the proper selection and use of child restraint devices.
- Educational messaging regarding when children should ride rear versus forward facing should make it clear that this orientation is relative to the current direction of travel, rather than a designated front or rear of the vehicle.

- Mechanical intervention, such as vehicle seats that can only face forward in relation to travel when occupied by a child, should be explored and incorporated, as appropriate.
- Vehicle and child restraint product labels should warn caregivers about recommended and required use in bi-directional vehicles.

Evolving Uses of Existing Interiors

- The recline of vehicle seats when not driving must be considered in relation to child restraint installation and crash performance, as well as vehicle occupant protection feature performance and potential crash interaction among adjacent passengers.
- Additional research on how injury can be mitigated in evolving environments, including through advanced restraint designs, like seat belt pretensioners, load limiters and innovative air bags.
- Since adjustable and movable seating is expected to be more common in AVs, these configurations must be designed considering child restraints and all passengers. Fail-safes and/or indicators should confirm that seats are properly attached to the vehicle and adjusted for travel.

Distribution of Crash Types

- Current child restraints are designed to be optimally effective in frontal crashes and have been required to pass dynamic frontal tests since 1981. In 2022, an amendment to the federal standard was issued that will require child restraints for children up to 40 pounds to pass near-side lateral testing by or before June 29, 2025. These tests presume all child restraints are installed on front-facing vehicle seats.
- Child restraint standards and designs reflect the fact that crash data consistently show frontal crashes to be the most frequent injury-producing events, while certain other crash types may be more or less injurious. However, as automated driving systems transform our roadway experience, the frequency of various crash types and severity may also evolve.
- Comprehensive data collection in real-world AV crashes should be established and examined to determine whether child restraint designs and testing must evolve to meet new protection needs and vehicle environments.
- Law enforcers and/or other first-responders will be essential data collectors for identifying trends in crash types and the involvement of children in AV crashes.

Novel Occupant Protection Systems

- Active and passive vehicle restraints, including seat belts and air bags, must be compatible with and appropriate for use with child restraint devices and accepted practices. Any that require specific child restraint design changes should be communicated to industry 18 months to 24 months prior to implementation.
- Any active or passive restraint, especially novel designs, must be extensively tested with child-size anthropomorphic test devices (ATDs) in child restraints and in seat belts (both in- and out-of-position) to determine compatibility, protection and unintended consequences.

Novel Vehicle Interiors

- As novel seating configurations and flexible seating concepts are considered by developers to meet consumer desires, assurance that they are appropriate for travel and include crash protection must be verified prior to implementation.
- Special attention should be given to traditional “front” seat positions, including in vehicles that are not equipped with human driver controls or have stowable driver controls.

- For child occupants, special attention should be paid to restraint system compatibility in all allowed configurations, the availability of appropriate child restraint attachment systems tested for deformation in all allowed configurations, and the potential for occupant-to-occupant crash interaction.
- As some vehicle environments become more unique or specialized, it may be necessary for vehicle designers to develop child restraint designs for their specific vehicles, including the potential for built-in boosters and five-point harness models.

Child Supervision and Emergency Response

- Automated vehicles, whether utilized for ridesharing, shuttles, private ownership or otherwise, may encourage situations in which children travel on their own or with other children without adult supervision, whether intentionally or not. Responsible adult supervision is crucial for monitoring child behavior, ensuring restraint use, and handling emergency situations (including potential evacuation).
- A minimum unsupervised child age should be established as a baseline to guide caregivers. SKAVA believes children under age 14 should not ride in a vehicle without adult supervision, and children younger than age 16 should not be expected to be the sole supervisor of underage children in any vehicle. These points should be codified into state laws. Even when a child has reached age minimums, caregivers should be advised that child-specific considerations, like knowledge, ability and general maturity, should be further factors to consider before unsupervised ridership is allowed.
- When children are old enough to ride alone, systems should be established to ensure that they enter the correct automated vehicle. This is especially important in rideshare situations, in which uninvited strangers should also be prevented from entering such vehicles.
- Create systems to ensure that unsupervised children enter the correct automated vehicle, especially in rideshare situations, and that uninvited strangers cannot also enter such vehicles.
- Other vulnerable users and adult supervisor impairment must also be considered. These considerations should be addressed by state laws.

Legislation

- Close occupant protection loopholes and eliminate exemptions for taxis, rideshares and all other “for hire” vehicles.
- Many state laws have been updated to allow road testing and the eventual widespread use of AV. Another preparatory step that's appropriate today would be to amend existing motor vehicle operation laws to assign responsibility for safe vehicle operation, occupant restraint, and child supervision in AVs.
- Beyond automated driving systems, legislation should also ensure that advanced driver assistance systems requiring human driver engagement are operated appropriately.
- Legislation should also consider onboard or remote responsibility for using the vehicle as designed and intended, respecting limitations of the included technologies.

Safety Outside of the Vehicle

- Creation of safe spaces, easily identified by GPS systems and recognized by human drivers, for loading or unloading passengers, attaching or adjusting passenger restraints and seating, and correctly securing or releasing children from appropriate restraints.
- Children and other vulnerable road users outside of vehicles should be considered, and their safety accommodated by consumer and commercial automated vehicles and automated devices.
- Testing should include children at play, pedestrians, pedalcyclists and other road users.

Pediatric Vehicular Hyperthermia Prevention

- New AV technologies should be programmed to facilitate the sensing and detection of vulnerable-occupant presence, and should also provide visual, audible, haptic and mobile alerts and notifications following a ride.
- In addition, these systems should be programmed to mitigate entrapment in cases when children enter parked vehicles on their own and cannot escape.

Regulation

- Appropriate improvements and updates to child occupant protection features (like anchorage systems) and devices (such as car seats, boosters, etc.) must be incorporated into new and existing regulatory requirements.
- These changes should be driven by child occupant and vulnerable road user data collection, analysis and ongoing monitoring
- Impact on child safety should be considered when any updates to regulations are made or new regulations are added, even if, ostensibly, the regulation is not specifically about children.
- Since designations of front and rear seats may become less objective, all seating positions should be required to adhere to FMVSS 208 and other appropriate regulations to assure that child protection is accommodated.

Marketing and Education

- Consumer expectations, basic system familiarity and intended system limitations must be considered to ensure optimal safety. All marketing materials for automated and partially automated vehicles must reflect system limitations, human responsibilities and appropriate behaviors. These materials include advertisements, graphic images, instructions, labels, and other items that provide vehicle utilization guidance.
- Marketing of automated vehicle systems/formats that may be utilized by families should be coordinated with safety educators to ensure images and messaging viewed by the public is in accordance with child safety efforts.
- Vehicle and system differences that challenge current authoritative safety guidance and child passenger safety best practices should be accompanied by new guidance and educational materials, and, as needed, new add-on or vehicle-specific child restraint products.

Who Makes Up Our Alliance (SKAVA)

To facilitate meaningful communication and assure that the resulting recommendations and standards are supported by data, experience and the existing knowledge base, the Safe Kids in Automated Vehicles Alliance (SKAVA) is true to its name. It is an Alliance of stakeholders focused on the unique safety needs of children and families in new and innovative vehicle environments. With careful attention, we have invited participation from some of the most involved and informed stakeholder groups. These partners include:

Child Restraint Manufacturers – Child restraint systems must be adequately designed, developed, tested and intended for compatibility and protection in emerging transportation environments.

Vehicle Manufacturers – Driver assistance, automated systems, unconventional vehicle interiors, and related marketing must reflect the safety needs of child occupants and road users. Some vehicle designs may defy the use of conventional child restraints and may therefore require vehicle-specific child occupant protection systems.

Automated Driver Developers – Automated sensors and systems must recognize children and child activities as they are implemented.

Driverless Rideshares – During current real-world testing and future widespread implementation, these early adopters must incorporate policies that reflect the safety and supervision needs of child users, and collect and publish data that can enhance future safety improvements.

Researchers – Because these technologies and their applications are new, studying their real-world safety potential and effects before, during and after implementation is imperative. Research representations must and does include:

- Academics
- Healthcare Professionals
- Insurance Stakeholders
- Expert Consultants
- System Developers

Advocates and Educators – With the emergence of automation, updated legislation, policies, regulation and educational programming are crucial components of its future safety. Representatives include:

- Injury Prevention Organizations
- Child Passenger Safety Technicians
- Industry associations
- Educational specialists
- Government organizations

Law Enforcement and 1st Responders – Since new technologies present new challenges for users and crash victims alike, especially during early transitions to automation, this direct involvement will help stakeholders to understand and resolve these challenges.