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September 2021

AV Considerations Under A Safe System Framework

Agenda

AV Safety Context

AV Considerations Under Safe System Framework

Research Needs & Potential Next Steps

AV Safety Context

Adopting a Safe System Approach can improve safety outcomes both today and in an AV future

Accommodating human mistakes

Keeping impacts on the human body at tolerable levels

Acknowledges shared responsibility of roadway designers and users

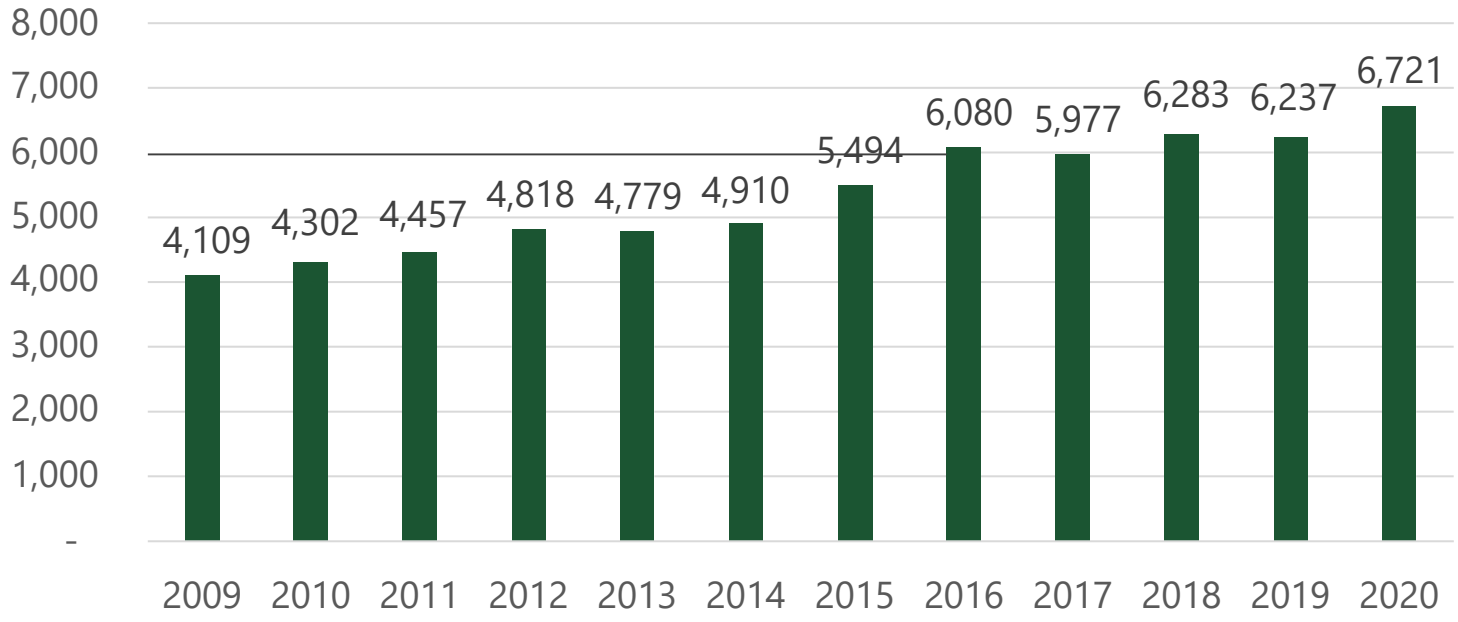
Recognizes that redundancy is crucial

Source: FHWA

AV SAFETY CONTEXT

Pedestrian deaths are increasing

Total US Pedestrian Fatalities
2009-2020



Source: NHTSA

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AV SAFETY CONTEXT

Automated vehicles are anticipated to fundamentally change how people travel

Potential Benefits	Potential Risks
Reduce congestion	Increase vehicle miles traveled (VMT)
Increase mobility for people who can't drive	Increase exposure for people walking/ biking
Improve traffic safety by reducing "human error"	Introduce new safety risks

AV SAFETY CONTEXT

Key safety goals both today and in an AV future

1. Prevent crash from happening
2. Minimize kinetic energy transfer of a crash
3. Ensure excellent crash response & post crash care

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AV Considerations under Safe System Framework

Safe Automated Vehicles

- Build on current technologies to reduce human error (e.g., lane departure warning, automatic braking)
- Consider effect of vehicle size/design on people walking/biking
- Protect passengers in different configurations (seatbelts, airbags)
- Standardize human-machine interface

Source: ambrozinio / Alamy Stock Photo

AV CONSIDERATIONS UNDER SAFE SYSTEM FRAMEWORK

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Source: Angie Schmitt

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Source: Cruise

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Source: Cruise

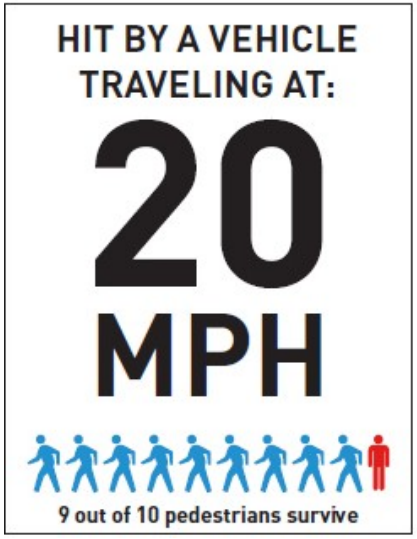
AV CONSIDERATIONS UNDER SAFE SYSTEM FRAMEWORK

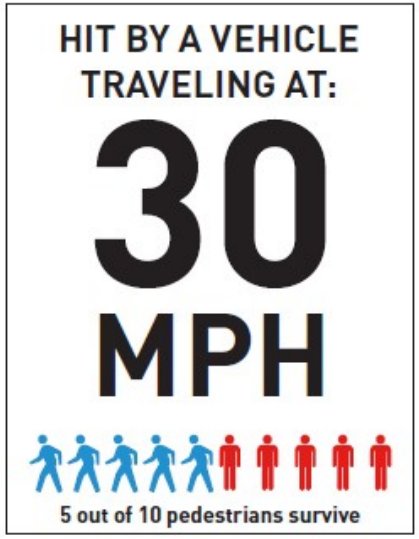
Safe Automated Vehicles

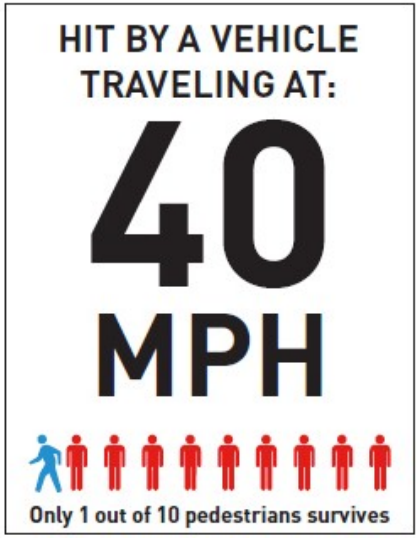
Source: Ford AV Safety Report

Safer Speeds through Automated Speed Regulation

- Regulate AVs to not exceed speed threshold
- Program AVs to travel below speed limit in adverse conditions or specific areas (e.g., with high walking/biking activity, senior populations)
- Test & regulate AV reaction time







Source: City of Seattle, Vision Zero Action Plan

AV CONSIDERATIONS UNDER SAFE SYSTEM FRAMEWORK

AVs & Safe Road Users

- Reduce distracted & impairing driving
- Automate enforcement
- Consider AV sensor technology limitations & equity concerns
- Educate all road users

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Safe Roads with AVs

- Reinforce proven safety countermeasures & speed management strategies
- Improve pedestrian scale lighting
- Consider protected facilities vs. shared streets
- Enhance curb management strategies
- Promote consistency in roadway design & materials

Median refuge islands

Speed limits

Curb extensions

Narrower lanes

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Shared streets

Separated bike lane

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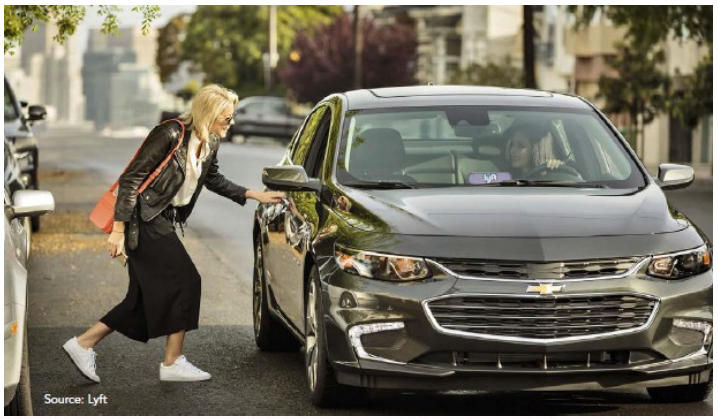

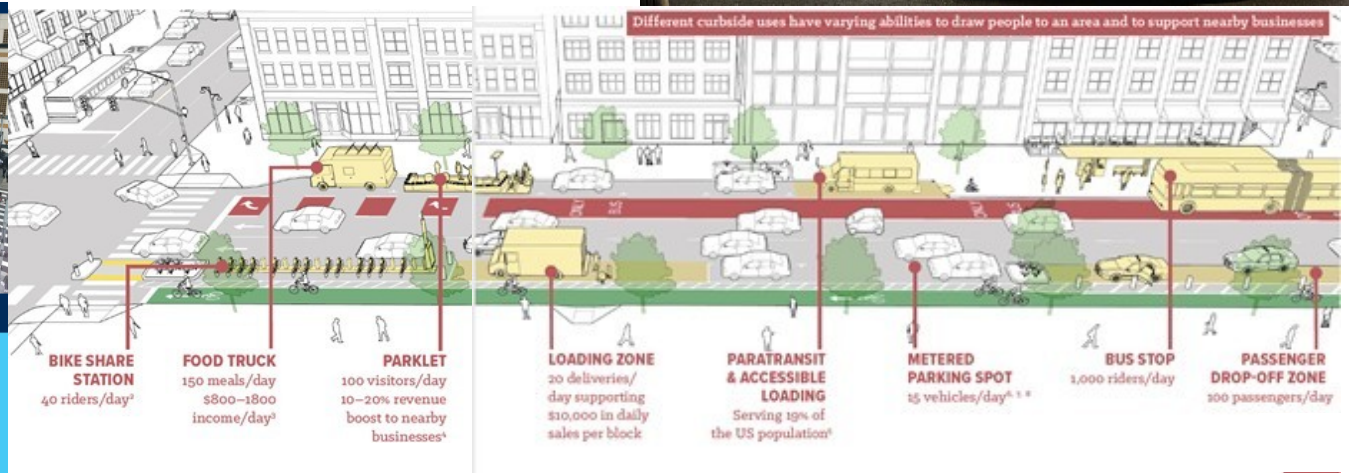

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Navigating construction zones

Consistent striping & signage

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AV CONSIDERATIONS UNDER SAFE SYSTEM FRAMEWORK

Post-Crash Care

- Leverage connected vehicle technology to prioritize emergency vehicles
- Track AV information in traffic violation & crash reports
- Collect & analyze in-vehicle data (e.g., hard braking, near miss) to inform safety planning

Example Footage from "Near-Miss" Analysis (Bellevue, WA)

Source: Transoft


Source: U.S. Department of Transportation

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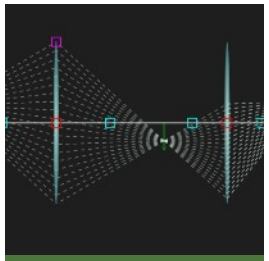
Research Needs & Potential Next Steps

Research Needs & Potential Next Steps

- Analysis of current AV safety metrics (e.g., disengagements, collisions) & trends
- Advancement of federal/state AV regulations (e.g., safety metrics, speeds, reaction times)
- Data management (connected vehicle/smart city technology, in-vehicle data)
- Considerations for how AVs can help cities achieve their goals, in addition to how cities can prepare for AVs
- Considerations for potentially long AV transition period

What's Next?

AV Readiness Planning



Modeling & Simulation

Automated Goods Movement & Delivery

Conferences, Marketing & Promotion

Questions?