COMMONWEALTH of VIRGINIA

AUTONOMOUS DRIVING WORKGROUP

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Secretary of Transportation

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Autonomous Driving Workgroup

2025 Va. Acts ch. 498 (HB2627) & 2026 Va, Acts ch. 738 (HB1124)

August 20, 2026 @ 3 pm
VIRTUAL Meeting

Agenda

3:00 – 3:05 pm	Welcome / Opening remarks *Office of the Secretary of Transportation*
3:05 – 3:35 pm	Safety data presentation and discussion *Noah Goodall, VTRC*
3:35 – 3:50 pm	Federal updates presentation and discussion *Noah Goodall, VTRC, and Deputy Secretary Schewel*

Notes:

- **Will occur virtually, via Microsoft Teams Town Hall. Please see the instructions and link to join on the next page.**
- Information for this meeting is posted on the Commonwealth Calendar and LIS.
- Past meeting information:
  - Past meeting pages & materials: April 24, 2026, May 22, 2026, and July 24, 2026.
  - Past meeting video is available in the workgroup meetings playlist on YouTube.com/@VDOTLIVE.
- Written comments may be submitted & viewed at https://publicinput.com/autonomousdriving
- Send administrative questions about the meeting to joshua.heslinga@vdot.virginia.gov
- The agenda table above was corrected on 8/17 to align with the 3-4 pm meeting timeframe.

Meeting and Microsoft Teams Instructions:

The Autonomous Driving Workgroup will be having a VIRTUAL, all-electronic meeting at 3 pm on Thursday, August 20th. VDOT will be using Microsoft Teams Town Hall to host the meeting. The link at the end of these instructions can be used to access the meeting.

When you log in to access the meeting, you will be asked to enter the name that will appear at the bottom of your participant window during the meeting. Please enter your organization and then your name, and try to be concise. For example: "VDOT – John Smith"

Teams background info:

- Attendees cannot enter the meeting until the meeting organizers start it.
- Attendees are initially anonymous & off screen in the meeting.
- Attendees can identify themselves by using the "Raise Hand" button/feature, at which point they are listed (in the "People" panel) by the entered name as an attendee in the meeting moving forward.
- Once an attendee raises their hand, meeting organizers can enable their ability to speak.
- There is a slight delay for attendees.
- Anyone can join and watch and listen anonymously, without being identified or having an ability to speak.

Comments and meeting procedures:

- There will be no designated public comment period during this meeting.
    - There will be a public comment period at the final, August 28th meeting.
    - The workgroup's survey page - https://publicinput.com/autonomousdriving - remains available for public comment.
- Chat is disabled for attendees.
- Attendees do have access to a written "Q&A" feature, but it may not be possible to address all questions submitted. Questions/comments must be relevant to the workgroup.
- Workgroup members and staff expected to present/speak are known as presenters. Whether or not a presenter is on screen, all meeting participants will be able to hear any presenter who is speaking and not on mute.
- Attendees will not see a presenter's window if that person does not have their camera on.

Records of the meeting:

- The organizers starting the meeting automatically starts a recording and automated transcript of the meeting.
- At the conclusion of the meeting, the recording and automated transcript of the meeting is available to attendees, and VDOT will make that publicly available too.

If there are administrative questions about the meeting, please contact Joshua Heslinga at VDOT.

Link to join the meeting:

Public join link for Autonomous Driving Workgroup meeting, 8/20, 3 pm

VDOT

Automated Driving Systems Safety Approaches

Virginia Transportation Research Council

Noah Goodall, Ph.D., P.E.
Senior Research Scientist
August 20, 2026

Agenda

- Introduction
- Review of recent major studies of autonomous vehicle safety
- How to compare the safety of AVs with human drivers
- Staff recommendations

Background

- As part of HB2627, VTRC was asked to describe safety frameworks and benchmarks for automated vehicle (AV) deployments
  - General comparisons with human driving
  - Appropriate benchmark selection
  - Data collection to support analysis
  - Specific operational or environmental areas of concern

- GOAL FOR THIS PRESENTATION: Share details behind staff recommendations for safety standards and data, and answer working group questions.

General evaluations

It is not definitively known if ADSs are safer than comparable humans

"I would say that there is **growing evidence that AVs crash less often per mile than human drivers. But it's still too early to say with any kind of confidence that they are safer than human drivers overall.** They just have not been deployed sufficiently across the various situations that humans encounter."

-David Kidd, Insurance Institute for Highway Safety, February 23, 2026

Zipper, D. (2026, February 23). *An Insurance Expert Appraises the Safety Record of Self-Driving Cars*. Bloomberg. https://www.bloomberg.com/news/articles/2026-02-23/how-a-car-insurance-expert-rates-the-safety-record-of-robotaxis

A **good** AV driving in the **right circumstances** is probably significantly safer than humans.

Not all AV systems have demonstrated they're "good enough" yet, and some circumstances aren't yet appropriate.

This working group's opportunity is to create permitting and data collection frameworks so that we only allow the **good** systems to drive in the **right circumstances** (while allowing the industry to grow into more circumstances).

This is possible – the data exists, the clear definitions of "safer" exist, and the models and guidance from other states and national organizations exist.

Review of recent major studies of autonomous vehicle safety

IIHS Findings

Teoh, E.R., Kidd, D.G., Riexinger, L.E., 2026. Rise of the machines: crash experiences of highly automated vehicles and human drivers. Insurance Institute for Highway Safety, Arlington, VA. https://www.iihs.org/api/datastoredocument/bibliography/2374

City	Driver	PR Crashes per MVMT	Injury Crashes per MVMT	Waymo's MVMT
Phoenix	Waymo	1.1	0.25	28.2
	Human	4.63	1.33	
San Francisco	Waymo	1.56	0.31	16.0
	Human	2.4	1.27	
Los Angeles	Waymo	1.16	0.39	5.2
	Human	4.01	1.73	
Austin	Waymo	3.6	0	0.6
	Human	3.48	1.42	

We want to be able to show similar stats for Virginia's regions

Speed and Light Differences

Table 6

Waymo L4 vehicles' SGO-reported crash involvements while in driverless operation deemed possibly police-reportable and human-drivers' police-reported crash involvements, excluding interstates and freeways, by crash environment, 2021–2024

	Waymo		Human drivers	
	N	%	*N*	%
Total	64	100.0	901,525	100.0
Speed limit				
≤25	31	48.4	68,881	7.6
30–40	29	45.3	282,058	31.3
45	4	6.3	161,422	17.9
>45	0	0.0	176,240	19.5
Unknown	0	0.0	212,924	23.6
Surface condition				
Wet	2	3.1	44,602	4.9
Dry	62	96.9	851,038	94.4
Other/unknown	0	0.0	5,885	0.7
Lighting condition				
Dark	26	40.6	241,006	26.7
Light (including dawn/dusk)	38	59.4	640,710	71.1
Other/unknown	0	0.0	19,809	2.2

Kusano, K.D., Scanlon, J.M., Chen, Y.-H., McMurry, T.L., Gode, T., Victor, T., 2025. Comparison of Waymo Rider-Only crash rates by crash type to human benchmarks at 56.7 million miles. *Traffic Injury Prevention* 26, S8–S20. https://doi.org/10.1080/15389588.2025.2499887

More Miles Allows More Detailed Comparisons by Crash Type

Table 5. Comparison of ADS and human benchmark (with dynamic benchmark adjustment) crashed vehicle rates in all locations combined by crash type in *Any-Injury-Reported* crashes (through January 2025, 56.7 M RO miles).

Crash type	Human IPMM	ADS IPMM	Expected ADS count different to benchmark	ADS to human percent difference	95% confidence interval	
Cyclist	0.29	0.05	−13.5	**−82%***	**−97%**	**−41%**
Motorcycle	0.20	0.04	−9.4	**−82%***	**−99%**	**−29%**
Pedestrian	0.42	0.04	−21.8	**−92%***	**−99%**	**−66%**
Secondary crash	0.21	0.07	−7.9	**−66%***	**−93%**	**−5%**
Single vehicle	0.27	0.02	−14.2	**−93%***	**−100%**	**−58%**
V2V backing	0.04	0.00	−2.0	−100%	−100%	87%
V2V F2R	0.61	0.44	−9.5	−28%	−56%	12%
V2V opposite direction	0.06	0.04	−1.6	−45%	−95%	126%
V2V intersection	1.58	0.07	−85.7	**−96%***	**−99%**	**−87%**
V2V lateral	0.27	0.07	−11.5	**−74%***	**−94%**	**−27%**
Other	0.09	0.02	−3.9	−80%	−100%	31%

Note: An asterisk and bold text signifies a statistically significant difference, i.e., the 95% confidence intervals to not cross 0%.

Kusano, K.D., Scanlon, J.M., Chen, Y.-H., McMurry, T.L., Gode, T., Victor, T., 2025. Comparison of Waymo Rider-Only crash rates by crash type to human benchmarks at 56.7 million miles. *Traffic Injury Prevention* 26, S8–S20. https://doi.org/10.1080/15389588.2025.2499887

How to compare the safety of AVs with human drivers

Evaluating Safety

Event Types

- **Crashes**
- **Crash surrogates**
  - Near misses, hard braking, etc.
- **Non-crash-related events**
  - Unanticipated takeovers, etc.

Attributes to Collect

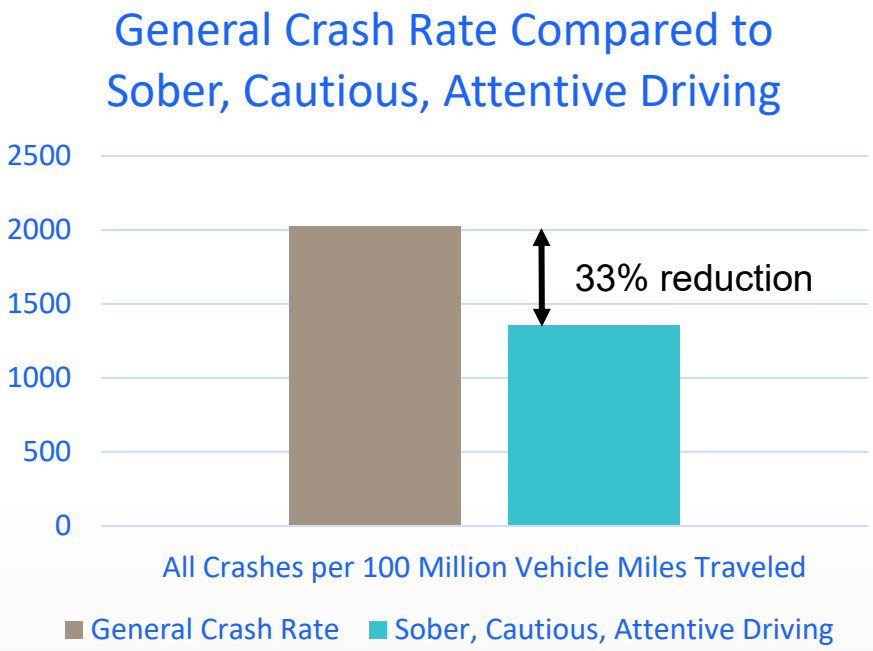
- **Rates (per VMT)**
- **Event subtypes**
  - Crash severity, etc.
- **Prevalence**
  - How often does it occur per mile?
- **Benchmark**
  - How often does it occur in the comparison population?
- **Supplemental data**
  - To help understand and assess safety
  - Location, time of day, conditions, etc.

Controlling for Similar Conditions

- AV safety should be compared to similar benchmark when possible
  - Passenger cars
  - Crash rates of the region in question (or similar regions)
  - Similar roads (non-freeways has double the crash rate of freeways)
- For AVs operating as commercial passenger carriers, ride hailing crash rates might a better proxy
  - Limited data
  - Preliminary all-crash rates in San Francisco
  - Injury rates in New York City
  - However, we don't have detailed ride hailing crash data for Virginia, so we can only use these other cities as context, not as a benchmark

Performance Targets

- Impairment
  - From a NHTSA study of filmed driving among the general public, drivers who were non-impaired (sober), non-aggressive, and non-distracted drivers crashed **33% less** than the average driver.
- Public surveys
  - A survey in a peer-reviewed journal showed public preferred AVs have an **80% lower crash rate**, i.e., 5 times safer



Liu, P., Yang, R., Xu, Z., 2019. How Safe Is Safe Enough for Self-Driving Vehicles? *Risk Analysis* 39, 315–325. https://doi.org/10.1111/risa.13116

Dingus, T. A., F. Guo, S. Lee, J. F. Antin, M. Perez, M. Buchanan-King, and J. Hankey. Driver Crash Risk Factors and Prevalence Evaluation Using Naturalistic Driving Data. *Proceedings of the National Academy of Sciences*, Vol. 113, No. 10, 2016, pp. 2636–2641. https://doi.org/ 10.1073/pnas.1513271113.

Miles needed to establish safety

- An AV company's published crash count is not always the whole story
  - Crashes are relatively rare events
  - No crashes in 100 miles does not mean perfect safety
  - One crash in the first mile does not *necessarily* mean it's unsafe
    - Could go the next million without crashing
- We can use statistics to estimate crash rates, even when there are few crashes
  - More miles needed for rare events
  - More miles needed to be more certain (80%, 90%, 95%) that it is crashing less than the benchmark

Model Driving - Miles Needed to Establish Safety

Metric	Rate per 100 million miles (US)	Adjusted for Model Driving (33% reduction)	Incident-free miles to establish safety compared to 33% reduction (million miles)	
			90% Confidence	*95% Confidence*
Injury + fatal crash rate	95	64	4.7 **with passengers**	5.8 **with passengers**
Police-reported crash rate	333	223	1.3	1.7
Any crash rate	2020	1353	0.2	0.3
Any-crash rate, San Francisco ride-hailing	6490	-	0.05	0.06
Virginia urban (City of Richmond) injury + fatal	149	100	3.0 **with passengers**	3.7 **with passengers**
Virginia rural (Buckingham Co.) injury + fatal	63	42	7.1 **with passengers**	8.7 **with passengers**
Virginia urban (Richmond) police-reported	280	280	1.6	2.0
Virginia rural (Buckingham Co.) police-reported	113	113	4.0	4.9

5x Safer - Miles Needed to Establish Safety

Metric	Rate per 100 million miles	5x Safer (80% reduction)	Incident-free miles to establish safety compared to 5x (million miles)	
			90% Confidence	*95% Confidence*
Injury + fatal crash rate	95	19	15.7 with passengers	19.4 with passengers
Police-reported crash rate	333	67	4.5	5.5
Any crash rate	2020	404	0.7	0.9
Any-crash rate, San Francisco ride-hailing	6490	1298	0.2	0.3
Virginia urban place (City of Richmond) injury + fatal	149	30	10.1 with passengers	12.4 with passengers
Virginia rural place (Buckingham Co.) injury + fatal	63	13	23.7 with passengers	29.1 with passengers
Virginia urban (Richmond) police-reported	280	56	5.4	6.6
Virginia rural (Buckingham Co.) police-reported	113	23	13.3	16.4

Note: not official numbers – for discussion only

Crash Surrogates

- Other events may be pre-cursors to crashes
  - More common than crashes, so more statistical power
  - AVs can collect this data automatically
- Near-crashes
  - No jurisdiction currently requires this data
  - No obvious definition, but several possibilities in the literature
- Hard braking
  - California requires reporting hard braking events
  - Risk of incentivizing AV companies to avoid braking when they should

"The manufacturer shall report to the department any automated driving system braking event that produces **speed decrease of 3 m/s or more** from braking at a **deceleration rate that exceeds 5 m/s/s for at least 0.5 seconds** during the operation of an autonomous vehicle in autonomous mode on a public road with a posted speed limit of 35 miles per hour or higher."

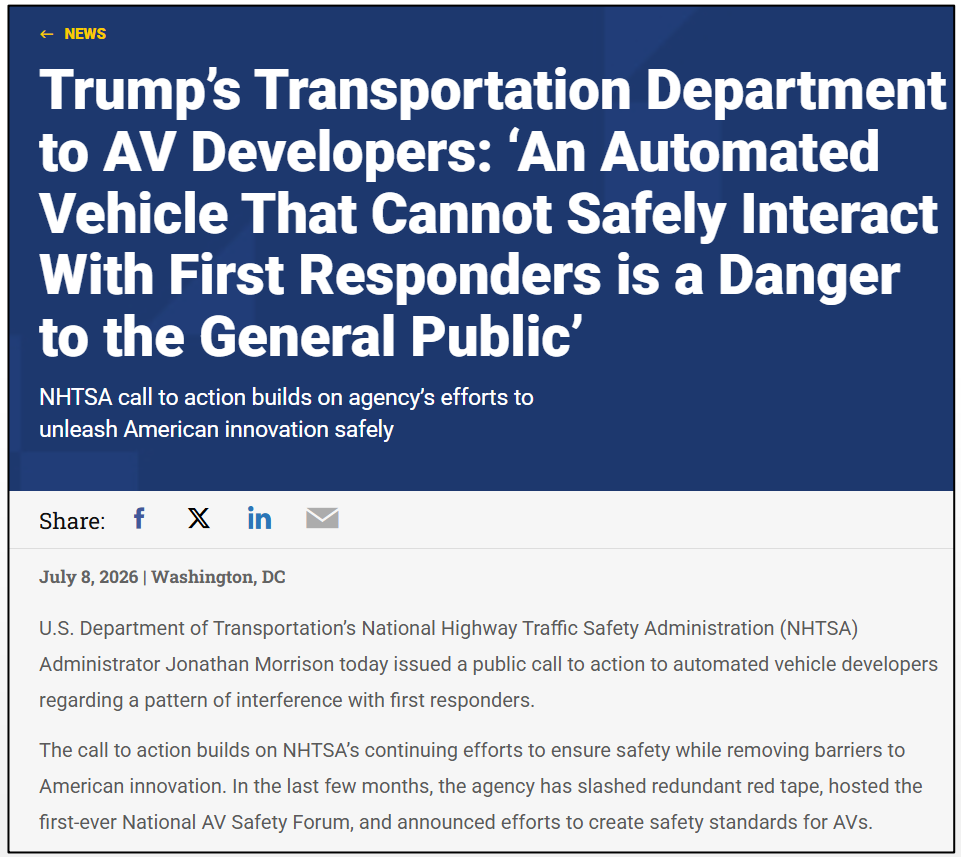
CA Article 3.7, Sec. 227.66

A Note on Injury Crashes

- Injury crashes are a common benchmark
  - More frequent than fatal crashes
  - High reporting rates, better data quality
- Needs adjustment for AV comparisons
  - AVs without drivers log empty miles, no one to be injured
  - Late model vehicles (most AVs are newer vehicles) have 3x lower injury crash rates due to safety features

Non-Crash Events

- Some events have safety implications beyond crashes
- Vehicle takeovers
  - Any vehicle that required test driver, remote operator, or someone else to proceed
  - Required monthly reporting in California for both driverless (Sec. 227.58) and with safety driver (Sec. 227.56)
  - By requiring event details, can capture data on:
    - Remote operator events and durations
    - Lane blocking incidents
    - Unsafe stopping
    - First responder interactions



← NEWS

Trump's Transportation Department to AV Developers: 'An Automated Vehicle That Cannot Safely Interact With First Responders is a Danger to the General Public'

NHTSA call to action builds on agency's efforts to unleash American innovation safely

Share:

July 8, 2026 | Washington, DC

U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) Administrator Jonathan Morrison today issued a public call to action to automated vehicle developers regarding a pattern of interference with first responders.

The call to action builds on NHTSA's continuing efforts to ensure safety while removing barriers to American innovation. In the last few months, the agency has slashed redundant red tape, hosted the first-ever National AV Safety Forum, and announced efforts to create safety standards for AVs.

(NHTSA press release)

Staff recommendations

Data Required in Other Jurisdictions

	Federal — NHTSA SGO 2021-01	California (13 CCR Arts. 3.7–3.8, as amended)	Pennsylvania (PennDOT guidelines; 75 Pa.C.S. ch. 85)	Nevada
Crash reporting trigger	Fatality, hospital-treated injury, vulnerable road user strike, airbag, or tow-away; other property-damage crashes monthly	Any collision on a public road with property damage, injury, or death; copies of SGO submissions also filed with DMV	Bodily injury, serious injury, death, or tow-away-level damage	Standard SR-1 crash reports
Timeline	1 day (fatality/injury); 5 days (tow/airbag); monthly (other)	10 days, standardized form (§227.52)	Initial report in 6 hours; follow-up in 24 hours	Standard timelines
Exposure (VMT)	None — data not normalized for exposure	AV miles filed on standardized machine-readable (.csv) templates via DMV portal	Semi-annual miles by roadway type & zip; draft rule adds annual miles by operation type	Annual ride-hailing trips/revenue (confidential).
Non-crash events	None	Amended regs replace disengagement reports with DDT performance-relevant system failures (§227.56) and braking events (§227.66)	Draft: quarterly remote-operation latency stats; ODD-encounter counts (work zones, school zones, etc.)	None
Public availability	Public dataset, but dates coarsened, VINs truncated, precise location redactable as PII; narrative / ODD / version redactable as CBI	Individual collision reports + annual report data published (per-manufacturer, not consolidated)	Not published	No public

Data Required in Other Jurisdictions – Staff Recommendations Context

	Federal — NHTSA SGO 2021-01	California (13 CCR Arts. 3.7–3.8, as amended)	Pennsylvania (PennDOT guidelines; 75 Pa.C.S. ch. 85)	Nevada
Crash reporting trigger	Fatality, hospital-treated injury, vulnerable road user strike, airbag, or tow-away; other property-damage crashes monthly	Any collision on a public road with property damage, injury, or death; copies of SGO submissions also filed with DMV	Bodily injury, serious injury, death, or tow-away-level damage	Standard SR-1 crash reports
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STAFF REC	**Require unredacted copy**	**Require same data collection as California with minor adjustments**	**Add on PA requirement for roadway type, zip, operation type**	

Data Required in Other Jurisdictions – Additional Staff Recommendations

- Work with partner agencies in other states on a regular basis to share emerging issues, allowing Virginia to act before problems surface here
  - Automated Vehicle Pooled Fund Study
  - American Association of State Highway and Transportation Officials (AASHTO)
  - American Association of Motor Vehicle Administrators (AAMVA)
  - Informal groups

Staff Recommendations: How to measure safety comparisons

- For pilot – Set mileage target using "any crash" rate comparison within the ODD for the pilot. Ensure all portions of ODD are piloted.
  - This means the pilot can be briefer than if police reported/injury thresholds were used, as those events are extremely rare.
  - If any particular circumstance fails it can be excluded from the permitted ODD (e.g., rain).
  - Allow a few choices to make for apples-to-apples comparison and set up the right targets based on requested ODD (locality, urban/rural, highway/nonhighway, light/dark)
  - Approval/disapproval is not automatic based on miles without crash. Staff can use other context to finalize permit.
- Once the permittee is operational –
  - Use and report "any crash" in aggregate and by relevant groupings (at night, at intersections, rural vs. urban, locality etc.)
  - Add on "police reported crash rate“ and “injury” comparisons to publication once the operator has crossed the 90% threshold of miles required.
  - Adjust weights for injury level (using standard EPDO weights) and for "no-person" miles.

Next steps

- We will update the Options/Recommendations slides to accommodate information from this presentation in the materials to be distributed before the August 28th meeting

Questions

Noah Goodall
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Virginia Autonomous Driving Working Group – Update on Recent NHTSA Activities

August 20, 2026

Recent NHTSA Activities

- The National Highway Traffic Safety Administration (NHTSA) is a USDOT agency focused on vehicle safety regulations
- Two recent publications on automated driving systems:
  - Updating and Expanding Guidance on Safety Development and Deployment of Automated Driving Systems (Docket No. NHTSA-2026-1520, July 31, 2026)
  - AV Framework Updates and Request for Comments on Interim Guidance (Docket No. NHTSA-2026-1552, July 31, 2026)
    - Focus is on physical characteristics of AVs. For example – do they need a rearview mirror?
- Announced program to develop AV performance standards

Updating and Expanding Guidance on Safety Development and Deployment of Automated Driving Systems

- NHTSA has published four guidance documents on AVs
- The last one to address safety was *Automated Driving Systems 2.0: A Vision for Safety* in 2017

Updating and Expanding Guidance on Safety Development and Deployment of Automated Driving Systems

- NHTSA proposing a detailed technical document addressing 15 aspects of AVs
- Remains a guidance document
- “Guidance is not legally binding” and conformity is “entirely voluntary”
- They are currently requesting comment on proposed chapters

Chapters

1. Emergency responder interactions
2. Safety management system
3. Remote assistance / tele-guidance and operational oversight
4. Safety case
5. Adherence to multi-jurisdictional laws
6. Work zone operations
7. ADS system capabilities and behavioral competencies
8. Verification and validation with advanced testing methodologies
9. Considerations for driverless deployment
10. Crashworthiness
11. Post-crash behavior
12. Human machine interface
13. Accessible design
14. Data monitoring, capture, reporting, and governance
15. Maintenance fleet operations, continuous safety monitoring, and post-deployment enhancement

Gray = Vehicle-design focused, not relevant to states

Impact on this committee

- Timing, scope, and extent of guidance unclear
- Voluntary compliance
- NHTSA explicitly rejected collecting AV mileage in the Standing General Order in May 2026 (Docket No. NHTSA–2026–0529)

AV Framework Updates and Request for Comments on Interim Guidance

- Requests comments on NHTSA's interim guidance on general exemptions from Federal Motor Vehicle Safety Standards, with emphasis on AVs
- General update on NHTSA activities since announcing the AV Framework in 2025

General Exemption Interim Guidance

- Allows the manufacture of vehicles not in compliance with Federal Motor Vehicles Safety Standards
  - For AVs, these are generally purpose-built, unconventional vehicles
- NHTSA posted guidance for AV developers on what information to provide when applying
- NHTSA proposing more flexible exemptions that can be modified (e.g., expanding the service area) without a full re-application

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Update on NHTSA Activities since June 2025

- Allowed domestic AVs to get special exemptions via the simpler import process, with plans to codify the process
- Revised AV crash reporting under Standing General Order, eliminating certain low-severity crashes
- Initiated revisions to the Federal Motor Vehicle Safety Standards to address standards assuming human drivers, e.g. mirrors, turn signal controls, etc.

AV Performance Standards Development

- Announced partnership with SAE Industry Technologies Consortia (ITC)
- Will fund a three-year, $5 million A2SCEND ("ACSEND" in some documents) consortium
  - Gather data and accelerate creation of AV performance standards
  - Will inform a single national standard for AV safety
- Consortium members not yet announced
- Recommendations would need to be adopted via administrative action to become requirements