WASHINGTON STATE
AUTONOMOUS VEHICLE
WORK GROUP

MEETING SUMMARY

Meeting: Safety Subcommittee
Location: Virtual Meeting - Zoom
Date: September 8, 2021

Attendees:

Name	Organization
Ted Bailey	Washington State Department of Transportation (WSDOT)
Debi Besser	Washington Traffic Safety Commission (WTSC)
Lt. Dennis Bosman	Washington State Patrol (WSP)
Daniela Bremmer	WSDOT
David Carter	United States Department of Transportation (USDOT)
Brian Chandler	DKS Associates
Kit Chiu	WSP USA
Lt. Tim Coley	WSP
Dan Cooke	Washington State Department of Licensing (WSDOL)
Doug Dahl	TransitLab
Dr. Andrew Dannenberg	University of Washington
Mandie Dell	WTSC
Will Hitchcock	Washington State Department of Health (WSDOH)
Tamara Jones	WSTC
Egil Juliussen	EE Times
Joanne Kerrigan	Washington State Transit Insurance Pool (WSTIP)
Mi Ae Lipe	Driving in the Real World
Kathryn B. Marshall	Venable, LLP
Kimberly Mathis	Washington State Patrol
Kyle Miller	WSDOT
John Milton	WSDOT
Pam Pannkuk	WTSC
Manuela Papadopol	Designated Driver
Terry Ponton	WTSC
Ryan Spiller	Alliance for Automotive Innovation
Lt. Courtney Stewart	WSP
Brian Ursino	AAMVA
Bryce Yadon	Futurewise
Sgt. Chong Yim	WSP

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WELCOME & INTRODUCTIONS

Manuela Papadopol & Debi Besser

- Introductions
    - Captain Dennis Bosman from Washington State Patrol was introduced as the new co-chair
- Walkthrough Agenda

Topic closed.

AV Use-Cases & Regulation

Egil Juliussen, Ph.D – Consultant & Columnist, EE Times

- Egil Juliussen presented on potential future use cases of Autonomous Vehicles (AVs), estimates on how AV use cases may evolve over time, and the impact of AV regulations on AV use cases.
- Focusing on SAE Level 4 (L4), the presentation highlighted emergent use cases and existing key players under two major categories: Autonomous Trucks and Goods AVs, and Robotaxis and Fixed Route AVs.
    - In regards to Autonomous Trucks and Goods AVs:
        - Egil noted that there has been increased attention to autonomous trucking and its applicability to the simple hub-to-hub trucking model adopted during this time. The US and China are leading this space, with many key players including TuSimple, Waymo, Aurora, Plus, Embark, and Einride.
        - Other use cases include goods delivery AVs, sidewalk goods delivery AVs, road-based goods-only AVs and road based goods AVs that include small vans and trucks with people in them.
            - Starship Technologies and Amazon lead the sidewalk goods delivery space, with some testing happening in Washington State.
            - Road based goods-only vehicles—that do not hold people—include purpose-build vehicles from Nuro and Neolix.
            - Road based goods vehicles—that also hold people—include small vans and trucks from Argo, Aurora, Waymo and Udelv.
    - Robotaxis & Fixed Route AVs pertain to use cases for passenger transport:
        - Robotaxis include AVs used for ridehailing. Egil noted that this is getting significant attention due to the vast market potential. Despite market delays due the pandemic, there is continued growth in this area, particularly in the US and China.
        - Fixed route AVs include vehicles for shared rides. The pandemic has had a negative impact on development in this area.

        - Egil noted that personal AVs are less likely to be available prior to 2025, possibly 2030, unless a breakthrough in technology is made. Its development will follow that of robotaxis.

- When it comes to the safety of AVs, there are key differences between human and software drivers.
    - Driver License:
        - While human drivers are given a test to prove traffic rule proficiency, it remains unclear how AV software drivers will be tested.
    - Driving skills and experience:
        - Egil noted that human drivers gain skill and experience over time, but generally follow a bell curve shape through different life stages according to age, starting from little skill at the beginning to greater skill level mid-life, and then a deterioration of skill towards older age.
        - On the other hand, software driving grows continuously with increased experience in road driving and virtual driving, taking more of a penetration growth shape.
    - Distraction (including visual, manual, and cognitive):
        - A major area of difference between human and software drivers is that software cannot be distracted. However, sensors could still have possible visual issues.
    - Speeding:
        - Speeding would virtually never be an issue for AVs if driving systems are governed by speed limits.
    - Driving under influence (DUI):
        - This is not applicable for software drivers.
    - Reaction time:
        - This depends on the individual person and their experience level, but generally software drivers would have a faster reaction time.
    - Drowsy or tired:
        - This would not be a problem for software drivers.
    - Weather impact:
        - Humans may be currently better at responding to diverse weather conditions, but overconfidence in ability to manage different weather conditions is a problem.
        - Software drivers currently do mostly fair weather driving, though there are increasingly being tested under more adverse conditions.
    - Edge Cases:
        - Humans are quite proficient in handling edge cases and are good at fault mitigation.
        - Difficulty addressing edge cases is the biggest disadvantage of software drivers, and the ability to match human driving skills in this area will be key to its advancement.

  - Crash avoidance and system failure:
    - Individual skill level of human drivers is key to crash avoidance while software drivers can rely on fail-soft software architecture.
    - Teleoperations as back-up will be a key functionality to ensuring safety in case of system failure.
- There remains questions to consider and possible unintended consequences of AVs and ADAS:
  - L1 to L3 technologies are helping to reduce crashes, but a question to consider is whether reliance on this technology will eventually dull human driving skills.
  - Human drivers rely on some level of communication with other road users, but how will software communicate with others?
  - How quickly will edge cases be learned?
  - For how long will safety drivers be needed?
- Egil noted that three issues (distraction, speeding and DUI) account for 58% of incidents in the US—edge cases are not a major issue. However, there remains a need for software to address edge cases.
- Standards and regulations from around the world are being put forward to begin regulating AVs:
  - ISO22737 low speed autonomous driving (LSAD):
    - This is applicable to goods delivery and fixed route AVs, which have applications to first-mile last-mile transport as well as potentially in public transit.
    - It specifies performance, system, and test requirements for vehicles, but has no specific guidance on sensor technology.
  - German AV regulation:
    - Provides a legal framework for AV deployment, focusing on L4 use cases with an emphasis on Mobility as a Service (MaaS) applications.
    - Focused on the simplest of AV use cases, and includes teleoperations.
    - AV type approval is required before legal use.
  - France AV regulation:
    - The current highway code and transport code allows for AVs.
    - There is a framework for legalized AV use along re-defined route and zones.
    - Type approval is required before use, and there are similarities to ISO 22737.
  - U.S. AV regulation:
    - NHTSA currently has ADAS L2 and ADS crash data reporting requirements
    - NHTSA AV Regulation Proposal came out in December 2020. Comments ended in April, but the regulation is not expected until 2022 and 2023.
  - China AV regulation:
    - Regulations for AVs in China are moving quickly. A number of developments this year, including a Road Traffic Safety Act for AVs and draft regulation for L3 and L4.
    - Some cities such as Shenzhen have tried to advance their own AV legislations ahead of the national level.
  - Russia AV regulation:

        - Russia has allowed AV testing since 2018 and came up with updated testing plans in early 2021.
        - Yandex is an AV leader for robotaxis and sidewalk robots in Russia.
    - Japan AV regulation:
        - New regulations (RTVA and RTA) allow for L3.
        - Testing of L4 is permitted.
- Additional standards and regulations the impact the trajectory of AVs include:
    - ISO 26262 which is a functional safety standard, including safety critical embedded systems such as ADAS.
    - UNECE WP. 29 which provides cybersecurity and OTA requirements
    - SAE J3101 which provides standards for hardware protected security, including steering, braking, propulsion, security and safety.
    - ISO 21448 which gives guidance on mitigating AV risk due to system failure, focusing on the safety of intended function by defining mathematically how a vehicle should behave.
- Egil provided a graph with estimated deployment times for the various AV use cases. Many of the use cases, including robotaxis, fixed route AVs, goods-only AVs, and sidewalk AVs are already in use today with a safety driver. He expects that complete removal of the safety driver will occur around 2025 to reach L4 automation. However, personal AVs will likely take much longer to come to fruition. He estimates that they will not be on the market until 2030 at the earliest, being the latest of the use cases to be deployed.
- **Questions and Answers:**
    - In regards to the comparison of Human Driver and Software Driver, a perceivable challenge is stopping AVs that have broken a rule. Egil was asked to share his perspective on the difference between the two.
        - Egil responded that the reason there needs to be teleoperations is that if an AV is stopped, there needs to be a way to address the issue. Because of this, teleoperations will be important to include.
        - A big question for Egil is drivers licensing. He mentioned that he is of the opinion that there will need to be some form of licensing or method of clearing vehicle software in the future. Currently this is done state by state, but the federal level may need to play a role.
        - Egil also reiterated that there is concern that ADAS will dull driving capabilities.
    - Clarification was requested on the timeline noted for autonomous trucking hub to hub with a safety driver. The current graph shows this type of AV being deployed in 2021-22. Is this for L1 to L2, with L4 coming later in the 2025-26 time frame?
        - Egil responded that that is correct, but that the safety driver would only take over if there is something wrong, such as when a vehicle is getting of the highway.
        - He added that the timeline is mostly reflective of the southwest where this type of testing is happening, and this may be different for Washington State.
    - A comment was made that hub to hub applications would likely happen within a geofenced area. L4 deployment would be different from company to company and there may be a need to look at

how to standardize this across vehicles. Right now, each company as different levels of autonomy and technology in their vehicles.
    - Egil responded that that there is hope that NHTSA will develop standards for this. At the moment, NHTSA is going through the comments that came in from the draft regulations, and they have had to extend the timeline.
- It was noted that Washington had put out an RFI with several other all weather states across the I-90 corridor to solicit different levels of testing. There has been some interest, primarily from companies interested in L1 to L2 testing with platooning, safety drivers, and potentially scaling up to L4 standalone testing (though more likely L3 as a safety driver would still be on board to take over. Ted noted that Washington is ready for that kind of testing.
- In regards to the point on dulling of driver skills, an anecdote was provided about a farmer's regular use of an autonomous John Deere 4940, and the difference it made in how manual driving tasks had been handled differently after the fact, noting that the farmer had become more complacent to certain aspects of the driving task..
- **ACTION ITEM:** Subcommittee staff will post Egil Juliussen's presentation along with relevant article links on the Safety Subcommittee's meeting page[1]

Topic closed.

PUBLIC COMMENT AND OPEN DISCUSSION

- Public comment
    - *No public comment*
- Open discussion:
    - *No open discussion*

MEETING ADJOURNED

Next AV Safety Subcommittee meeting:
Wednesday, October 13th, 2021 @ 10 a.m.[2]

NOTE: The next Executive Committee meeting will be held on Tuesday, October 5th, 2021 @ 9 a.m.[3]

[1] September 8th, 2021 Safety Subcommittee meeting materials: https://avworkgroupwa.org/committee-meeting/safety-subcommittee-meeting-24
[2] October 13th, 2021 Safety Subcommittee meeting materials: https://avworkgroupwa.org/committee-meeting/safety-subcommittee-meeting-25
[3] October 5th, 2021 Executive Committee meeting materials: https://avworkgroupwa.org/committee-meeting/executive-committee-meeting-11