House Transportation and Infrastucture Subcommittee on Highways and Transit Holds Hearing on Automated Vehicles

CQ Transcriptions

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Body

House Committee On Transportation And Infrastructure Highways And Transit: The Road Ahead For Automated Vehicles

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SPEAKERS:

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REP. SAM GRAVES (R-MO.), EX-OFFICIO

[*]ELEANOR HOLMES NORTON: Good morning and welcome to the Subcommittee on Highways and Transits hearing on the future of automated vehicles known as AVs. I must say I'm particularly interested in this hearing, fascinated by it because it gets us well beyond roads and bridges. Today we will examine the effects of the adoption and deployment of AVs on roadway safety infrastructure and the commercial driving workforce.

We will also consider this committee's role and responsibility overseeing AV deployment to ensure that the highest possible safety standards are met, and that all Americans have access to high quality family wage transportation jobs. Automatic vehicles are on the cusp of transforming our transportation system.

AVs, including commercial trucks and busses, are those in which at least some aspect of safety-critical control function occurs without direct driver input. Some can themselves reform all driving tasks and monitor the driving environment. This technology presents both opportunities and threats. Nationwide, we are experiencing a startling rise in fatalities among drivers and other road users.

AVs have the potential to drastically reduce deaths on our roadways by reducing traffic crashes caused by human behavior. Still, safety benefits must be carefully weighed against risks, especially when deploying commercial and passenger-carrying AVs. We have seen disastrous consequences when automation technology is deployed haphazardly.

To maximize the road safety impact of AVs, we must ensure that these technologies are held to the highest possible safety standards. Such standards must consider the safety of all road users who interact with AVs, including pedestrians and cyclists, and those who scoot and use wheelchairs, which is especially critical in urban areas like my own District of Columbia.

AVs must be integrated into our transportation system in a manner that respects America's commercial driving workforce. AVs could significantly improve working conditions for commercial drivers and increase on-the-job safety, but eliminating the need for a human driver could also result in a widespread job displacement if the needs of workers are not prioritized at the outset.

Employer transparency, comprehensive regulations and oversight of AV deployment will be required to create and preserve high quality family wage jobs and good working conditions for Americans whose livelihoods depend on driving. Thank you to each of our witnesses for being here and offering your unique and much needed insights for this subcommittee.

I look forward to a lively discussion and hearing what our committee can do to maximize the benefits that AVs aim to deliver. I ask unanimous consent that the chair be authorized to declare a recess at any time. Without objection. I also ask unanimous consent that members not on the subcommittee be permitted to sit with the subcommittee in today's hearings and ask questions. Without objection.

As a reminder, please keep your microphone muted unless speaking. Should I hear any inadvertent background noise, I will request that the member. please mute the microphone. To insert a document into the record, please have your staff email it to *documentsTI@mail.house.gov*

Now I am pleased to recognize my good friend, the ranking member, Mr. Davis.

RODNEY DAVIS: Thank you Chair Norton. And before I begin with my opening comments, can I ask unanimous consent to insert into the record comments from the National Association of Mutual Insurance Companies?

ELEANOR HOLMES NORTON: So ordered.

RODNEY DAVIS: Thank you, and we will email it too, follow those instructions. I want to welcome everyone to today's hearing along with Chair Norton on automated vehicles. AVs offer the opportunity to not only transform the automotive trucking and transit industries, but it will also transform our nation as a whole and solve many of the challenges that we face. As you know, this subcommittee has jurisdiction over large trucks and busses.

Employing automated technologies on trucks and busses will have economic and societal implications that we believe will benefit every American. Most importantly, incorporating this new technology will save lives. The National Highway Traffic Safety Administration estimates that 38,680 people died in motor vehicle accidents in 2020, and expects fatalities to increase in 2021.

According to the Department of Transportation, 94 percent of serious crashes are due to driver error. Because AVs are expected to anticipate dangers and mitigate or remove human error from the chain of events that lead to a crash, AV technology would increase safety and save lives. In addition, AVs could revolutionize mobility and make the transport of goods and people safer, easier, cheaper, more efficient and more accessible.

AV technology could improve mobility for vulnerable groups, including the elderly and those with disabilities, connecting them with jobs and services, and allowing them to live independently. In addition, the resulting freight transportation efficiencies could reduce the cost of goods for consumers, and in the longer term, provide solutions to some of the supply chain bottlenecks that America is currently experiencing today.

All these benefits are compelling. We must recognize the potential impacts of AV technology and what they could have on our workforce and we need to implement pro-worker policies, because AV deployment may lead to fewer professional driving jobs, we need to incorporate employee development and training programs to upskill our workforce so that they can take advantage of new jobs that AVs will create.

Today, transit agencies and trucking companies are partnering with technology firms to test AVs. Our future depends on what we do now. We need to have a clear regulatory structure in place to be able to continue to

support AV innovations and its eventual deployment. We need to take the steps necessary to ensure that America cements its leadership in the AV space.

And with that, I want to thank our witnesses for joining us today, and I look forward to hearing their testimony, and I yield back.

ELEANOR HOLMES NORTON: Thank you, Mr. Davis. I'm now pleased to yield to the chair of the full committee, Mr. DeFazio for any opening statement he may have.

PETER DEFAZIO: Thank you, Madam Chair. Thanks for holding this very important hearing, and thanks to all the witnesses. Since there are so many witnesses and there's a lot to learn, I'll be very brief. The challenges that are proposed, obviously there's tremendous promise with AVs, with already a number of aspects of those promises have been mentioned by the two preceding speakers.

I won't repeat those, but it's also a tremendous challenge to regulators. To regulate a rapidly evolving technology to be certain that the public is, all public interests are included in the development, deployment and operation of these vehicles is going to be an extraordinary challenge for the federal regulators.

It shouldn't be done state by state. We need some reasonable guidelines federally, and we've got to get it right. Unregulated, we saw what happened with Boeing and the MAX, and we don't want that to happen with AVs. I just read a report today and I think it was The Post that there were 34 unexpected and unnecessary severe braking incidents in Teslas last month, didn't lead to any major accidents yet, but certainly could.

So there are potential downside to this technology as it is being deployed and developed, and we have to stay on top of that. It also presents a challenge to our infrastructure, that these Avs use different ways of basically centering themselves on the road. If you don't have good striping, if you don't have fog lines, if you don't have regular signage, it's going to be much more problematic deployment and rollout ultimately.

So we've got to get it right, we've got to realize the promise. We can mitigate congestion, certainly mitigate deaths and be a more efficient nation in terms of fuel consumption. There's a whole host of benefits just waiting out there. We just got to get it right as we move toward them. Thank you, Madam Chair.

ELEANOR HOLMES NORTON: Thank you, Chairman DeFazio. I'd like to now welcome today's witnesses on our panel. The honorable Martha Castex-Tatum, vice mayor pro tem and City Council member for Houston, Texas testifying on behalf of the National League of Cities. Mr. Scott Marler, director, Iowa Department of Transportation testifying on behalf of the American Association of State Highway and Transportation Officials.

Mr. John Samuelsen, international president, Transportation Workers Union of America. Ms. Catherine Chase, president, Advocates for Highway and Auto Safety. Mr. Nat Beuse, vice president of safety, Aurora. Mr. Doug Bloch, political director, Teamsters Joint Council. Mr. Nico Larco, professor and director of Urbanism Next Center, University of Oregon.

Mr. Ariel Wolf, general counsel, Autonomous Vehicle Industry Association. Thank you for being here today. I look forward to your testimony. Without objection, our witnesses full statement will be included in the record. Since your testimony has been made a part of the record, the subcommittee requests that you limit your oral testimony to five minutes. First Miss Castex-Tatum, you may proceed.

MARTHA CASTEX-TATUM: Good morning, Chair Norton, Chair DeFazio, Ranking Member Graves, Ranking Member Davis and members of the subcommittee. I am Houston's vice mayor pro tem representing District K on the southwest side of Houston. I'm here today on behalf of the National League of Cities to discuss our experiences with piloting autonomous vehicles.

Zero is the only acceptable number of deaths on America's roads. Today we are losing far too many of our residents to dangerous roads in Houston and across this country, and efforts to reduce fatalities must include every possible strategy, including autonomous vehicles. Cities handle most aspects of public transportation, and that

experience and authority equips us to see both the opportunities and challenges to these new types of transportation.

We are aiming to create the right environment of shared, safe, connected AV transportation options that will better serve our residents and meet our goals as a city. In Houston, piloting the testing of AVs started with our Metro Transit Agency and their self-driving shuttle at Texas Southern University on their Tiger Walk across campus.

They are now expanding their pilots to on-road options between two universities, AV busses and researching better paratransit options. My district was one of the first three areas in Houston where Nuro launched Zero-Occupant AVs for commercial service delivery using lower speeds and smaller lightweight vehicles.

These AVs pull right up to your home and deliver groceries, prescriptions or hot food from Kroger, Domino's, CVS and the Houston Food Bank, which has been extremely helpful during COVID when we needed to social distance, but also needed our daily necessities. When Nuro first came to District K, we made arrangements with our local police officers to allow them to see the vehicle, understand how to access it in an emergency and to ask questions.

As with all AVs, these vehicles must be designed to operate on the roads as they exist today, and to interact in the real-world situations. Today, the National League of Cities is providing three recommendations for federal action. Number one, invest in piloting with local governments. Congress and US Department of Transportation can support a federal pilot for local AV testing in partnership with communities and with strong safety guidelines.

The scaling and spread of piloting to different areas of the country and different climates can encourage the data exchange that will allow for federal safety regulators to move the entire autonomous industry forward. Number two, invest in ensuring a skilled trained workforce. In Houston, we want to ensure residents have access to quality jobs that have even higher earning potential.

We're encouraged by companies like Nuro starting new upskilling training programs with community colleges, but investments in our nation's workforce needs to happen at scale. We know we need workers for infrastructure rebuilding and for growing technology industries like AVs. If we do not invest in worker training now, NLCs latest study shows the US will struggle to fill at least 4.5 million jobs.

Any moving legislation like the Build Back Better Act must invest in workforce training. Number three, raise planning and technology sharing in regions. Anticipating, adapting and accommodating for changes is the basis for good transportation planning. New technology is changing transportation, and investment in planning for the future will serve us in a more sustainable and practical way.

In closing, we firmly believe Congress and America's cities, towns and villages are crucial to the safe adoption of AVs into our existing transportation networks. I'm proud of the work that we've done in Houston, and we look forward to working with each of you as we advance our shared goals in transportation safely together. Thank you.

PETER DEFAZIO: Thank you, and now we would move to Mr. Scott Marler, director, Iowa Department of Transportation. Mr. Marler, you're recognized for five minutes.

SCOTT MARLER: Chair Norton, Chair DeFazio, Ranking Member Davis, Ranking Member Graves of members of the subcommittee, good morning and thank you for the opportunity to appear today and speak to the important topic of automated transportation. It's my honor to testify on behalf of the American Association of State Highway and Transportation Officials and the Iowa Department of Transportation.

My main message is to share the critical importance that connected and automated vehicles or CAVs will have on improving the safety, equity and sustainability of the nation's transportation system. State DOTs are preparing for a future with CAVs and are absolutely dedicated to supporting the safe deployment of a connected, automated and cooperative vehicle roadway ecosystem, where benefits extend across modes and throughout all states.

One of the key reasons state DOTs are so interested in CAVs is to improve roadway safety. We learned that the first nine months of 2021 were deadly on our nation's roads, where more than 31,700 people died in traffic crashes. In Iowa alone, we lost 354 people to traffic crashes last year.

This is entirely unacceptable, as each life lost is one too many. USDOT recently announced the National Roadway Safety Strategy, which includes actions for safer roads and safer vehicles. CAVs hold tremendous potential to reduce crashes and save lives, and I believe that CAV technologies must be an integral part of these strategies in order to fully realize the safety promise they hold.

In Iowa, our vision for deploying automated transportation has taken a two-pronged approach, focused on the drivers of today and the CAVs of tomorrow. We have several strategies that promote readiness for a more connected and automated transportation future, including the following.

Defining our vision and plan, extensive stakeholder engagement through our Automated Transportation Council, new policies and legislation that now enable and support driverless vehicles, and infrastructure improvements that work for human drivers today and the CAVs of tomorrow. Iowa's experience is not unique among the state DOTs.

In October 2021, AASHTO adopted 10 CAV policy principles we believe fundamental to the safe and effective deployment of CAVs across our states and nation. I would like to quickly highlight two for you now. First, to fully realize the benefits of automated transportation, AASHTO member states believe that vehicles must be more than automated, they must also be connected.

Connected vehicle technology is key to ensuring automated vehicles have the enhanced safety features in place to fully advance our goals of a safe, mobile, equitable and efficient transportation system. This is a key reason why we continue to strongly support the preservation of the 5.9 Gigahertz spectrum.

Second, AASHTO believes there is an urgent need for coordinated national strategy, which includes a vision and roadmap for CAV readiness and deployment. The vision and strategy must be developed collaboratively, with active input from infrastructure owner operators, industry, communities and all levels of government. Because the safety and mobility benefits are potentially enormous, fully realizing them requires clear strategic direction to focus and align our programs and tactics.

These are only two of our CAV policy principles at AASHTO, and I encourage you to review all 10 in more detail. I would like to conclude my remarks this morning by bringing emphasis to three critical actions that we believe will lead to the successful deployment of CAV technologies.

Number one, develop a national strategy and vision. Congress can foster progress by calling on USDOT and the transportation community at large to articulate a clear vision and national strategy for automated transportation. Number two, continue to foster collaboration and partnerships. USDOT needs to continue fostering partnerships and cross-sector dialogue because collaboration is our competitive advantage.

Number three, preserve the needed communications spectrum. Congress can provide much needed certainty by working within their authority to reserve the safety spectrum for transportation. Thank you again for the honor and opportunity to testify today on behalf of AASHTO and the Iowa DOT. I'll be happy to answer any follow up questions. Thank you.

PETER DEFAZIO: Thank you, Mr. Marler. We now move to John Samuelsen, international president, Transportation Workers of America. John, youre recognized five minutes.

JOHN SAMUELSEN: Thank you, Chair Norton, Ranking Member Davis, Chair DeFazio and Ranking Member Graves for providing us this opportunity to present our views on autonomous vehicle technology. As president of the Transport Workers Union of America, I'm here representing more than 150,000 working people who are on the front lines of our passenger and freight transportation systems.

These members include school bus workers, transit operators, mechanics and other workers serving communities across the country. Our members are the ones most at risk of job loss and displacement if automated vehicles are deployed without a clear federal framework or in ways that undermine workers and jobs.

This committee's leadership in crafting AV legislation is absolutely essential for the House to advance an AV proposal centered on the safety and economic security of all road users. Ensuring safety, protecting transport workers jobs and rights and prioritizing investment in our transportation network are all core to this Committee's work.

Let me be clear, the TWU fully supports pro-worker, pro-safety technology, innovation and policy. We frequently spend our own capital at the bargaining table to force our employers to install automatic braking, blind spot detection and other safety and driver-assist innovations. We would strongly endorse legislation that regulates AV technology, holds new technologies to our existing safety standards, and ensures that this industry creates and sustains good union jobs in America.

Innovation and automation are not new to our union or our members. The New York City subway ran a fully automated train across Manhattan from 1962 to 1964, a train maintained and overseen by the Transport Workers Union. This system and others like it gave rise to federal transit worker protections.

Standards like these ensure that workers are treated fairly, have access to necessary training and can transition as jobs change due to technology. And they have made our transportation sector a major hub for the solid, blue-collar jobs that power strong communities and our economy. While the specific features or equipment may be different in 2022 than in 1964, this approach has empowered workers for generations and should not change.

The same is true of our safety policies. The DOT has successfully integrated tens of thousands of new pieces of equipment, vehicles and processes into our transportation systems across every mode. TWU members have worked with regulators to transition from rotor blades to jet engines, to positive train control and most recently, towards zero-emission busses.

As a country, we have always fought to ensure that these innovations not only meet or exceed our existing safety standards, AVs must be held to the same level of accountability. AV operators and manufacturers must demonstrate their ability to improve safety, and our regulations must hold them accountable to any promised safety improvements.

As automated technology has been integrated into other modes, focus has been centered on safety requirements around qualified, licensed, trained professionals to operate commercial vehicles. Airline pilots, railroad engineers and ship captains already work with automation and regularly assume control as the situation demands.

Bus, subway and truck operators play an equivalent role in surface transportation, and our federal AV policy must declare these onboard workers as the essential element for safe roads and transit operations. No level of vehicle automation should ever replace them.

My written testimony provides specific recommendations on several issues that AV legislation should address, including elevating workers voices in developing and implementing new technologies, ensuring any transition to AVS creates and sustains good union jobs across the entire spectrum, and reforming DOT to create a unified approach to regulating automation across all of its modal agencies to ensure workers are supported as new technologies arise.

TWU members and all transportation workers are counting on our elected leaders to fight for our jobs and our safety. This committee has an opportunity now to lead the way as we integrate the next generation of transportation technology. Thank you for giving me the opportunity to address these issues here today, and we look forward to your questions.

ELEANOR HOLMES NORTON: Thank you very much, Mr. Samuelsen. First, I'd like to recognize Ms. Chase. Ms. Chase is president of the Advocates for Highway and Auto Safety. Ms. Chase, you are recognized.

CATHERINE CHASE: Good morning, Sharon Norton, Chair DeFazio, Ranking Member Davis and subcommittee members. I'm Cathy Chase, president of Advocates for Highway and Auto Safety known as Advocates. Thank you for holding today's hearing at a critical time with motor vehicle crash fatalities skyrocketing to historic highs despite a drop in vehicle miles traveled since the onset of the pandemic.

Fatal truck crashes also have been on the rise, increasing by 45 percent since 2009. Automated or driverless technology, including cars, trucks and busses, is being offered as a potential way to reduce this mounting death and injury toll.

However, it is yet to be fully developed, and its safety and numerous other impacts are currently unknown. In the short term, many safety solutions are available. Since our inception in 1989, Advocates have strongly supported proven life-saving technologies as standard equipment in all vehicles. These include airbags, seatbelts, electronic stability control to prevent rollovers and rearview cameras.

Advocates is deeply concerned about the rush to deploy undertested, unproven and unsafe automated or autonomous vehicles, AVs, including trucks and busses, while overlooking the need to advance current life-saving solutions now. The public also shares this concern about AVs. We commissioned a national public opinion poll last week.

It revealed that 80 percent are concerned about sharing the road with driverless cars. This distress is evenly expressed throughout the country. An even greater concern of 85 percent was found for driverless trucks, and again throughout the country. Yet when asked if their concerns about driverless cars would be addressed if required to meet minimum government standards, 60 percent responded, yes.

Since Congress held its first hearing on AVs nearly a decade ago, we have been urging adoption of standards. If the auto, truck and tech industries can figure out how to build AVs, the US Department of Transportation or DOT can figure out how to develop standards. Last month, DOT Secretary Buttigieg responded to a question on AVs during an interview stating quote, We need to make sure that people who are weighing how to navigate a world of automated vehicles know that there is some baseline of safety that's being established by regulation, unquote.

We share that view. Without regulations, government oversight, consumer information and industry accountability, the safety of all road users is in peril. These inadequacies are contributing to a great deal of confusion about the capabilities of driverless vehicles versus cars with convenience features like adaptive cruise control with lane keep assist.

In turn, this has led to drivers misusing and over-relying on some technologies which have resulted in fatalities and injuries. Also, yesterday, ***Tesla*** recalled 54,000 cars which were programed to roll through stop signs. The DOT clearly needs to step in and step up its oversight and regulatory responsibilities.

This includes NHTSA immediately releasing the information it has been collecting since last June from automakers about cars with advanced technologies involved in crashes. Advocates commends this subcommittee and the full committee for their Invest in America bill, which included numerous safety advances, some of which were included in the Infrastructure Investment and Jobs Act IIJA. Two critical truck safety measures are the mandated rule on automatic emergency braking, AEB, for large trucks within two years, and a mandated upgraded standard within one year for rear guards to prevent horrific truck underride crashes.

These and other directives must be a floor not ceiling by DOT. The issuance of minimum standards for a verified advanced driver assistance systems like AEB for all new vehicles must occur with expediency. These systems significantly reduce or mitigate crashes caused by many factors, including impaired, distracted or drowsy driving.

Moreover, they are the building blocks for the possibility of future driverless cars and trucks. Upgrading infrastructure is also critical to advancing safety. The tragic bridge collapse in Pittsburgh last week is a stark example of this need. Adoption of a safe system approach, which includes infrastructure improvements and vehicle safety advances, was included in the IIJA and quick implementation throughout the nation is vital.

Additionally, research and data on the impacts of AVs on accessibility, workforce, transit, the environment and other issues in the study directed by the IIJA must be completed to inform future policies. In closing, we support rigorous testing, government oversight and industry accountability, with the future goal of safe deployment of AVs, including autonomous trucks and busses.

In 2020, Advocates was joined by 60 groups representing labor, disability rights and emergency responders, law enforcement, bicyclists, pedestrians, smart growth and others in developing the AV tenets. We urge the subcommittee to continue its safety leadership role by advancing these and other needed protections to improve the safety of all road users and our nation's infrastructure. Thank you.

ELEANOR HOLMES NORTON: Thank you very much, Ms. Chase. Before our next witness provides testimony, I'd like to recognize Representative Lamb to say a few words of introduction about the next witness.

CONOR LAMB: Thank you, Madam Chair. I'm excited to introduce my constituent, Nat Beuse who lives here in the 17th District of Pennsylvania and works for Aurora. One word about, one sentence about Aurora, they are an incredible far-seeing company that is going be with us for a long time coming from executives and innovators out of Uber and ***Tesla*** and Waymo.

They partnered with companies like Toyota and Volvo to really take the lead in self-driving and automation technology both for cars and trucking. You can see their cars on the road in the city of Pittsburgh almost anytime, and they really have been an honor to have in our community as one of their main headquarters.

Nat is the vice president of safety, one of 900 Aurora employees that we have in western Pennsylvania. He leads the development of their approach to safety every single day, works with groups on industry standards and regulatory bodies to offer guidance about how we're going to make rules for this industry of the future.

He was with Uber before Aurora, but probably most relevant for us, before working the private sector, Nat oversaw the entire nation's motor vehicle safety research program, including automated vehicles at NHTSA. He was the associate administrator for vehicle safety research. He also serves on the Board of Mothers Against Drunk Driving.

So this is somebody coming to us today who not only has significant industry experience and can help us understand the day to day, but has worked on behalf of the entire public before and still continues some of that work in the [inaudible].

ELEANOR HOLMES NORTON: Thank you very much. Mr. Beuse, you are recognized.

NAT BEUSE: Good morning, Chair DeFazio, Chair Norton, Ranking Member Graves, Ranking Member Davis and members of the subcommittee. My name is Nat Beuse, and I'm the vice president of safety at Aurora. Thank you for the invitation to testify before you today on the subject of autonomous vehicle technology, and thank you to Representative Lamb for the very kind introduction.

Aurora's mission is to deliver the benefits of self-driving technology safely, quickly and broadly. We are building the Aurora Driver, the hardware, software and data services that can be used to power any vehicle to move people or goods safely. Aurora was founded in 2017 by experts in the AV field, Chris Urmson, Sterling Anderson and Drew Bagnell, and the company has grown to over 600 employees across eight offices in seven states, including Pennsylvania, California, Montana, Texas, Washington, Colorado and Michigan.

I lead the team responsible for developing and implementing Auroras holistic approach to safety. Our programs cover all aspects of our operations, organization and the engineering of our product. We also work with industry

standards groups, regulatory bodies to develop best practices and safety standards, and to share our safety approach, because transparency is critical for the success of this technology.

My entire professional career has been focused on making our roads safer. It's a deeply personal connection for me and for so many Americans. It's not acceptable that we lose 40,000 Americans every year, and that millions are injured in crashes. The unbelievable part is this trend has been going on in the wrong direction for far too long. NHTSA released new data yesterday showing that traffic fatalities continue to rise at a record pace.

I believe deeply in the work that we do at Aurora every day, and that it's going to be a part of the solution to improve safety on our roads. First, it's important to note for this subcommittee that Aurora is a regulated company at all levels of government. Our technology is subject to NHTSAs Motor Vehicle Safety Requirements, and our motor carrier operations are subject to FMCSAs safety regulations.

In addition, each state in which we operate has its own approach to permitting and regulating our AV operations. While USDOT's jurisdictions or AVs is clear and in full force, there are several open rulemakings about the safe deployment of AVs that we would like to see move forward as we continue to build our internal safety programs in parallel.

So where does my role as VP of safety at Aurora fit into this regulatory system? There is one thing we know from decades of learning across safety-critical industries. Failures in safety are rarely caused by a single person, but instead, by organizations that fail to prevent multiple mistakes from turning into a disaster.

At Aurora, we're building on these lessons. Two of our strategies for our approach are as follows. One, all Aurora employees are empowered to request halting of operations if they believe there is a safety concern, and this is part of our larger approach for managing safety risks. Teams across Aurora are held responsible for completing our Safety Case Framework, providing evidence that our AVs are acceptably safe to operate on public roads.

How we develop the Aurora Driver and prepare for a public road operations also matters. An incredible amount of work goes into mapping a route, collecting rural data for our virtual testing suite, and strategically using on-road testing to validate our simulations. With our virtual testing suite, Aurora runs millions of simulations every day.

This allows us to train and evaluate the Aurora Driver software across a vast range of scenarios well before that software is loaded onto vehicles or onto public roads. We do not build technology for its own sake or as a silver bullet. We are building the Aurora Driver to improve safety and support our partners.

A key example is our pilot with FedEx. We are running commercial loads today for FedEx on I-45 between Dallas and Houston while in autonomy. This pilot is critical for us to learn while testing safely on public roads. In my remaining time, I'll highlight two ways Aurora believes Congress and UST can support the safe development of AVs.

First, we ask Congress and the administration to ensure that laws and regulations for AVs are technology and business model neutral. Second, we ask Congress to ensure that any commissioned research about the job-related impacts of AVs be driven by actual industry experience with the technology, and that job quality be central to any policy and industry conversation.

Aurora is committed to continuing to tackle these important issues together with Congress, USDOT, our state regulators, cities, law enforcement, safety advocates, labor and many other stakeholders to support safety, innovation and jobs here in the United States. I want to thank Ms. Tatum and Mr. Marler for their leadership on AV issues in their communities and their testimony today.

Chairman DeFazio, thank you for your work on AV trucking issues this past Congress. The process you led demonstrates how impactful leadership from Congress can be. Thank you again for the opportunity to testify today, and I look forward to your questions.

ELEANOR HOLMES NORTON: Thank you very much, Mr. Beuse. We go next to Mr. Bloch, who is the political director of the Teamsters Joint Council 7.

DOUG BLOCH: Thank you, Chair Norton, Ranking Member Davis, Chairman DeFazio and members of the subcommittee. I appreciate the opportunity to testify before you today. My name is Doug Bloch and I'm the political director for Teamsters Joint Council 7. I'm proudly representing over 1,000 Teamsters in Northern California and Nevada.

A future that includes partial and fully autonomous vehicles will change the nature of work in nearly every part of the transportation industry. Congress will play a key role in determining whether these changes will be for the better or worse. And in this case, I'm afraid that if we let large corporations write the rules themselves, then it will surely be the latter.

Our union is not afraid of new technologies. The Teamsters logo displays a team of horses, and in our early days, there were skeptics who thought that horses would never be replaced with motorized transportation. But the technology evolved and so did we. We can do it again, but we need your help. The impact that AVs will have on workers is still unknown.

Congress has an opportunity to mitigate these impacts before they happen, and possibly shape better outcomes. Our experience makes me skeptical about claims that we will train our way out of any job losses. We once had roughly 100,000 members working in California canneries, and thanks mostly to automation, we're down to about 15,000 now.

When Campbell's Soup shut their Sacramento cannery and 700 Teamsters lost their jobs, government swooped in to provide job training assistance. Later, the paper reported on a second-generation Teamster from Campbell's. Her mom worked there for 40 years. As a single mom herself, she made $23 an hour plus benefits.

After the closure, it took her three years to learn to become an ultrasound technician and find a job. This is a place where government can step in. This committee was right to include the Surface Transportation Workforce Retraining Grant Program in the Invest in America Act. The act also mandated that transit agencies receiving grants to deploy AVS must require workforce development plans from applicants.

We're trying to get ahead of the curve here. How do we capture the jobs being created by automation and make sure they're good union jobs? What can our elected officials do to help? We're meeting with manufacturers and government to see how to do that. In San Francisco, we represent nearly 1,500 workers in parking garages.

AV fleets need a place to park, get charged, be maintained. This is work the Teamsters already do in parking garages and for rental car agencies. There's no reason why municipal garages cannot be retooled to serve AV fleets and Teamsters should be doing that work. However, every time there's a hearing like this, companies call us up, and while we have many good conversations, so far it hasn't resulted in many new union jobs.

That's why it's critical that government does not cede the ability to regulate these new technologies and industries. It's also important to ask, what's the problem we're trying to solve here? One problem we hear a lot about recently is the so-called truck driver shortage. Before deregulation in the 80s, driving a truck was a good middle-class job, but in very little time, trucking devolved to one where misclassified independent contractor drivers work an average of over 60 hours a week, in many cases making less than minimum wage.

Automation is the industry's answer to a driver retention problem that industry itself created. The solution is not to do away with humans, but to better enforce our labor laws and bring back good jobs. Finally, the issues facing commercial vehicles are different and potentially more dangerous than personal.

They warrant their own separate and careful consideration. Every day, our members see both the benefits of new technologies and the malfunctions that occur. Human drivers are a much-needed safety net for those scenarios and

more. The commercial use of vehicles at 10,00 pounds or less presents an agency jurisdictional issue which should be addressed.

For example, Waymo recently teamed up with our employer UPS in Arizona to use self-driving vans, and Nuro received California's first AV deployment permit. These are under 10,000 pounds, but they're clearly operating as commercial vehicles. The committee included the Operation of Small Commercial Vehicles Study in the INVEST Act. We urge you to continue to explore this segment of the package delivery industry for appropriate regulation.

In closing, in all aspects of automation, but especially when we're considering commercial motor vehicles, it's important to get it done correctly rather than just done quickly. We applaud you for having this hearing with the Teamsters voice at the table. Thank you and I look forward to answering any questions you may have.

ELEANOR HOLMES NORTON: Thank you, Mr. Bloch for your testimony. I would like to recognize now the chair, Mr. DeFazio for his introduction of the next witness.

PETER DEFAZIO: Thank you, Madam Chair. I'm pleased to introduce the next witness, Professor Nico Larco at the University of Oregon School of Architecture and Environment. Professor Larco is the director of the Urbanism Next Center, which focuses on how technological advancements such as AVs, new mobility, e-commerce sharing economy are changing our cities.

He's also the co-founder and co-director of the Sustainable Cities Initiative, a nationally and internationally awarded multi-disciplinary organization that focuses on sustainability issues as they relate to the built environment. Professor Larco has worked directly with many cities and states to examine the impacts or potential impacts of emerging technologies and help them to begin to plan for the future.

I'm pleased he could join us today, and I'm looking forward very much to hearing his testimony. Thank you, Madam Chair.

ELEANOR HOLMES NORTON: Thank you, Mr. Chair, and Professor Larco, you are recognized for five minutes.

NICO LARCO: Thank you. Thank you Chairman DeFazio for that introduction. Chair Norton, Ranking Member Davis and subcommittee members, thank you for this opportunity to testify on the future of AVs and the impacts they could have on communities. I just want give particular thanks to Chairman DeFazio for all you do for the country and for the state of Oregon.

Very much appreciate it. My name is Nico Larco, and I'm a professor of architecture and design, as well as the director of the Urbanism Next Center at the University of Oregon. Urbanism Next as was mentioned is a cross-disciplinary center focused on understanding the impacts that emerging technologies such as AVs, new mobility and e-commerce are having and will continue to have on communities.

Our focus is not on the mechanics of the technologies, but rather on their impacts on land use, urban design, building design, transportation and real estate, and why these impacts matter for equity, health, safety, the environment and the economy. We work extensively on these topics with cities and states throughout the country, private sector partners for developing or deploying emerging technologies, professional organizations, other research organizations and foundations.

Our country is at the earliest stages of developing AV technologies and real-world AV testing. What we don't know about AVs at this moment far outweighs what we do know about them and how they will impact our communities. That said, one thing that's clear is that AVs are not just another vehicle in the same way that over a century ago, cars were just not a different horse.

Our research indicates that AVs could have widespread cascading impacts on communities, and because of this, we need to be sure to shape AV deployment to serve community goals. Research supports AVs having both positive and negative transportation impacts. For instance, we suspect that AVs will cause increases in congestion in local streets similar to the hours and delays we're already seeing caused by rideshare companies.

On the positive side, they can lead to large drops up to 80 or 90 percent in the demand for parking, and if they're used in transit vehicles, potential improvements in transit frequency and coverage. Those transit service improvements, as you've heard, might however also come with large impacts on labor, and AVs could actually pull riders away from transit.

Similarly, AV trips may simply cost so much that AV travel could become a transportation choice for the wealthy, but with their implications shouldered by everyone. But AVs are not only a transportation issue. This is an important point that I want to make. AVs will have cascading impacts on communities beyond transportation impacts.

For instance, AVs have the potential to exacerbate sprawl, allowing people to drive further distances on freeways in less time. This would lead to increasing land consumption and would impact infrastructure, the environment and equity. Another example, reduced parking demand would open up existing parking lots for cities for other forms of development.

We could fill parking lots with housing, offices, shops and services, increasing accessibility. Not needing to build parking would allow us to actually put more development on any one parcel and would bring down the cost of development, increasing affordability. At the same time, the shift in parking demand would increase the supply of land available for development in a community. If supply increases and demand stays the same, this could negatively impact land prices.

This is true for urban and suburban areas, with areas that currently have the largest amount of parking the most affected by these changes. Regarding government revenues, AVs could significantly impact the revenues of governments that use fuel tax, vehicle registration, licensing, parking fees and traffic citations to fund transportation infrastructure and operations.

A study conducted by my colleagues at the University of Oregon found that revenue losses could be between 3 and 51 percent, with the direst predictions being for cities that heavily depend on fuel taxes and parking fees to fund transportation. AVs could also have substantial impacts on equity. In work we've done with the Knight Foundation and Cityfi and with AARP and the RAND Corporation, we found large areas of concern regarding who has access to AVs.

Older adults and lower-income individuals are most at risk of falling by the wayside if these accessibility issues are not directly addressed. With these points in mind, we suggest the following recommendations. First, fund pilots specifically focused on the cascading impacts of AVs.

Don't only focus on AV technology efficiency and safety, which are very important, but also expand that to address the cascading impacts of AVs. And pilots should not only focus on large cities, but also mid-sized, small and rural communities. If we don't, we wont to understand the cascading impacts in these areas and these communities will be ill-prepared and likely suffer adverse effects from future AV deployment.

Second, support research on the cascading impacts of AVs. Similar to the points regarding pilots, we also need research that goes beyond the focus on the technology, safety or deployment and expands to understand cascading impacts. The Center of Excellence for Automated Vehicles and Mobility in the IIJA is a promising step forward and we're very thankful to Representative Blumenauer who first presented the PLACE Act language that was the basis for this Center.

We need more programs such as this. Third, assist local governments in states with regulatory preparedness. This encompasses not only enabling regulations such as permitting, infrastructure, insurance and emergency response policy, but also understanding governmental roles and how best to steer deployment towards community goals, how to use tools and levers, how to incorporate community engagement.

Fourth, organize and lead a national dialogue on AV impacts and community needs. We hear a consistent desire from both public and private sector for forms to organize and share research and best practices on the many aspects of AV deployment.

In closing, I want to say that our AV future is not preordained. It is ours to shape, but we can only adequately shape the future if we understand not only the technical requirements of AVs or the regulations enabling deployment, but also the cascading impacts AVs will have on our communities and the regulations, tools and levers we can use to shape deployment to support community goals.

Thank you for this opportunity to speak with you, and I look forward to answering your questions.

ELEANOR HOLMES NORTON: Thank you, Professor Larco. We will hear next from Mr. Ariel Wolf, General Counsel, Autonomous Vehicle Industry Association.

ARIEL WOLF: Chair Norton, Ranking Member Davis, Chair DeFazio, Ranking Member Graves, members of the subcommittee, good morning. My name is Ariel Wolf, and I served as general counsel to the Autonomous Vehicle Industry Association on whose behalf I appear today. I also serve as a partner at the law firm Venable where I chair the Autonomous and Connected Mobility practice.

Thank you for giving me the opportunity to testify at this important hearing. The Autonomous Vehicle Industry Association was founded as the unified voice of the AV industry. We are committed to bringing the tremendous safety, mobility and economic benefits of AVs, otherwise known as SAE Level 4- and 5-capable vehicles to consumers in a safe, responsible and timely manner.

For a dozen years, AV technology has been tested on our roads over tens of millions of miles and maintains a remarkable safety record. At the same time, roadway fatalities in this country involving vehicles with human drivers have increased dramatically. As members of the subcommittee already know, just yesterday the National Highway Traffic Safety Administration reported that 31,720 Americans died on the roads in the first nine months of 2021. Those 31,720 deaths represent the highest number of fatalities in the first nine months of any year in the past 15 years.

The 2021 fatality numbers are part of a pattern of increasingly unsafe driving that is occurring across the country. Last week in its new National Roadway Safety Strategy, the US Department of Transportation reaffirmed what we have known for many years. Human behavior is a contributing factor to the overwhelming majority of crashes, including drunk, impaired, distracted and reckless driving.

The AV industry was established to confront the monumental and ongoing tragedy on our roads. While AV technology continues to develop and advance, the simple fact is that AVs do not drive drunk, they do not drive while texting, they do not fall asleep at the wheel and they do not recklessly speed. The record is clear.

Autonomous vehicles are being developed safely and they will make our roads safer. To reduce fatalities and injuries, Americans need a comprehensive approach to roadway safety that includes a full suite of solutions, from safer road design, to driver impairment prevention systems, to updated traffic guidance, but the approach must also include the deployment of autonomous vehicles.

AV technology will also transform our transportation system by making it more accessible, efficient and sustainable. Just last week, I visited several AV industry association members to see firsthand how this transformation is taking shape.

I rode in AVs that are safely navigating the streets of cities like San Francisco, Las Vegas, Phoenix, Miami and Pittsburgh. I climbed into autonomous trucks that are hauling freight in states like Texas and New Mexico to boost our supply chains. I saw how zero-occupant electric delivery vehicles are expanding access to fresh food and reducing emissions.

To experience AV technology at the see its capabilities is to understand the opportunities for this industry to change our lives for the better. On a personal note, I think about safer streets for my four daughters as they grow up, expanded independence for my grandmother in Florida, and for my parents and in-laws as they get older, and opportunities to expand equitable transportation and delivery options in my neighborhood here in DC.

I see this happening all while growing the economy and creating new well-paying jobs. The AV industry is creating jobs and providing opportunities for workers with a wide array of expertise and educational backgrounds, including many jobs that do not require a college degree. In locations across the country, AV developers and manufacturers are hiring auto technicians, fleet managers, safety operations specialists and many others to support the testing and deployment of AV technology.

One study found that the AV industry has created 6,500 new jobs in the Pittsburgh region alone. A recent US Department of Transportation study also indicated that adoption of AV trucking will increase total US employment by as many as 35,000 jobs per year on average and raise annual earnings for all US workers.

Given the phased timeline for AV truck deployment, autonomous trucking is not expected to displace jobs in the trucking industry, but rather serve as one tool to reduce strains on the supply chain caused in part by the long-standing truck driver shortage. AVs offer great opportunities, but without a national framework that maximizes deployment of the technology, it will be harder to achieve those benefits.

I want to thank the subcommittee for its leadership on these important issues. The Autonomous Vehicle Industry Association looks forward to serving as a resource concerning both technical and policy questions in this area, and working with you to make autonomous vehicles a reality for Americans nationwide.

We are eager to engage with Congress, the Department of Transportation and all stakeholders on the right policies to accomplish our shared goals, safer streets, expanded mobility, and new jobs and economic growth. And I look forward to answering any questions you may have.

ELEANOR HOLMES NORTON: Thank you very much, Mr. Wolf. I now recognize the chair of the full committee, Mr. DeFazio.

PETER DEFAZIO: Thank you, Madam Chair. Thanks to all the witnesses for the testimony. This is a very important hearing, and the committee needs to be focused more on these issues. I'd like to address one particular concern. Pretty much all of the discussion in Congress has been about the technology, the vehicles themselves.

I think there's been very little discussion of the current state of our infrastructure, and whether or not it's suitable, and if not, what sort of measures do we need to implement in order to have vehicles safely deployed throughout the whole United States. Anyone like to comment on that?

MARTHA CASTEX-TATUM: Thank you for that question, Chair DeFazio. Many of the autonomous vehicle companies have stated that the infrastructure needed is not different from the current infrastructure of drivers today. We can all benefit from improved roads, fewer potholes and better lines, but the information that we've received in Houston is that these vehicles will operate with the infrastructure that we currently have in our cities.

PETER DEFAZIO: Yes, but I mean some of them are dependent on cameras. I mean they use different ways of navigating. And if anybody else would like to comment, because I'm concerned that when many states don't put the state of good repair at the top of their list, that there are many roads that don't have adequate fog lines, that don't have good markings, and those are the things that many of these vehicles have depend upon to range more widely. Anyone want to comment on that?

NAT BEUSE: Yeah, Mr. Chair, I can comment on that. I think being in a city that just experienced a pretty horrific bridge collapse, and thank goodness that there were no fatalities, the point that you raised is really, really important to understand around maintenance of the current infrastructure. While I completely agree with what Ms. Tatum was saying, there are normal things that make driving as human beings good, and those are good for self-driving vehicles.

But to your point, everybody has sometimes a different approach, and so when we talk about this issue, I think it's really more about what can we do to make the current environment safer. So whether that be striping, whether that be making sure road signs are there, whether that be even equipping current day vehicles with different

technologies, all of those things together actually will help the deployment of AVs as opposed to where we treat them now as sort of these very discrete and different issues.

PETER DEFAZIO: Thank you. Anybody else?

CATHERINE CHASE: Yes, Mr. Chair, Cathy Chase. I agree with some of the points that you already astutely pointed out, in terms of improvements that need to be made both for vehicles now as well as vehicles of the future, especially as our population is aging, signage needs to be improved, different lines of sighting need to be improved for autonomous vehicles.

I also am thinking about a few years ago when the Senate Environment and Public Works Committee held a hearing on infrastructure and autonomous vehicles, and then head of the New York City Department of Transportation, now Deputy Secretary of Transportation Polly Wattenberg said something to the effect of New York City is never going to have a perfect infrastructure.

These vehicles better be ready to pretty much deal with what they're going to come upon, and we agree with that. And that's why we're pushing so hard for these minimum standards, like a vision test, so that when a car or truck takes over the responsibility of seeing, that we know that the vehicle itself will actually see and respond to what's happening.

So I think we need a holistic approach, where the infrastructure needs to be improved both now, because people are holding onto cars for approximately 12 years, and vehicles of the future and all of this can be accomplished.

PETER DEFAZIO: Thank you. I want to quickly make another point, because this is very important. Tomorrow we're holding a hearing on 5G. The FCC created issues the way it was deployed, but we also saw that the FCC has proposed to selling more than half of the vehicle-to-vehicle communication spectrum. Mr. Marler, you referenced this.

I mean, can you just comment on how abysmally stupid that is?

SCOTT MARLER: Thank you, Mr. Chair. I'd be happy to offer a few perspectives from the state DOTs. And to link it to the previous question about infrastructure, we all want good pavement condition. We all think that lane markings and clear signage are very important. These will help drivers today and the CAVs tomorrow, but the digital infrastructure is just as important to enable the future transportation systems.

We're talking about communications, we're talking about data standards, we're talking about digital mapping. So with specific regard to connectivity, we believe that the safety promise of the CAVs will be enhanced through connectivity, so preserving the 5.9 Gigahertz safety band, this would add certainty, not only for state and local jurisdictions, but also for developers and manufacturers, and we do see that as a key component of any future automated transportation system.

PETER DEFAZIO: Thank you. Thank you, Madam. My time's expired.

ELEANOR HOLMES NORTON: Thank you, Mr. DeFazio. I now recognize Mr. Crawford for five minutes.

RICK CRAWFORD: Thank you, Madam Chair, appreciate that. I would note that this hearing was originally scheduled for 10 AM. I don't know how many people this change inconvenienced, but I would hope that we can at the very least maintain a schedule, and further, perhaps if we held hearings more frequently, we wouldnt need to jam eight witnesses into a single panel.

At the very least, it's unwieldy, but it's also does a disservice to both witnesses and members of this committee by constraining meaningful dialogue. Let me say this, I want to direct a question to Catherine Chase. In your written testimony to the committee in November on challenges to the supply chain, you responded to the argument that many of my colleagues and myself made that if 18 is old enough to put your life on the line and drive a convoy into battle, then it's old enough to make a living as a commercial truck driver.

Your testimony dismissed that idea. Not only did you miss the point of the argument, but you minimized the hard work and sacrifice of young men and women in uniform with an offensive political cartoon depicting seven sailors operating one combat car, including one sleeping in the back, presumably because it's such an easy task.

Ms. Chase, would you consider manning military vehicles an easy job?

CATHERINE CHASE: No sir.

RICK CRAWFORD: Thank you. If 18 is old enough to die for your country, is it not old enough to choose to make an honest living as a truck driver?

CATHERINE CHASE: Well, I'd like to first address the comment you made.

RICK CRAWFORD: That's a yes or no question, ma'am. That's a yes or no question. Is 18 old enough to die for your country? Can they also drive a truck?

CATHERINE CHASE: They're not comparable questions. It's an apple

RICK CRAWFORD: They are, That's an absolute yes or no question. And you're taking a position that, as a military veteran, I find offensive, and many of the members on this panel who are military veterans find offensive. Not only did you make that comment, but you included this, which is already in the record, but I'll ask unanimous consent to enter it into this record.

ELEANOR HOLMES NORTON: So ordered.

RICK CRAWFORD: I find that highly offensive as a veteran, and I think most veterans would, that your position is that we're either incompetent and/or lazy and not well-trained. So I'm asking you again, this is a yes or no question, do you think 18 years old is old enough to die for your country, shouldn't they be old enough to make a living driving a truck?

CATHERINE CHASE: Sir the point of this political

RICK CRAWFORD: Yes or no, and then I'll go onto my other witnesses.

CATHERINE CHASE: It's very difficult

RICK CRAWFORD: Yes or no, and then Ill go on to my other witnesses.

CATHERINE CHASE: Please go on to your other witnesses.

RICK CRAWFORD: So you have no answer to that question? We know how you feel about it based on the cartoon you entered in the record earlier in your testimony. OK I'll move on. I'll move on to Mr. Ariel Wolf and Mr. Beuse. We certainly in my district like many other districts, a lot of truck drivers out there and I know how vital trucks have been to the American economy, especially during the COVID pandemic and our recent supply chain crisis.

Can you talk about how you envision higher levels of automation making truck driving jobs safer and what impacts that'll have in terms of efficiencies on automated trucking and productivity?

ARIEL WOLF: Congressman, I'm happy to take that question, and thank you for it. I think the place to start is the well documented in long-standing driver shortage, truck driver shortage that's having an impact on the economy as we speak and the supply chain, and that issue in concert with the US Department of Transportation study that showed a net increase of jobs, as many as 35,000 per year in addition to other economic benefits, leads us to the conclusion that it really is time for us to shift the way we think about the conversation around jobs and autonomous trucks.

These are two areas that can complement each other in this ecosystem, and as that technology move forward, I would just also say it's a matter of safety as a baseline matter, because as we talked about the safety statistics are worsening over time, 14 percent of fatal crashes, serious crashes, involve heavy trucks. So getting this technology deployed is essential in that respect.

And in the jobs front, we certainly see overall an increase in jobs, economic growth, and as I noted in testimony, as the ecosystem grows, there are a number of different roles, and new kinds of jobs are going to be created in this exciting area. So I think all of that taken together, we see a lot of positive activity going forward.

RICK CRAWFORD: Thank you. Mr. Beuse.

NAT BEUSE: Congressman, thank you for that for the question. I think Ill mention two things. Part of the challenge we have with this space is the lumping of all the technologies together, and we call them all automated. Certainly there are technologies in the pipeline, some already on vehicles today, on commercial trucks, that make the driving task easier for human drivers.

And then there's technology like that we're working on, which is really around the driving task which could make the driving trucking jobs different in the future. So it's not about some sort of replacement thing, and that's exactly why we're doing this pilot with FedEx so that we can learn all of these different issues beyond just does the tech work.

It's actually how do we introduce this technology into the existing system in a way that's frankly seamless. We don't want to introduce additional friction into a system that already has a bunch of friction in it.

RICK CRAWFORD: Thank you. I yield back.

ELEANOR HOLMES NORTON: Thank you very much. I recognize myself for five minutes. Mr. Samuelsen, your testimony makes a strong case for ensuring workforce needs are addressed as deployment of commercial AVs become more prevalent. I share your concerns that if left unchecked, automated vehicles may create tremendous hardship for commercial motor vehicle drivers.

So my question is, what steps can Congress and the federal government take to harness the safety benefits of automated trucks and busses, while at the same time supporting a stable, well-paid surface transportation workforce? And do you believe that addressing commercial driver workforce needs and employing AV technology are mutually exclusive goals, or can both be attained? Mr. Samuelsen.

JOHN SAMUELSEN: Thank you for the question. So we have a situation now where there are ways of technology coming into public transport, busses for instance, the operation of busses, that require an absolute robust federal regulatory framework for them to be deployed safely. And I think the first thing that needs to be done is that there needs to be a federal check that anything that goes onto highways, roads in America, meet a regulatory minimum that's set forth by the federal government.

And the second piece of that is, I've listened to some of these questions back and forth about automated technology and impact on the workforce. I think that the impact on the workforce has the chance to be extreme. Right now, despite a discussion about automating technology being introduced for safety reasons, for any other reasons, there are transit systems and operators across the country right now that are embracing this technology simply for the purpose of reducing headcount.

And that's absolutely true. We deal with transit employees across the country, public-sector operators that are looking to reduce budgets, and private-sector operators that are looking to maximize profit, and all doing this without any regard for the safety, the future safety of highways or roads.

And I think that the only intervening there that can prevent this from happening in a chaotic way is the federal government. And in terms of the use of automated technology simultaneously with human operators, I think that is the way to go, to utilize automated technology augmenting and assisting humans operating vehicles, particularly in public transit.

There's no working American that believes that replacing busses with automation is a good thing for working people who use public transit in America. Nobody believes it. And also, this notion that the introduction of automation is going to somehow create new jobs.

We've heard all of this with NAFTA. We've heard it many, many times with NAFTA, with normalization of trade with China, that somehow the introduction of automated technology that could replace human operators, it's going to produce more jobs. We've heard that, we've seen that movie already, and have absolutely no trust or faith in this technology coming in, in a positive way unless the federal government steps up and regulates. Thank you.

ELEANOR HOLMES NORTON: Thank you very much, Mr. Samuelsen. Mr. Beuse and Mr. Wolf, the last time the subcommittee held a hearing on this topic was in 2013. That's going on 10 years ago, and at that time, AVs were still considered a technology of the future. But today there are at least 1,400 AVs including automatic commercial vehicles being tested on US roadways in 36 different states.

What do you think is a realistic timeline for deployment of your technology, specifically vehicles with Level 4 automation and above, and when can Americans expect to see the vehicles driving on the roads next to them?

ARIEL WOLF: Madam Chair, I'm happy to jump in and then defer to my colleague on the panel here. I think that as a baseline matter, we see this technology on the roads today as you noted. One of the most important things to see this technology scale, and again it is as Mr. Beuse noted, being used in pilot projects, carrying freight and helping to alleviate the supply chain crisis that we face, as well as other instances where the technology, one example in Arizona providing meals to individuals who live in food deserts. It's just another example, but to scale this technology, the timeline is somewhat dependent on building a national framework that will accomplish two things.

One is to enhance consumer trust in the technology, but then two is to maximize deployment. And in my written testimony, I note a number of different steps that we are eager to work, continue to work with this committee, and we're thankful for the work thus far, and other committees in Congress and stakeholders to develop a national framework that will maximize the deployment of this technology so that we can start to see those benefits that we've talked about a number of times accrue to the public.

ELEANOR HOLMES NORTON: My time has expired, and I go next to Mr. Bost.

MIKE BOST: Thank you, Madam Chair. Before I go on to my questions that I have prepared, I would like to associate myself with the comments that Representative Crawford made, because as a member on this committee, probably the only one that actually had my license for a tractor-trailer when I was 16, was driving whenever I was 18, and by the time I turned 19, I was in the Marine Corps.

All of those things I was very capable of handling and handling safely. My family believed in me. You know, the state of Illinois actually tested me out and by golly, guess what? I passed that driver's test at 16 years old. Never had a car license. I only had a tractor-trailer license. At a time when the United States is needing people to be available to work, wise decisions based on the individual, not discriminating against them because of their age, would probably be a lot wiser thing to do than have cute cartoons about where we're at right now and what we're needing.

That being said, Mr. Wolf, the development and deployment of the automated trucks is already raising questions for truck drivers about what the future of their profession would look like. Many are wondering how their work will change and what new skills they will need. To help us kind of understand what the future would look like for drivers, could you describe the level of standardization between the various AVs as far as trucks and their technologies that are being developed by different manufacturers?

For example, if a trucker is trained to operate one of the trucks that Aurora has developed, would their skills be easily transferable to the drivers of a different manufactured truck or technology? Or what would the driver need to have separate or additional training? Do we know that?

ARIEL WOLF: Thank you, Congressman for the question. I'm happy to address it. I think maybe the place to start is to understand that there are two different kinds of technologies here, and the Autonomous Vehicle Industry Association, we're working with, of course, autonomous vehicle technology, which is so-called full automation, where a human driver is not

The technology is not designed nor is it expected for a human to be involved in the driving task. That is distinct from driver assistance technology, which many of us have seen. Lane keep assist, adaptive cruise control and others have described it, and that technology, there is an expectation for a licensed human operator or driver to take back control or to be vigilant at all times that they control.

So those two are very different kinds of technologies and I think that distinction is critical because oftentimes it can be conflated. So in that respect, I can't speak to the expectation to licensed human drivers in the driver assistance context, the technology in that sphere, but in the autonomous vehicle side, again, the expectation is that there would not be a driver to take back control.

For the time being, there are safety operators and monitors involved there, and I would defer to individual members, our bar association to speak to the transferability of those skills.

MIKE BOST: I understand, I appreciate that answer. Mr. Samuelsen, well-trained mechanics are essential for keeping our trucks and busses safe and on the road. What additional training needs will be for mechanics for having automated systems? Are there additional safety concerns for workers around the automated trains or busses?

And what can we do to make sure that the maintenance workers are prepared for these type vehicles once they start an operation?

JOHN SAMUELSEN: Yes, thank you for the question. So, workforce development forced by federal intervention, a federal regulatory requirements is of the utmost importance with the advent of these latest waves of technology coming in, and AV technology and electric busses are closely related. And if that is a model going forward of what we could potentially expect, electric busses which seem like such a great idea in terms of greening the environment, greening urban America, have had the unintended consequence of a massive, massive negative impact on workers, particularly bus mechanics.

So we anticipate a 30 to 40 percent reduction in bus mechanics that would be necessary when the bus fleets across America are fully electric, are fully zero emissions. Without the combustion engine, its just a lot less maintenance required. So what we see is a necessity for workforce development, a necessity by the federal government to ensure that our current mechanics on diesel busses are able to make the transition to work on the new fleet, and that systems and the trade union movement are able to work collectively to figure out how the existing workforce, how the negative effects can be mitigated as best available.

So the federal government is extremely valuable in this. They're going to be the guide here, and again a regulatory framework and with workforce development requirements is vital. Thank you.

MIKE BOST: Thank you. My time has expired. Madam Chair, I yield back.

ELEANOR HOLMES NORTON: I recognize next Ms. Johnson of Texas.

EDDIE BERNICE JOHNSON: Thank you very much, Madam Chair, and thank you for holding this hearing. I have a question for Mr. Bloch, but I'll do as part of my statement first. Over the last three years, the Dallas-Fort Worth area has become one of our nation's central testing grounds AV trucking technology, and two companies, Kodiak Robotics and Waymo have opened operation hubs in my district, and another company Aurora, expanded into the Dallas-Fort Worth area and in June 2020 bring in a high-quality, high-tech jobs to many of my constituents.

Indeed, this wave of investment is due in large part to the leadership and close coordination demonstrated by Dallas College, which is at Community College Network, the North Central Texas Council of Governors, and the

Dallas Regional Chamber, the Department of Texas Transportation and Public Safety, and Dallas College has been the leader in creating the workforce development at community college district focused on the future transportation, in part fueled by $1.5 million granted from [inaudible] to development a curriculum for AV and transportation tech jobs through a grant.

However, although AV technology has the potential to provide better societal benefits, serious questions remain. Like many of my colleagues, I'm concerned about the issues related to safety, and want to make sure that a strong federal safety framework is enacted and adhered to in the industry.

Additionally, as we move forward, I believe that the Congress and the industry should incorporate labor priorities and address the workforce needs by including policies aimed at mitigating both job losses and any potential wage decreases. And lastly, I urge the AV industry to invest in the creation of high-quality jobs for those who may face displacement.

Now we have a large traffic injury and this was simply a way to try to keep things moving. I noticed that most people are worried about the jobs and we are too, except that we have such a small number of drivers for the traffic we have. So Mr. Bloch, for highlighting the provisions, I want to thank you for highlighting provision that failed to include an INVEST Act regarding workforce retraining.

As you can imagine, I was more than disappointed that the Senate deleted that language from the final bill. Would you be able to expand on what kinds of programs you would like to see when you mention workforce retraining programs for surface transportation workers whose jobs have been affected by automation.

Now I have the largest Teamsters local in the country in my district, so I'd like you to respond to that, if you will.

DOUG BLOCH: Thank you very much for the question. I'm thinking about legislation we are introducing in the California state legislature in the public transit arena that will make it a subject of collective bargaining when AV technology is introduced in the public transit arena. And I think the important thing is that impacted workers get notice of new technology before it's introduced and have a chance to respond and have a voice.

I gave some examples out of the canneries, where canneries were closed and workers were thrown out there at the mercy of workforce development, and it did not work well for them. So I do think it's important to get ahead of this, and I appreciate the efforts that are happening in your district.

Here, we represent 800 workers at a bus company called GILLIG. They're the highest paid manufacturing workers in the United States. They make busses that Mr. Samuelsens members drive, and we are doing a partnership with GILLIG with funding, workforce development funding from the state of California to train workers to work on zero-emission vehicle busses.

We really do think there are win-win scenarios out here where we can leverage federal and state money to train workers for the jobs of the future. But again, the important thing here is that, at least in California, when employers get money, there are strong labor standards attached to that, prevailing wages, minimum wages, so that we make sure that the workers that we are training actually stick around and get retained in their work.

EDDIE BERNICE JOHNSON: Thank you very much. I'm out of time, and I ask unanimous consent to submit the rest of my questions [inaudible] and the rest of my statement. Thank you, Madam Chair and I yield back.

ELEANOR HOLMES NORTON: So ordered. Mr. Stauber. I recognize Mr. Stauber.

PETE STAUBER: Thank you. Thank you all for being here today, and I think we have all learned a lot about the industry and about this technology already during this hearing. A preface, this was saying that I think that Congress needs to get this right, and I think there's a happy medium between letting tech companies rule our streets and applying over-restrictive government regulations on industry.

My first question has to do with the actual technology used in the AVs. As technology progresses, I have no doubt that we will see more of these vehicles throughout the country, not just in cities or in areas where there are company-specific engineers to make repairs to vehicles. We have already seen with some manufacturers that they are limiting who can actually do work on their vehicles.

I can tell you that I trust my local mechanic a lot more than someone who needs to fly out to my hometown of northern Minnesota from Silicon Valley to do the repairs. And Mr. Garamendi, this should not be offensive to you. I just want to know Mr. Wolf or Beuse, how are companies looking at these types of issues as we move into the future?

NAT BEUSE: Thank you, Congressman for the question. I'll take a shot at it and then I'll pass it over to Ariel to talk about just kind of what we're doing at this stage. So, obviously, we're still in the testing phase in getting kind of really focused on the path to shipping a product. One of the things we're learning in all of that is exactly the questions you're asking about.

So how do we think about maintenance, the schedule of those? What that really looks like. I think a key point to reference here is the fact that the technology that we're developing is really more of a business-to-business relationships. So think about a FedEx or Walmart or an Amazon who has their own fleet of vehicles who is maintaining those fleet of vehicles for the operations that they're conducting versus the point you actually made about, you or I in our personal vehicle needing to get a repair at the local repair shop where we choose to go.

I think again this is where we, and our principles are very supportive of Congress actually doing more on commissioning any studies on jobs and that they really be around the quality of those jobs because they're going to be slightly different than I think what we envision today.

PETE STAUBER: OK, thank you, and Mr. Wolf.

ARIEL WOLF: Thank you, sir. I may just add in response to that question that the autonomous vehicle industry is a diverse industry with respect to use cases and applications. And so in thinking about those important issues you raised, there is of course personal vehicle ownership, there's deployment in a fleet model, there is autonomous trucking and then there's last mile autonomous delivery services. And that all sort of in a sense, it's not one size fits all. There may be different conversations in each of those use cases as those businesses start to continue to scale up and bring benefits to the American society.

PETE STAUBER: And Mr. Wolf, this is a next question. Additionally, I also recognize that increased automation introduces new risk factors for folks that we do not understand yet such as sensor camera or software problems. Because of this diagnosing damage to a vehicle determining liability and completion of police reports will increasingly rely on the data that the vehicle generates before, during and after an accident.

Mr. Wolf, what are the companies you represent, what are they doing to ensure that relevant entities will have access to this critical data and that it is timely, complete and useful?

ARIEL WOLF: Well, thank you for the question, Congressman. In that respect, the autonomous vehicle industry and companies that are developing and operating this technology are engaging in information sharing in a number of ways. I may just spell out a couple here. All of these companies are responding to an NHTSA order with respect to incidents involving autonomous vehicles.

The developers and manufacturers also are participating in a voluntary initiative with the National Highway Traffic Safety Administration to provide information about the location of testing and the parameters of that testing. Members also have released safety self-assessments that examine the safety of the technology and provide information in that respect.

And so I think for those reasons and other reasons, there is a number of ways that these companies are providing data and information, and I look forward to having that conversation going forward in other ways as well.

PETE STAUBER: OK, my last question real quick for Mr. Samuelsen. The human component of our public transit operators are really valuable and great members of our community. For instance in a bus or one of the transit commuters, we've seen examples where there's violence happening. Can you please speak to some of these incidents and how are we going to look at them going forward on AVs or EVs?

JOHN SAMUELSEN: Yeah, so I mean violence is prevalent. Theres a full moon type atmosphere going on right now across a passenger transportation, but it's been a glaring problem in urban transportation, urban transit busses and subways for decades. So actually the uniformed bus operator is the single greatest deterrent to that type of crime, to crime taking place against riders in the systems.

And I think a really big problem with the potential of humanless operation in public transit is the crime that riders would be exposed to absent the uniform presence of a bus operator. I think it's super important to contemplate going forward. I myself was on a P78 bus in Brooklyn many times mugged during high school and saved by the intervention of a uniformed bus operator.

So I hope that answers your question. I think it does.

PETE STAUBER: It does. Thank you very much. Madam Chair, I yield back.

ELEANOR HOLMES NORTON: I recognize next Mr. Garamendi.

JOHN GARAMENDI: Madam Chair, thank you very much. Very good hearing. Mr. Stauber, thank you for your questions. I was going down the same line here. My questions really go to first Ms. Chase. The gathering of information. It seems to me that one of the things that we must do immediately is to make sure that information on all accidents as well as the machine and the technology be readily available.

Could you please respond to that. Is information available? What do we need to do to make sure that it is on reporting on all accidents?

CATHERINE CHASE: Thank you for the question, Congressman. As was recently just mentioned, there's a standing general order by the National Highway Traffic Safety Administration, which requires companies that are producing vehicles of SAE Level 2 and higher to submit information regarding crashes. However, we have not seen that information. So we don't know what's happening on our roadways, and it's very critical that the National Highway Traffic Safety Administration share this so that the public and consumers are informed when they're on the roads, when they're buying new cars, what they can trust.

And I'd just like to comment also on the compliance with the voluntary safety agreements or the AV Test Act, none of these are regulatory or required. They're all voluntary, meaning a company can decide to submit some information, choose what information they want to submit or walk away at any point.

And that's why these minimum performance requirements are so essential. A framework or voluntary agreement is not going to do the trick. We need to know what's happening on our roads and the way to accomplish safety is through regulation.

JOHN GARAMENDI: Very good. That also applies to the insurance industry and that was I'm sure one of the issues was brought to us earlier today. Mr. Samuelsen and Mr. Bloch representing the men and women that are on these trucks and vehicles, how do you envision a regulatory environment or scheme in which your workers would be protected and the transit operators and people that are on those vehicles would also be protected? What do we need to do to create a regulatory environment?

JOHN SAMUELSEN: So if I may, I think the main thing here is to understand that we've seen advanced technology introduced into public transit several times before. In my 30 years here, this is about the third or fourth significant wave of technology coming in, and the technology can be used to enhance service delivery, safety, state of good repair while simultaneously benefiting workers.

And that's what a regulatory framework from the federal government should emphasize, that all of these can work synergistically together to produce a really good outcome for riders in transit systems and workers, where no worker gets left behind and no rider gets endangered. Thank you.

JOHN GARAMENDI: Thank you. Mr. Bloch.

DOUG BLOCH: Yes, thank you, Mr. Garamendi. So we all know our friendly neighborhood UPS driver, and our members, we have 325,000 working for UPS, it's the largest collective bargaining agreement in the country, we drive trucks that have driver assistive technologies like automated braking systems, lane control, telematics, mapping and routing software, algorithms that all make our jobs safer and better.

So like Mr. Samuelsen, we're not afraid of technology and we benefit from it. However, in response to your question, I think it's very important, as others have mentioned, that the federal government set the floor for the regulation of technology and not the ceiling. I'm fortunate enough to live in a state like California where a lot of this technology is being developed, and we have policy makers that are going above and beyond to protect both workers and the general public, and not to stop this technology but to ideally develop it in a way that benefits workers and the public and the industry. Thank you.

JOHN GARAMENDI: Thank you for that. It seems to me that we have a necessity to set at least a couple of standards here, one that information from crashes and the technology be readily available, not only to the government, but also to the insurance industry as well as to the committee so that we can then develop legislation.

Secondly, the training programs that have been discussed here must also be in place. Fortunately and unfortunately this committee wrote a very good bill on surface transportation. Unfortunately, much of the training programs that were in that bill did not find their way into the Infrastructure and Jobs Act. So we have to repurpose and get that back in. With that, I yield back.

ELEANOR HOLMES NORTON: The gentleman yields. I ask next Mr. Burchett for your questions.

TIM BURCHETT: Thank you, Chairlady. Thank you all for being here. I will make a statement first that has absolutely nothing to do with my questions. But I think one of the folks in Labor said something about NAFTA and how they were promised jobs, and how that just turned out to be a joke. I think that might have been Mr. Samuelsen.

And if you think these have AV jobs are going to come to you, I think you probably are mistaken in that, because the only thing we seem to do up here very well is run up debt, and you're either at the table are on the menu, and I think American workers are currently on the menu when a lot of this stuff comes down. So I hope you all are paying very close attention to that.

But my question is for Mr. Beuse regarding the FedEx ground pilots with Aurora. What safety data is Aurora collecting and how will that be used to improve the safety of AVs more broadly?

NAT BEUSE: Congressman, thank you for the question. This is a really great example of something I mentioned in my testimony about our Safety Case Framework. So our Safety Case Framework is a holistic approach to safety where we're not looking at just the product, but also our operations, as well as our organization.

And so in this way, this is how we're addressing safety even before those vehicles are on the road with autonomy. As we get closer to actually releasing the product without vehicle operators, then all of those different principles that we have, and there are five that we need to fulfill within that. So the FedEx pilot is really learning more about the operational aspects of what we're trying to do as opposed to how we are engineering the product.

And certainly there are some things that we're actively looking at, particularly with respect to maintenance that I mentioned before, but really the safety of the product is really handled by our Safety Case Framework.

TIM BURCHETT: Thank you. I was county mayor and I remember hearing some testimony about it, and just I think the educational level on this is lacking out in the communities, because a lot of folks thought that some of this will be controlled community to community, but in reality it's got to be an entire network.

It can't be one county to one county, or one state to one state, because we know those borders are not followed, especially when traveling. But the automotive vehicle legislation, of course, it's been in limbo for at least half a decade. And what do you think is going to be needed in the short and long term to make sure that the automated vehicle technology can be safely deployed?

And also, I wonder, in my mind I hear a lot of folks talking about how AV, is it going to be somebody is going to have the master switch, you're going to be able to turn it off, where if somebody steps or files law or some other reason that they can literally shut that down. I wonder what your thoughts on that are? Mr. Beuse.

NAT BEUSE: Thanks again, Congressman for the question. Yes, I completely agree with your points around a jurisdiction-to-jurisdiction approach. That is certainly not workable for an efficient rollout of the technology, nor is it workable to actually realize that even the potential, like that is a framework that just doesn't work, and it's a framework that we've never used for motor vehicle equipment in the United States.

I think with respect to what's needed, I think it's some of the things that bear mentioning here. So one is NHTSA and DOT have already outlined a number of rulemakings. Some are started, some they planned as part of what Secretary Buttigieg put out late last week.

And we need those to continue and we need those to continue with some urgency. I think one of the themes that I keep hearing in this panel is, we're pitting safety against innovation. And I don't know why we're doing that. We are literally in a crisis of fatalities on our nation's roadway. We really need all of these tools on the table, including autonomous vehicles.

And so all of those rulemakings are helpful, whether they apply to lower levels of automation or whether they apply to what we're doing. I think the second thing we need is really for Congress to show and demonstrate some leadership with all of our stakeholders around developing laws and regulations that are technology and business neutral.

I still hear a lot of commentary that seem very specific to a very particular application, in some cases, even a particular manufacturer, which again is not how we've developed and rolled out technology in the United States. And then the third thing is really with respect to the jobs question. No doubt there are issues that we need to study and understand.

But that doesn't mean we should not take action, right. Again, the status quo is not great. That should not be our goal. Our goal should be, what are all the tools that we need to use in order to see this technology really advance.

TIM BURCHETT: Thank you, Chairlady, that's all my time. Thank you so much, ma'am.

ELEANOR HOLMES NORTON: Thank you. We hear next from Mr. Johnson of Georgia.

HANK JOHNSON: Thank you, Madam Chair for holding this very important hearing, and thank you witnesses for your testimony. The Georgia Institute of Technology released the study in March of 2019 that exposed the algorithmic bias embedded in machine learning and the technology behind self-driving cars.

Researchers found that people with darker skin are more likely to be struck by an autonomous vehicle than a person with fair skin because models are programed by people who do not consider every complexion a person can have. Mr. Beuse, what measures can be taken to root out racial bias at the outset or at the onset of newly developed AV technology?

And what, if anything is holding back industry from taking those steps?

NAT BEUSE: Thank you, Congressman Johnson for that question. Pretty important as we sit here in the beginning of Black History Month as well. I think what I would say is it's not necessarily about the folks writing the software. Part of what we're doing is training autonomy based on what it sees, and so it really is more of the environment that it's in as opposed to someone actually programing something malicious in the code.

There is a lot of talk in the industry about how do we go about making sure that those biases aren't in the algorithms as we get closer to deployment. And I know some researchers have put some studies out there, but I think this is one that's worth maybe a deeper conversation around just how all of this is fitting together and certainly how deeply Aurora thinks about this particular issue.

HANK JOHNSON: Thank you sir. As AVs increase in numbers, they will need to talk to one another and their surroundings. This will result in the need for supportive infrastructure, not to mention cybersecurity and privacy safeguards for the exponential growth in data. Mr. Wolf, what regulatory measures are needed to prevent against cybersecurity attacks and to ensure the privacy of Americans data?

ARIEL WOLF: Congressman Johnson, thank you so much for the question. The autonomous vehicle industry has some of the world's top engineers working to build AVs. And in that context, cybersecurity efforts are part of the engineering and design process from the start at all levels of development. So that's a very good aspect there, not just for the development but for the testing and eventual deployment.

Now, in the 21st century, of course, cybersecurity is critical. Every single day for the AV industry, but it's not confined to the AV industry of course, its for the rest of the automotive industry, and so in that context, not of course not just the automotive industry, but all sectors of the economy writ large.

So we support as an industry, a robust and risk-based policy approach that recognizes that cyber threats are dynamic and constantly evolving, and would be happy to work with this committee and other stakeholders to develop that approach.

HANK JOHNSON: Thank you. How should federal agencies ensure that our wireless infrastructure can handle the data needs that AVs require without causing interference with existing systems such as what we've seen with 5G and aviation industry? Mr. Wolf.

ARIEL WOLF: Thank you, Congressman. Now I want to make sure I answer the question directly. I think there may be two things. One is if it's on the issue of spectrum and the use of connected vehicle technology, of course the industry welcomes investments in that respect. But autonomous vehicles are being developed, tested and deployed so as to not have to rely on connected vehicle technology, but again, of course, welcomes investments in infrastructure that enables those functionalities.

With respect to the data handling and on the federal side, I may have to defer to others in the panel who can better answer it or just respond to you in writing on that. But I'm happy to do so.

HANK JOHNSON: Thank you. The statistic that 94 percent of traffic crashes are caused by human error is widespread, even though it's erroneous. In fact, numerous structural issues play a role in traffic crashes, including the distance between crosswalks and the roadway, the rift, the width of a lane as the speed limit changes, and the presence or absence of bike lanes.

So the idea that self-driving cars are the solution misses the bigger picture. What's more, ***Tesla*** recently developed a self-driving model that includes an ***assertive*** driving feature so that the car will not fully stop at stop signs. Mr. Wolf, what justification is there for developing a program that allows vehicles to violate state and local laws?

ARIEL WOLF: Well, I appreciate the question, Congressman, and the simple answer is, ***Tesla*** is not a member of our association because it's not an autonomous vehicle. It's a driver assistance technology. Autonomous vehicles are developed from the start to comply with all federal and state and local laws as just one component of the safety assurance systems that are put into these technologies.

Other examples is you raise are just, they deal with other technologies, again driver assistance that just don't relate to it. And I would just maybe just say one additional note very quickly on the statistic you noted. Whether or not it's a specific exact number, DOT, the US Department of Transportation just last week reaffirmed in its National Roadway Safety Strategy that the overwhelming majority of serious and fatal crashes involve at least one human behavior issue as a contributing factor.

And that's the key point, and the autonomous vehicle industry fundamentally and first and foremost exists to address that safety failure that is contributing to the crisis on our roadways, and in addition to many other solutions and strategies that are outlined in that paper. And as you noted, Congressman, we are hopeful and look forward to getting this technology widely deployed to solve that problem.

ELEANOR HOLMES NORTON: Thank you very much.

HANK JOHNSON: Thank you.

ELEANOR HOLMES NORTON: And I recognize Mr. Guest for five minutes.

MICHAEL GUEST: Thank you, Madam Chairman. I want to first thank all of our witnesses for educating us on the challenges that lie ahead for automated vehicles. Mr. Beuse, I want to talk to you just a few moments. In your testimony you talk about the importance of safety and trust as being an important key mission. You actually say there in your written testimony on page three, you say, Safety is at the core of everything we do in Aurora. It shapes who we hire, how we work and how we develop our products.

I see later on, on page four you talk about Aurora's Safety Case Framework which was published in August of last year in which you describe as the first AV Safety Case Framework that applies to both autonomous trucks and passenger vehicles.

And then you go on to talk a little bit more in-depth about safety. One of the things that I found was particularly helpful was the fact that you say no single piece of evidence captures the totality of safety, and then you go on to list five safety principles. Those principles that you list in your report were proficient, fail-safe, continuously improving, resilient and trustworthiness.

And so I would ask if you would take a few minutes to expand first on each of these principles, and then to explain how these principles are applied to automated vehicles.

NAT BEUSE: Thank you, Congressman for the question. Yeah, I'm a safety guy. So safety appears a lot when I talk. It means a lot to me. One of the things that I think maybe help to explain how this all fits together is kind of taking a step back and talking about the Aurora Driver as a technology versus Aurora Driver and being inserted, let's say into one of our platform partners like PACCAR or Volvo or Toyota.

So in order to do those partnerships, we have to have deep relationships with those vehicle manufacturers who are very good at building vehicles, and what we're doing is putting together the best of the best. So we're very good at building hardware and software that can do the driving test, and they're very good at building vehicles that are used today and for the foreseeable future.

And so when we think about the safety, it is the safety of that whole package together. And so these five principles are how we engineer and design the Aurora Driver in concert with those vehicle manufacturers. And so let me talk about proficiency for example. So proficiency is really around how we put the right behavioral competencies in the vehicle.

Do we actually understand what those mean? Do we understand the environment that we're operating in? We have test requirements and so on and so forth. When you look at the principal a fail-safe, that's really around is the vehicle safe in the presence of all faults and failures. So Chairman DeFazio mentioned like the camera goes down, right?

That's something that we have to understand and we have to understand how that relates so that the vehicle always ends up in a safe spot or lidar or whatever the case may be. When you think about continuous improving. So this is where we're always learning. I think one of the challenges that we have in the industry right now is the assumption is that you do it once and then it's done forever.

Well, that's not the case with automated vehicles. There's a continuous improving part of it that we're always going to input the lessons learned and put them back into the vehicle. Resilience is where we sort of really focus on things like software and how the vehicle can be misused. These are all things that we have to think through as we design the Aurora Driver to be used in commerce. And the last one is really around trustworthy.

That's really with first and foremost our regulators. That's also with members of the public, and then that's also with our partners, right. We have to build a product that is safe for them to actually be able to trust it and actually use it in their course of business. And so those five principles together, we believe encompass the whole framework of safety that's needed to deploy these vehicles safely.

MICHAEL GUEST: And is this something that can be expanded industrywide, so it's not something just unique to Aurora itself, but these same principles would be something it would be important to anyone who would be in this industry, is that correct?

NAT BEUSE: Yes, Congressman it is. We've been openly sharing our framework. In fact I would note that I was in DC about two weeks ago for the sake of an industry meeting and there were some of our competitors openly talking about the use of safety case and some of the things that they consider.

MICHAEL GUEST: Thank you very much. Madam Chairman, at this time, I yield back.

ELEANOR HOLMES NORTON: Thank you very much, Mr. Guest. I next call on Ms. Brownlee for five minutes.

JULIA BROWNLEY: Thank you, Madam Chair. I really do appreciate you holding this hearing today, and I'm sure this is going to be one of many, many hearings on autonomous vehicles, as certainly as the technology progresses on this. So, I think always safety has to be first. I think everybody agrees on that, and as Mr. Samuelsen noted in his testimony, he said overreliance on automation can be deadly.

And we certainly saw that on this committee with the 737 MAX and the 2009 Red Line Metro Crash in DC. So in my opinion, we are going to continue to need highly skilled drivers for transit vehicles and trucks. So Mr. Samuelsen, speaking further on safety, you also noted in your testimony that there are 9.1 self-driving car accidents per million miles driven versus 4.1 per million miles among regular vehicles.

This is to me a startling statistic. So many proponents of AVs argue that the technology will improve safety, why do you think there is such a disconnect between the real statistics and the rhetoric?

JOHN SAMUELSEN: Well, first of all, I think that the introduction of automated operation into public transit is just so new. It's so absolutely new. It's not even here yet. In reality, there are tests going on into big city public transit systems in America. So the rhetoric is going to accompany just the introduction because it's new and nobody's ever seen it before.

But absolutely, the statistics that are being put forth, we just saw kind of dueling statistics right now with how many accidents that were per 100,000 and whether or not those accidents are based on reality or are based on human error or based on traffic design and that type of thing. So, I don't think I'm answering your question quite well.

JULIA BROWNLEY: Well, I appreciate your attempt at it, and I just think it's an important distinction to make as we move through, as we move forward, we want to move forward based on the science and the facts and not by rhetoric. Ms. Chase, do you have anything to add?

CATHERINE CHASE: I do. Thank you Congresswoman. I think that the lack of minimum performance standards and the confusion right now about what technologies can and can't do, and human overreliance upon some of the

technologies, not to beat up on ***Tesla***, I don't mean to do that at all, but when a company calls a system auto driver, autopilot or ***full self-driving***, it really communicates a message that that's what it's going to do.

And I think that while Aurora and other companies might be, as Nat said, having the best of the, best that's not happening throughout the industry, and that's why the federal government needs to step in, and we need our regulators to do their jobs. With that assurance to the federal government, then we will see all types of crashes reduced.

JULIA BROWNLEY: Thanks for that. And that leads me actually to another question for Mr. Wolf, and this is really more about public education. There seems to be some misunderstanding among the general public regarding the level of autonomy that some vehicles offer. For instance, I'm sure we've all seen the viral videos of people sleeping behind the wheel or sitting in the backseat of vehicles which are not fully autonomous.

And then there have been some high-profile crashes that raised concerns that consumers do not fully understand the necessary level of driver engagement required to operate vehicles that are considered Level 2 vehicles. So my question is, what is the Autonomous Vehicle Association doing to educate consumers about the significant differences between Level 2 and Level 4 or 5 autonomy, and what additional steps do you think are needed in this area?

ARIEL WOLF: Congresswoman, thank you so much for that question, because it speaks to a very important safety issue that's at play today. Autonomous vehicles are distinct and different from driver assist technology, and that conflation, as you outline ma'am, that conflation is having really a twofold impact. One is it's dangerous, because it's leading consumers to believe that lower levels of automation and technology are in fact actual autonomous vehicles and overreliance on that.

And then second, it's having an impact on consumer trust in the autonomous vehicle industry, which is problematic because of the very positive safety benefits that will accrue to society if we get that technology deployed. So it has a twofold impact as well as other things. Now the industry is absolutely committed to trying to brighten this line, delineate this as clearly as possible, and has undertaken some initiatives on consumer education.

There's a number of educational initiatives. I'm trying to work on terminology, standardizing terminology so that consumers can understand that. So in a number of different ways we are laser focused on trying to get this distinction, essentially decoupling this, because what we're concerned about in addition to what I mentioned is in some respects in the conversation, leveraging these high-profile failures of driver assist technology, and having that impugn or disparage the autonomous vehicle industry, which has a very strong safety record going on more than 10 years.

And again, will solve a number of safety problems that are driven by human behavioral issues in the statistics. So I'm happy to follow up with you more on that and explore ways to try and brighten that line.

JULIA BROWNLEY: Well, thank you for that. My time is way over. I yield back, Madam Chair.

ELEANOR HOLMES NORTON: I next call on Mr. Fitzpatrick for five minutes.

BRIAN FITZPATRICK: Thank you, Madam Chair. Thanks to all of our panelists for being here, for your work. We do appreciate your expertise. I want to start with Mr. Samuelsen. Sir, good to see you. I wanted to talk a little bit about AVs. DOT recently issued a new set of innovation principles for transportation. These principles make it clear that innovation investment should be in service of creating high quality jobs.

Do you believe that Congress should adopt this approach to overseeing new technologies like AVs as well? And if so, do you expect this approach to improve the lives of your members in your union?

JOHN SAMUELSEN: So thank you for the question. Absolutely, Congress should follow the lead that the DOT set out. Innovation investment can be an absolute win, win, win across the board in public transit. It could be a win for

the workforce in terms of ensuring that good jobs are protected ,and when good jobs are created, that they're solid union jobs.

It can also enhance service delivery, enhance state of good repair, enhance the overall transit rider experience. So that type of innovation investment is exactly what we're looking at. And with a regulatory framework in place that bears in mind the impact on workers, our members will likely greatly benefit from much of this technology.

BRIAN FITZPATRICK: Appreciate that. Moreover, I wanted to expand on that topic. Since about 2016, DOT has taken steps to having a regulatory framework for AVs. If Congress were to move forward this year with an AV bill, what TWU provisions benefiting your union would you like to see in there?

The AV bill this Congress could tell us what kind of provisions would ensure that labor has a seat at the table?

JOHN SAMUELSEN: So, we would want to see a bill that put an emphasis on rider safety, worker safety, workforce development and an absolute assurance that we don't revisit mistakes of the past that workers are displaced by technology in the same way that they would be displaced by a mass exploitation of jobs.

All of this can be achieved with federal government intervention. That piece of legislation would be incredibly helpful to workers, and I feel without a piece of legislation that accomplishes what I just laid out that workers will be severely negatively impacted going forward.

BRIAN FITZPATRICK: Thank you, Mr. Samuelsen. Next to Mr. Wolf. The FAA has extensive experience with autopilot technologies going back to its founding. More recently, it has dealt with AVs. Some AVs even have ambitions to be more multi-modal and serve as surface and air taxis. So from your industry perspective, has there been adequate cross agency collaboration between NHTSA, FAM, CSA and the FAA?

ARIEL WOLF: Thank you, Congressman for the question. I can't speak to what conversations have taken place between the modes at DOT, whether between NHTSA and FAA and so forth. What I can say is that the autonomous vehicle industry and the engineers and scientists and all of the folks who are working to develop that technology, I know are open to learning from all different analogies and other technologies to make this technology as safe as possible.

I would note that of course there are some key and important differences, 270 million plus vehicles registered in the United States, and our approach does take a human driver approach to how those operate and licensing. And so all of us get behind the wheel. And as I noted a couple of times, just it bears reiterating, that the US Department of Transportation has reaffirmed just last week that it remains the case that the overwhelming majority of serious and fatal crashes involve at least one human behavioral issue as a contributing factor.

So in that respect, becomes very important for the autonomous vehicle industry to scale and deploy so it can work to remove those human behavioral issues that contribute to these tragedies on our roads. And if we can get that technology out and scale it quickly and safely as possible in conjunction with many other safety approaches that may apply in the cross-modal context as you noted, Congressman, then we can start to see a reversal of the terrible trend regarding fatalities and injuries and arrests.

BRIAN FITZPATRICK: Do you believe there should be a new agency whose sole mission it would be to oversee new transportation technologies such as AVs?

ARIEL WOLF: Well, Congressman, I would say that as we look right now as co-panelist Nat Beuse has mentioned, there are a number of regulatory instruments and rulemakings that are underway at both NHTSA, the Federal Motor Carrier Safety Administration that will help address the national framework that we need to get this technology to scale.

So at the moment, we're looking at those rulemakings and advancing them as quickly as possible in conjunction with Congressional action that will also put some of the measures I enumerated in my written testimony, will help the industry scale and build out and bring those benefits to the public.

ELEANOR HOLMES NORTON: Thank you very much.

BRIAN FITZPATRICK: Yield back.

ELEANOR HOLMES NORTON: We'll next hear from Mr. Lowenthal.

ALAN LOWENTHAL: Thank you, Madam Chair, and thank you to all of our witnesses. I think that what we've heard is the tremendous opportunities, the challenges that autonomous vehicle technology that it presents to us. And Mr. Bloch and Mr. Samuelsen, I want to hear from your perspective how these technologies impacted part of our supply chain, which often are overlooked.

And frequently that is really the disenfranchised part of our supply chain. I represent the Port of Long Beach and also the co-chair of the Ports Caucus, and you know drayage truckers face some of the most challenging working conditions in an extremely competitive industry and frequently drayage drivers are misclassified, I believe.

Theyre misclassified as independent contractors, and what that means is frequently it leaves them in a cycle of poverty without the benefits of employment, without the benefits of potential unionization.

And so the question that I have is when we're dealing with those that are the most disadvantaged now, the most impact, how do we facilitate the deployment of AV technologies to take advantage of their potential to improve working conditions for existing drivers such as the driver assistance technologies to improve operator safety and job quality, while also mitigating the risk of job loss or displacement, when we're really talking about those that are already disenfranchised [inaudible] members of trucking workforce. Do you have any thoughts about how this is going to impact those that are the most disenfranchised today?

DOUG BLOCH: Well, Mr. Lowenthal, I appreciate the question and I appreciate all the work that we have been able to do with you during your time as a Representative in California to improve the working conditions for truck drivers at all of our California ports. We did a study with a researcher named Steve Pacelli out of the University of Pennsylvania a few years ago looking at how automation was going to roll out in trucking.

And the scenario that he projected after talking to industry experts was that a lot of the long-haul trucking is poised to take advantage of this technology, from platooning to semi-autonomous to fully-autonomous vehicles. But when you get into urban areas such as Long Beach and LA, it's very hard to imagine drayage trucking or short-haul trucking or even less than truckload trucks fully automated doing that work.

So the scenario we saw was hubs being set up outside urban areas where these transfers could happen. And our concern unchecked is that we could have hubs outside of urban areas all over the United States that operate under the same model that happens at our ports, which you're describing, which is hiring workers as independent contractors instead of employees, making them buy the trucks, making them liable for everything.

And essentially, they're making less than minimum wage after they pay all their expenses, which has led to huge turnover in the workforce, and gets back to my earlier point about the supply chain problems are not really a training and recruitment problem, but a worker retention problem that's tied to actually making sure that drivers make decent wages and benefits so they can stay in their jobs. I hope that answers your question.

ALAN LOWENTHAL: Yes, thank you. Mr. Samuelsen, do you have anything to add. That was a very complete answer.

JOHN SAMUELSEN: Yeah, only that in the - Thank you. Thank you for the opportunity, and only that in your comments leading up to the actual question, you spoke about innovation technology working synergistically with truck drivers. And I think that's the ultimate goal here. That should be everybody's ultimate goal, to utilize technology to make transportation, either passenger transportation or otherwise, as safe as it possibly can be. We all know that automation fails.

We've seen automation fail. There's been testimony and answers to questions about how safe it is. But all we have to do is look back at the 737 MAX incident where in one fell swoop, a computer overrode the decision of a pilot and crashed, killing several hundred people, more than once. And I'm not suggesting that that's imminent, but it's that type of thing that a human operator would stop.

And this type of technology, again working hand in hand with a human operator is an ideal that we should be pursuing. Thank you.

ALAN LOWENTHAL: Thank you and I yield back.

ELEANOR HOLMES NORTON: Thank you, and I recognize Mr. Johnson of South Dakota.

DUSTY JOHNSON: Thank you, Madam Chair, I appreciate it and my conversation will be with Mr. Marler and I like the fact that you called out the fact that although our rural areas only hold 19 percent of our population, its 68 percent of our nation's lane miles, and 45 percent of our fatal crashes. And so coming from a rural state, of course, I care a great deal. And Chair DeFazio asked a really good question earlier to one of the other witnesses about the effectiveness of these automated vehicles really depends a lot, autonomous vehicles rather, depends a lot on the quality of the roads.

And so you mentioned this automated shuttle service that was operating in all different kinds of rural roads, including gravel and unmarked roads. And so maybe tell us a little bit more about that, maybe tell us how you would have answered Chair DeFazios question?

SCOTT MARLER: Well, thank you for that question. Rural roads and the operations of autonomous vehicles on rural roads is certainly on the minds of many of our states, because many of our populations are rural in nature. And as you pointed out, the rural areas have 45 percent of all fatalities on our rural roads. So this absolutely is a concern.

So one of the things that we focus on in Iowa is our physical infrastructure across the board needs to be in good condition, better pavements and bridges, our lane markings, our signage, our shoulders. We know that those good stewardship of our physical infrastructure helps to enable automated vehicles of the future.

But we're also looking at the digital infrastructure, and that's getting at the demonstration project that you mentioned. The University of Iowa actually received a federal grant to look at the operation of rural shuttle busses in rural parts of Iowa. These busses are operating on gravel roads and on unmarked roads, very rural scenarios in the state of Iowa, because we're trying to make sure that we are able to serve all of our populations across the state.

And so one of the things that is very important for this shuttle bus to work is the digital infrastructure, and more specifically the high-definition mapping that's on board. That map is able to digitally paint a center line down a gravel road, and this is very key for the operation of this particular rural shuttle.

Now that's one thing that we're learning, and there are many learnings that we're experiencing, but I would say that there is work yet to do here and we need to ensure that the benefits are going to be widespread. I'll mention one other thing that will tie into this directly is the expansion of broadband across our states and across our nation.

In Iowa, this has been a very important focus for us, and we just in the last 12 months as a matter, we've invested $323 million in broadband grants for the private sector to install more broadband.

DUSTY JOHNSON: So as we work on this demonstration project, as the University of Iowa works on this demonstration project, what appears to be the biggest challenge? I mean logistically, what is going to be the largest hurdle to clear?

SCOTT MARLER: Logistically is standards across the board. Basically this project is helping us understand the data standards that we need, but we're building that through this demonstration project. What are those minimum standards across our nation that we need to look at for data? What are those minimum standards for connectivity?

This is one reason we talk about preserving the 5.9 Gigahertz space. We need to be able to rely on some of the communication technologies as well as those minimum data standards that make the distribution of the technologies ubiquitous and everywhere in our country.

DUSTY JOHNSON: Is the demonstration project - I mean tell me more about if they're analyzing to what extent these things are scalable, right? I mean setting aside the broadband, because I think you're right, the digital infrastructure is critically important, but what about all of the other things? I mean you talk about upgrading the quality of the roads, that's a pretty substantial undertaking as well.

Is a demonstration project very scalable?

SCOTT MARLER: We think it will be, and keep in mind, we're learning a lot with this, but the reason we think it's scalable is because of these lessons that we're learning. We're trying to look at it more from an agnostic point of view with the technology and just saying, what are those basic things that we need in these rural areas.

And that's why I mentioned earlier the broadband perspective is because we know

DUSTY JOHNSON: One more thing quickly. What would come next? Let's say that the demonstration projects a big success, what does phase two look like?

SCOTT MARLER: So phase two is we're trying to understand operationally what we can do as transportation departments to help the situation with rural automation. What can we do from an infrastructure and an investment perspective to set that stage so that it can really, as you say, be scalable and go to the next level? So it's really our operations focus is what comes next as we analyze the data.

DUSTY JOHNSON: Thank you, sir. Thank you, Madam Chair for your indulgence. I yield back.

ELEANOR HOLMES NORTON: Thank you. Next Mr. Garcia for five minutes.

CHUY GARCIA: Thank you, Chairman Norton and Chairman DeFazio for holding this important hearing on automated vehicles. As automation becomes more common across all our transportation modes including public transit, we must proactively ensure that we are placing workers first, and that we are upholding the highest safety standards.

We can do this by including workers in the decision making on how automation is deployed, and making sure that they're giving knowledge to use the new technologies. My questions. To Mr. Samuelsen, in your testimony, you mentioned how AV framework needs to focus foremost on upholding the highest safety standards and on creation of good jobs.

As you mentioned, we can do this by giving workers a seat at the table so that they can help shape innovation. Employers who automate jobs, including transit agencies, usually know that they will eliminate positions years ahead of time. Is this information generally shared with workers in a timely manner? And if not, should the federal government require companies that use automated technology to give workers advance notice on these kinds of procurements?

JOHN SAMUELSEN: Yeah, absolutely and thank you for the question. Certainly there is very little notice given in general to workers or representatives of workers, workers unions, very little notice, and it would be common for a worker or the union to find out that there's going to be technology displacing human jobs when a pink slip arrives. That would not be uncommon at all.

CHUY GARCIA: And how best can we bring workers to the table when it comes to deploying innovation? Is it fair to say that making sure workers learn about these kinds of events far enough in advance to find other employment or to retrain in the use of new technology is the first step?

JOHN SAMUELSEN: Yeah, absolutely. In cities in America where workers have the power to compel that to happen, it's happened, but the overwhelming majority of transit cities across the country, that does not exist. So the federal government stepping up and compelling transit employees or municipalities and state governments to give as much advance notice as possible as a requirement would be ultra helpful.

And in fact, it would enhance labor peace in the long run. I would give the unions and the employees a chance to work together to identify jobs that workers who are potentially facing displacement could land in and that's what this should all be about.

CHUY GARCIA: Thank you. Mr. Bloch, from a Teamsters perspective, how can you bring workers to the table when it comes to innovation so that we're putting workers first?

DOUG BLOCH: I appreciate the question, and would echo the comments of Mr. Samuelsen. When new technology comes to the workplace and workers have the ability to join together in unions, then they can sit across the table from their employer and bargain about it. As I mentioned, we're introducing legislation in California to make the introduction of autonomous vehicles in the public transit sphere, where we also represent a lot of drivers, a mandatory subject of collective bargaining.

We are going into bargaining with United Parcel Service this year, as I mentioned, the largest collective bargaining agreement in the country. And you better believe we're going to be bargaining around technology. Our experience has been that new technology can help make our job safer and make us more productive.

But as you've said, sir, to have those discussions on the front end allows us to be proactive and adapt. And for workers that don't have unions, they just have to take whatever they get from the boss and that's not the sort of protections the workers need.

CHUY GARCIA: Thank you, sir. Council member Castex-Tatum. In your testimony, you discuss how the manual on uniform traffic control devices needs to be modernized. Is the Infrastructure Investment and Jobs Act that Congress directed the US Department of Transportation to revise MUTCD, including by making sure vulnerable users like pedestrians and cyclists are protected and by incorporating AVs into the MUTCD for the first time.

From the National League of Cities perspective, what reforms need to be made to the MUTCD to modernize it?

MARTHA CASTEX-TATUM: National League of Cities n definitely supports the modernization of the manual. We think that better protection for road users equally is extremely important. The main thing we want to point out is we want to make sure that this does not become an unfunded mandate on cities. Local governments own many of the roads in our cities and maintain those roads.

So starting the manual, we just want to make sure that it does not become an unfunded mandate with those changes.

CHUY GARCIA: Thank you, and thank you for your indulgence, Madam Chair. I yield back.

ELEANOR HOLMES NORTON: The gentleman yields back, and I recognize Mr. Nehls now for five minutes.

TROY NEHLS: Thank you, Chairwoman Holmes Norton and Ranking Member Davis for having this hearing. I do have some concerns about how we integrate AVs safely onto roads and into the economy. Trucking is a critical industry and disruptive technology like AVs promises great increases in efficiency and safety, but it threatens jobs in our already strained truck driving market.

While I appreciate talking about how technology could disrupt the trucking market in 20 to 30 years, I want to talk about what is forcing truckers out of the profession today, now, and that's the vaccine mandate. While the Supreme Court thankfully struck down the unconstitutional vaccine mandate imposed by President Biden, both the Canadian and US governments are imposing vaccine mandates on truckers just to be able to cross the border.

We are releasing potentially COVID infected aliens from federal custody into our country on the southern border, but on the northern border, we are not allowing truckers to cross, simply because they don't have the vaccine.

Interesting, for the first two years of the pandemic, it was considered safe, but now that the main variant causes less serious infections, the truckers must be vaccinated. Doesnt make a whole lot of sense. This also threatens to disrupt trade with one of our most important partners, Canada in the middle of an artificially created supply chain crisis.

In Canada, we have seen a massive protest against these senseless mandates, a convoy of trucks 45 miles long made it all the way to Ottawa to protest and a similar protest is being planned in the US. So I have a question for Mr. Bloch. Its one question. In your written testimony, you talk about the difficulties truckers face in the occupation, including supply chain inefficiencies that cause drivers to wait in line for hours.

The freight division and the car haul division of the Teamsters represents thousands of hardworking drivers across the US and Canada. Do you know how many of your members either resigned or lost their jobs due to earlier vaccine mandates? And is the union concerned about the new cross-border mandates impact on your members livelihood?

DOUG BLOCH: Well, thank you for the question, sir. On the federal policy and the cross border, I will have to ask our federal policy experts to respond to your question, which I'm happy to do. The California experience on the inefficiencies, I think everybody on this panel today who has worked for somebody or supervised anybody during your career, can appreciate the efficiencies you have with an employee where you can direct that person to go somewhere and do something versus this model that Mr. Lowenthal talked about of hiring truck drivers as independent contractors.

TROY NEHLS: OK, got it. So you represent 100,000 truck drivers from California, Nevada, and you're telling me you can't answer the question is how many of those truck drivers have been affected, how many have lost their jobs as a result of the vaccine mandate? You can't answer that?

DOUG BLOCH: I can tell you that we have not heard complaints here in California. We've heard complaints, but we have not seen resignations because of vaccine mandates here in California.

TROY NEHLS: Very well, not surprising.

DOUG BLOCH: And sir, we did not take a position on the mandatory vaccinations as well.

TROY NEHLS: Im just saying with all the issues we are facing across this country, and right now what you're seeing in Canada and now coming to the US with vaccine mandates on our truckers, I'm surprised at you who represent the Teamsters, you could have an answer to my question, but again it doesn't surprise me.

ELEANOR HOLMES NORTON: The gentleman yields back. Since a vote has been called on the House floor, the subcommittee will stand in recess subject to the call of the chair. We will restart the hearing as soon as the last vote is over. That's approximately 30 minutes.

It could be longer, and we do have a number of members who haven't had the opportunity to ask their questions. We will reconvene after a recess for votes that are now being taken.

I want to call the subcommittee to order and resume the hearing. While members are returning and we certainly have one member here already. Mr. Auchincloss, you are recognized for five minutes.

JAKE AUCHINCLOSS: Thank you, Madam Chair, and I appreciate the patience of our witnesses as we take a break to vote. I want to start by emphasizing points that have been made in different threads by both my colleagues and by some of our witnesses, which is who needs to be at the table as we roll out autonomous vehicle technology.

With long-haul trucking in particular, as Mr. Bloch, I think you emphasize really quite articulately, the Teamsters need to be at the table, whether it's the hub model, whether it's a different model that ends up being the organizing architecture for an AV long-haul trucking system, unions and in particular, the Teamsters need to be at the table to make sure that we are sustaining, reinforcing and cultivating good union jobs as we roll out this technology.

And then insofar as AVs have a place in our cities and maybe they do, maybe they don't, I think we're going to explore that over the next decade. And cities, mayors and governors really need to be the ones driving that ship because they know what's best for their constituents. But insofar as we are rolling out AV technology in our cities, I would encourage us all to organize them around the premise of walkability.

What makes cities thriving places, what promotes public health, good environmental quality would help small businesses. What makes cities more livable for citizens of all abilities and ages is walkability, the infrastructure and the ambiance that promotes walking and cycling, and we do not want an autonomous vehicle future to in any way undermine that.

And it may not. It actually may promote it. And I think one way it could do that has been pointed out by one of our witnesses, is by reducing the need for parking, which has really been a plague of American urban land use for the last 70 years. If we can drastically reduce the amount of parking that's required because of an autonomous vehicle fleet, shared rideshare fleet, that would be a good thing.

And that should be used as an opportunity for cities to promote walkability and how they spend their infrastructure dollars and how they repurpose public land. One institution that really has not been brought up to date in this hearing as being an important stakeholder is the property and casualty insurance industry.

And I would encourage my colleagues and I, as well as our witnesses from their varied perspectives, to bring in the P & C industry in these conversations. The property and casualty insurance industry has a huge stake in making sure that we do this well. They're on the hook for a lot of the safety considerations financially.

They've got tremendous data, sometimes over the course of 100 years and at population scale about what kind of behaviors make for safe driving, what kinds of infrastructure and semiotics make for safe driving, and they really need to be part of this conversation. So I would open it up to any of the witnesses to weigh in here about how they have worked with the P & C industry or how they propose that we should work with the P & C industry to ensure a safe rollout of AV technology.

CATHERINE CHASE: Congressman, if I could respond to your question.

JAKE AUCHINCLOSS: Sure.

CATHERINE CHASE: By no stretch of the imagination do I speak for the P & C industry. But I wanted to share that our board of directors is comprised half of members of the P & C industry and half of other leading public health, law enforcement, consumer and safety advocates and individuals.

So there are some wonderful companies that belong to Advocates for Highway and Auto Safety who are deeply devoted to making sure that autonomous vehicles, both cars and trucks, are developed and deployed in as safe way as possible. I also just wanted to comment on your remark about making sure that cities are walkable and bikeable.

We share that as well. And one of the positions that we have been advocating for are to make vehicles more absorbing if there is a conflict or a crash with a car or a truck, especially delivery trucks, which are more ubiquitous in some of our neighborhoods and bicyclists.

And my last point on that is again, the urge for automatic emergency braking, to require that a standard equipment in cars and not as an add-on in a luxury package or only in a high-end vehicle, which not everyone can afford, because then it's an equity issue. Every family should be afforded the safest braking systems and that will be to tremendous value of all road users, especially vulnerable road users. Thank you.

JAKE AUCHINCLOSS: Thank you, Ms. Chase.

NAT BEUSE: Congressman I can add on from an industry perspective if that would be helpful?

JAKE AUCHINCLOSS: Yes, very briefly, please. I'm over time.

NAT BEUSE: Sure, so one of the things we've done I've seen is very, very important, and here in Pennsylvania, we are on a committee along with several other local firms that work on self-driving along with insurance companies. So absolutely they need to be at the table.

JAKE AUCHINCLOSS: Madam Chair, I yield back my time.

ELEANOR HOLMES NORTON: The gentleman yields back. Mr. Van Duyne.

BETH VAN DUYNE: I've been called worse. Ms. Van Duyne.

ELEANOR HOLMES NORTON: I'm sorry, Ms. Van Duyne. Please forgive me.

BETH VAN DUYNE: No, you're fine. You're fine. Thank you very much, Madam Chairwoman. Only a slim framework currently exists when it comes to automated vehicles across this country. Many states such as Texas have been leading the charge to provide safe testing while also giving companies the flexibility to run productive tests.

As we continue to recover from the pandemic, employers struggle to find enough workers, experience slowed economic recovery and are faced with national supply chain disruptions. A regulatory framework favoring AV deployment in the US is critical for workforce opportunity and domestic growth. The US is home to a dynamic AV industry that provides job opportunities for Americans across the country.

A regulatory framework favorable to deployment in the US will ensure continued growth of this industry by having increased career opportunities and more seamless supply chains. A 2021 US Department of Transportation found that Level 4 and Level 5 automation in the long-haul trucking industry would raise annual earnings for all US workers by between $203 and $267 per worker per year.

The study additionally found that trucking automation would increase total US employment by 26,000 to 35,000 per year on average over 30 years. So Mr. Bloch and Mr. Samuelsen, the trucking industry currently needs approximately 80,000 drivers. I have heard this for businesses across the country specifically within Texas.

This need is expected to double by 2030. And yet in your testimony, you stoke fear of massive job loss and layoffs. And I got to be honest with you, you are literally the only folks that I've heard that from in the country. And I'd be curious on what solutions do you propose to close these gaps, and if you do look toward the future and innovate through advancements in new technology?

DOUG BLOCH: Well, thank you for the question, and actually, we are not out running around screaming about a robot apocalypse coming to take jobs in the trucking industry. I don't see it. I actually agree with you. Oh, OK. Well, thank you. I don't go for hyperbole. And quite honestly, we do believe that in some segments of the supply chain, we may see a net job increase.

I think that our concerns are more around the quality of jobs. We are doing a big push around our apprenticeship program here in California to train workers to take these jobs. The big concern is how long people stay in those jobs after we train them, and we don't want to invest a lot in California or anywhere in the country, including Texas, in training workers if it's just going to be a revolving door.

And so that's why I try to tailor our comments to the quality of jobs that we're creating. And I appreciate you raising those issues in your question as well.

BETH VAN DUYNE: Thank you. Does anyone else have a comment on how to bridge the gap with a need in the current glut that we've got if not for technology? OK I'll go on to my next question. North Texas is home to a growing AV industry and has more aviation jobs than anywhere in the country. Autopilot requires extensive programming, and this creates new jobs to develop, maintain and update the system while increasing the efficacy and result in wages pilots in the aviation industry.

So why would autonomous motor vehicle technology not do the same thing for road transportation? And would your members not benefit from safety and productivity and wage improvements? Would your organization welcome the opportunity to represent the new folks who program and maintain these systems?

JOHN SAMUELSEN: If I may, and thank you for the question. I had no comment because we're simply not in the trucking industry. We are in the airlines and public transit and railroads, no trucking. So the question was posed as if somehow that were opposed to the implementation of technology or the development of technology and the way that that can create jobs.

It's simply not the case. So we're in favor of technology. We've embraced now waves of new technology and the jobs that that brings into public transit. We just want that technology harnessed in a way that creates and sustains jobs, doesn't have an unnecessary impact on workers and doesn't jeopardize worker safety or rider safety.

So the comments that I've made all day, I think sort of connect with the question you're asking, which is that type of innovation is good and we embrace it. We just want good jobs. We don't want workers inadvertently displaced where if it was another route was taken in implementing all of this, they would be fine.

So we're good with innovation. We just want good union jobs across America and we want safe jobs. So we do have a disagreement with the use of AV in public transit to replace bus operators. We believe it's dangerous. We believe automation should be under the control of a human operator at all times. And so thank you.

BETH VAN DUYNE: Alright. Thank you. Mr. Bloch, did you have anything to add?

DOUG BLOCH: I would say very quickly because you're out of time, yes, and if there are employers who are tuning into this hearing who think there are jobs out there, please call us, please, please contact, yes.

ELEANOR HOLMES NORTON: The gentlelady's time has expired. Ms. Bordeaux, you're recognized for five minutes.

CAROLYN BOURDEAUX: Thank you, Chairwoman Norton, and thank you for holding today's hearing. It's clear from the testimony that we are going to see automated vehicle technology increasingly woven into our transportation systems, and it is now our job to ensure that we at all levels of government create safe, equitable and well-researched AV policies that really maximize the benefits of this technology while also protecting against the risks.

My district is home to Curiosity Lab at Peachtree Corners, which is a one-of-a-kind living lab, and it's designed to provide a real-world test environment to advanced next generation intelligent mobility and smart city technology. During a conversation with the head of Curiosity Lab in November, he mentioned that vehicles are taking over smartphones as the most connected devices in the world.

A key element of safety, of course, is ensuring that these highly connected, technologically reliant vehicles will not be hacked or remotely controlled. And one of the things that they are testing there is cybersecurity. So just wanted to talk about that a little bit, and starting with Ms. Chase, in your testimony, you list cybersecurity standards as one of the tenets of autonomous vehicle legislation.

Could you fill us in and talk a little bit about the current cybersecurity requirements for autonomous vehicles, and are there additional standards or things we need to be thinking about to ensure their safety?

CATHERINE CHASE: Thank you, Congressman. I greatly appreciate the question, and you are completely correct that addressing cybersecurity and having a minimum standard is in our AV tenets.

I'm not going to claim to be a cyber expert by any stretch of the imagination. So I can't get granular into the details of that, other than to say we have deep concerns, because we have already seen hacking and weaponizing some vehicles that have advanced technologies in them to the detriment of pedestrians and road users.

So it's a concern of ours, and the AV tenets was really a collaborative process, as I mentioned earlier, with approximately 60 stakeholders representing a myriad of organizations. And we listened to everyone and we created this living document, if we will, that we hope that the committee and the subcommittee will use as a foundation for future legislation.

CAROLYN BOURDEAUX: Thank you. Mr. Wolf, do you have any thoughts on this? I know you talked about a similar issue earlier.

ARIEL WOLF: Absolutely, Congresswoman, thank you so much for the question. Cybersecurity is a challenge, which is one that's not limited to the AV industry of course, but for the automotive sector, and of course the economy writ large and all sectors. And so the AV developers, manufacturers, they build in cybersecurity by design up front.

And it's something of paramount importance at the outset. As we look ahead to ways in which the AV industry and the auto sector writ large can address cybersecurity vulnerabilities, we look at a robust risk-based approach as the best way to address that and happy to work with stakeholders on that process going forward.

CAROLYN BOURDEAUX: Thank you very much. Just sort of building on that and back to you Mr. Wolf, are there things that we should be doing in Congress to talk more about cybersecurity protections or build out standards? Should we be focused on software requirements, the workforce, physical infrastructure? What are the kind of things we should be thinking about as we move forward with trying to find ways to support the deployment of these technologies?

ARIEL WOLF: Appreciate the question, and I think ultimately be happy to respond to you in writing with some of the more specifics here. You know, risk-based approach is intended on looking for what are those risks and vulnerabilities, and how can there be a framework that is able to adapt over time rather than enact specific provisions and have a static kind of check the box exercise.

So that's the exercise that's important for this kind of policy. And I know that again, across different sectors, I believe with the National Institute for Standards and Technology has a framework for cybersecurity, and a number of other measures can be adapted and applied in this context. And again, very happy to follow up and writing on that.

CAROLYN BOURDEAUX: OK, thank you very much. I yield back.

ELEANOR HOLMES NORTON: Gentlelady yields back. Representative Gimenez. Mr. Gimenez. Mr. LaMalfa. Representative LaMalfa.

DOUG LAMALFA: Thank you, Madam. Chair. Yes, I'm here mostly. Thank you for convening today's hearing, and I had a few thoughts on what's going on here in rural California and the effects of legislation on people that were providing Lyft and Uber services, then tying that back in to what AV vehicles might be able to provide in our rural area. Excuse my illness here today.

Im at home, and so taking it easy here. My rural district in Northern California, Lyft was performing about 2,500 rides late at night, which might entail people that have had too much to drink or other purposes, but certainly drunk driving and drowsy driving is something we want to avoid. But in the state of California, of course, a bill called AB5 and it's been the PRO Act in DC has been modeled after that.

So the result was that they were trying to classify Lyft and Uber drivers as employees of companies when actually they really do have in their own way autonomy to set their own hours and their own workplace, etc. So the voters of California overturned that portion of AB5 via an initiative process to a referendum to say that had gone even too far over the line.

And so what we're looking at is that can - And so rural areas are especially affected by less choices with those types of Uber and Lyft operators. It's just, as you can surmise, there's just going to be less people operating at the hours as versus when you're in Washington, DC, etc.

So it's harder to compete for rural folks like that. And so if they find that they still can't compete because of the effects of AB5 or PRO Act coming through, then Mr. Beuse and Mr. Wolf, what can autonomous vehicles provide do you think in rural settings like we're talking about here, very rural, many miles between towns, etc.

NAT BEUSE: Yes, Congressman, thank you for the question. I think you point out at the macro level sort of an issue with regulations that sometime kind of go the wrong way. You know, specific to AVs, for example, when you look at the use case of where I live for example, I wouldn't consider myself necessarily rural, but it can take let's say half hour to get an Uber or Lyft out there.

And you can think one of the use cases for AVs is to kind of load balance that, where that part of the population that doesn't get the magic of the service as Dar would say, are better served by something like an autonomous vehicle operating on the network. I think the issue is larger though, right?

The issue right now we have is that in some states, it's particularly just not clear. So for example, in California, there currently is just a flat-out prohibition on the testing and deployment of autonomous trucks. And so until that gets fixed, we can't even start to address some of the issues that you're talking about with respect to trucking.

But one of the things we have to do is work closely with not just other industry partners, but also the government partners to kind of really encourage a more future-looking view, and not trying to lock down things for what we know today. I mean, having regulated at the federal level for a while, rulemakings are challenging.

And this is exactly, I think the point I was raising earlier around we really need a more flexible approach here, and for DOT to continue the rulemakings [inaudible].

DOUG LAMALFA: Let's bear down a little more on the rural aspect. I mean we're talking long stretches of two-lane road, highway, even turning down a dirt road perhaps for certain whether talking deliveries or an Uber or Lyft situation via an autonomous vehicle. How do you see it applying that well to areas just have less infrastructure of markers or yield signs or whatever you would use as an autonomous vehicle to tie into that?

NAT BEUSE: Yes, exactly. Those are challenges that we have to solve within the operational design domain or the area that we're going to go into. I'd point out, part of our mission at Aurora is to deliver this technology not just safely and not just quickly, but broadly. We believe there's a huge, huge impact far beyond our imaginations on what this technology could deliver.

And certainly, I think rural America is part of that. I mean, I grew up in a very rural part of town. We had one stoplight, so I can relate.

DOUG LAMALFA: Yeah, OK. Well, the time has flown by. I thank you. I yield back, Madam Chairman.

ELEANOR HOLMES NORTON: The gentleman yields back. Ms. Strickland, you're recognized for five minutes.

MARILYN STRICKLAND: Thank you, Chairwoman Norton and Ranking Member Davis. As we consider the direction of this emerging technology, I know my constituents back home in the Washington 10th Congressional District want to see transportation developments that can improve their daily lives, and also have a focus on equity. But they also want to know that they'll be safe and secure on our nation's roadways.

As we've heard today, there is evidence that AVs have the potential to reduce roadway deaths and injuries, and with 2021 being the deadliest year for motorists in Washington state in 15 years, Im glad the subcommittee is exploring this possibility. So I have two questions. One for Mr. Wolf in the industry and this is more of a conversation about messaging.

Could you very briefly talk to our constituents and people who may be hesitant or not quite certain or nervous about AV deployments happening across the country, and what would you tell them after this discussion today? What should be the big takeaway for people outside of our bubble?

ARIEL WOLF: Thank you so much, Congresswoman, for that question. The simple and straightforward answer is that the data is clear. Autonomous vehicles are not only safe, but they're making our roads safer. There is a crisis on our roadways has been discussed a number of times in this hearing and it cannot be stated enough.

And the number of crashes and fatalities and severe injuries continues to go up at an alarming rate. And the overwhelming majority of those, there is a contribution of human behavioral issue, whether it's distracted driving, drunk driving, those are the numbers, and it's a big problem.

So autonomous vehicles, the industry that we represent and the members of our association are designing technology that will address that specific issue. And it will have a dramatic impact on safety, in conjunction with many other solutions that were put forward by Secretary Buttigieg and the National Roadway Safety Strategy.

So first and foremost, this is about improving safety, not just of other drivers on the road, but vulnerable road users as well, bicyclists and pedestrians across the whole gamut. So that's the key thing, and I would just very quickly enumerate the other benefits with respect to equity, the ability to enhance and expand mobility for individuals with disabilities.

And with respect to economic growth, there are tremendous benefits that accrue to society as a result of the deployment of AVs. And what we're looking to do is build out a national framework to scale that deployment in a way that brings those benefits to the greatest number of people as possible.

MARILYN STRICKLAND: Great, well, thank you very much. I'd now like to turn to vice mayor pro tem Castex-Tatum, and welcome ma'am. It's nice to see you here, and I'm a former mayor myself, so I really appreciate that you're here today. And I would like to ask you, on a local level, what specific infrastructure investments have been needed in your city in Houston or any dedicated lanes as you tried to prepare for this deployment?

That's the first part. And then the second part, tell me how you've done this through the lens of equity as a leader.

MARTHA CASTEX-TATUM: Thank you for that question. I can speak from the pilots that we've had here in Houston. With the pilot that we had at Texas Southern University in conjunction with Metro, we had a shuttle that was riding on the campus of Texas Southern University, and that was phase one.

We're working in phases. Phase two, we are looking at going off-road between two universities. So as we work through each of the phases, we are hoping to gather more data so that we can make sure the infrastructure works alongside of the autonomous vehicles. With our work with Nuro which is delivering for businesses, we've seen transportation become less of a barrier for some of our lower economic communities.

Specifically during our time with COVID, Nuro was able to deliver senior boxes to apartment complexes and one of our poor areas in the city of Houston, one of our complete community areas, one of the areas where residents need assistance with getting groceries.

So we see the opportunity for these autonomous vehicles to really help the quality of life for some of our residents who can't drive to the store because they don't have a car, or some of our differently abled constituents to get their prescriptions delivered. So we see this as a new and innovative way for us to meet the needs of our residents and really improve their quality of life in cities.

MARILYN STRICKLAND: Great, thank you, Madam Vice Mayor. Madam Chair, I yield back.

ELEANOR HOLMES NORTON: The gentlelady yields back. Ms. Napolitano, you are recognized for five minutes.

GRACE NAPOLITANO: Thank you, Chairman Norton. My statement would be that it's going to create quite a bit of confusion people seeing driverless cars and trucks. So we've got to be sure that, because that's going to be a tremendous traffic safety hazard. But I have a question for Mr. Bloch. I agree with your testimony regarding concerns over the misclassification of truck drivers.

And I have met with some of the drivers in Southern California that work 14-plus hour days, make below me minimum wage with no benefits because of forced independent contractor status. The state of California has been trying to crack down on these companies, but the government needs to step in and do more.

I ask for a provision in bipartisan Infrastructure Bill that creates a federal task force to study the problem and create policies to address this problem. Secretary Buttigieg recently announced a plan to formulate a task force. What are your thoughts on what the federal government can do to address this problem?

DOUG BLOCH: Thank you very much, and this has been a problem the Teamsters union have been combating for the last 40 years, plus years since deregulation of trucking, and prior to that, 90 percent of the truck drivers in the United States made good wages working under a Teamster contract, and I wish that was still true today.

I can speak to the California experience that Mr. LaMalfa mentioned, which came out of a court ruling against a package delivery company using independent contractors that competes with UPS, one of the largest private-sector employers in his district. A UPS driver makes $100,000 a year in California on average, has fully paid family health insurance and a pension.

And it doesn't matter if you have a criminal background or just a high school education, you can get that job. The California law that passed and the portions of the PRO Act that deal with misclassification came out of a court case involving a company that was competing with UPS and undercutting those good wages.

And that is the issue that's happening within the trucking and transportation industry in the United States.

GRACE NAPOLITANO: What can the federal government do to make it better, to address it?

DOUG BLOCH: So having a task force to look at misclassification is very important. The new ABC test, the provisions in the PRO Act that Mr. LaMalfa mentioned, is a test in many states in the United States and it's the most stringent test to address the reclassification of workers.

GRACE NAPOLITANO: Thank you very much. Mr. Samuelsen, I want to thank the Transport Workers Union for working with me on a provision in the bipartisan Infrastructure Bill to improve transit safety program with bus driver protection and blind spot removal requirements. How can technology help drivers with blind spot issues and general safety issues?

JOHN SAMUELSEN: Well, thank you for the question. In terms of blind spots on busses, it is a fact that busses in the United States across every transportation district, every transit provider, bus operators are ordered to go through pedestrian right of way areas to maintain schedule on busses with blind spots.

And that is a bit of a disaster waiting to happen, and it's an example of where technology has such an extremely positive place in terms of collision avoidance and that type of thing in order to protect pedestrians, protect riders and protect the operator. And so technology does have its place.

And I'm sorry, you asked a second question, I forget what that one was.

GRACE NAPOLITANO: How can technology help drivers with blind spot, because if they implement it in AVs, then it solves a problem that might work. I don't know what technology can do to avoid having a blind spot to help prevent accidents.

JOHN SAMUELSEN: Oh, absolutely. The technology, our position essentially across the entire spectrum of this conversation is that the technology should be utilized to increase safety, to increase service reliability, increase state of good repair where that's applicable, and all synergistically working with a bus operator.

We believe that that's the safest outcome, a bus operator being in control of the automation, a bus operator that can pull a switch and end a dangerous situation if one is arising, but yet utilizing the technology to improve safety and improve service delivery.

GRACE NAPOLITANO: Thank you, sir. The AV issues are enormous, so we have to be very careful. Thank you, Madam Chair.

ELEANOR HOLMES NORTON: I thank the gentlelady for her question. Mr. Carbajal. You're recognized for five minutes.

SALUD CARBAJAL: Thank you, Madam Chair, and thank you to all the witnesses that are here today. Thank you for your time and your testimonies. From passengers to commercial vehicles, there is no doubt that autonomous vehicles will become integrated into our transportation system in the coming years.

Congress must begin preparing now to legislate in a way that optimizes economic benefits, prioritizes safety and avoids job displacement. I am interested in learning how Congress can support the growth and deployment of AVs, but also what we should be considering when it comes to safety regulations and ensuring transportation workers have a place in this workforce.

Mr. Samuelsen, you note that the Department of Transportation DOT innovation principles will put job creation and workers at the center of the innovation development process. Elements of these principles include forging partnerships with the private sector while protecting interests of the public workers and communities.

How can Congress promote partnerships with the private sector and local communities in ways that facilitate support for workers by expanding access to skills? And how can these partnerships wrap around ongoing deployments and pilots to develop and build training models?

JOHN SAMUELSEN: Right, so thank you for the question. The federal government plays a vital role from workforce development and across a whole wide array of other necessities as we go into the future of public transit. Now, as the federal government doles out money to transit providers, the federal government needs to ensure that those transit providers are doing everything that you said, both in terms of investing in workforce development, so that workers aren't left behind.

And also involving communities that workers live in and the decisions on what public transit will look like going forward. And you've said, I believe you said a couple of times about the deployment of automated vehicles in public transit, and again, we would be adamantly opposed to that. And it's not just about the degradation of jobs, which is bound to come despite what some people might put forth about how this is going to be a job creator.

When you talk about automated vehicles, automatically what that's going to lead to is the degradation or the diminishment of bus operator jobs. And we're opposed to that on a whole bunch of levels. And the main one is that service delivery and public transit delivery is about more than the amount of busses that you put out.

It's about service quality and service reliability, and we believe that innovation technology is best utilized, as I said before, in conjunction with a human operator, technology used to augment the safe operation of busses, augment service reliability, augment scheduling in a positive way to ensure that service delivery is at the highest level it can be for our riders. Thank you.

SALUD CARBAJAL: Thank you. Vice Mayor Castex-Tatum, it is exciting to hear about the successes of pilot programs in Houston. How could Houston work with the industry to implement these programs safely and equitably?

MARTHA CASTEX-TATUM: Well, I will tell you that Nuro came to us with their pilot and their bots, and we met with them. We had an opportunity to also introduce their product to the community. We introduced them to the law enforcement officers in our community so that once they started to see these bots on the roads, if there were any problems or concerns, they would know how to interact and who to contact.

So you know, I said all the time government can't do this work alone. So these public-private partnerships are extremely important for us to make sure we are meeting the needs of our constituents and really doing our best to try to make their quality of life better. So we're excited about the opportunity to bring services directly to people's homes, and also to provide shared services to help get one person out of one car.

And we think that the autonomous busses will allow us to get some cars off the road and move more people at the same time so that we won't all be sitting in traffic all the time.

SALUD CARBAJAL: Should other cities wish to implement similar programs, what lessons can they learn from Houston?

MARTHA CASTEX-TATUM: I think it's important that they start piloting with companies like Nuro and transit authorities like Metro. We learn as we pilot and gather data. That's why as the National League of Cities, we are asking for federal partnerships for more testing in more places, so that we can provide more data and get more AVs to have some regulated safety standards. So my suggestion would be, keep piloting.

SALUD CARBAJAL: Thank you. I'm out of time. I yield back.

ELEANOR HOLMES NORTON: Thank you very much. Next we have Mr. Moulton for five minutes. I recognize you, Mr. Moulton.

SETH MOULTON: Thank you, Madam Chairman, and thank you to all the witnesses for sticking this out. I know this is a long time, but we're grateful for your wisdom on this incredibly important issue. Professor Larco, if I may start with you. Emotional, which is an AV company headquartered in Boston, has partnered with Hyundai to develop AV fleets, but without a federal regulatory and legal framework for AVs, testing their technology looks different in Massachusetts than it does in Nevada, or at least that's how I understand it.

So states essentially are being burdened with the absence of clear federal guidance. Beyond the burden to individual states and communities like Nevada and Massachusetts, what does this cost with regard to our national priorities to not have these federal standards?

NICO LARCO: Thank you very much for the question. I think you're absolutely right that a lot of the deployment of AVs are actually, it's a local issue, right? And a lot of the things that I talked about before, some of these ramifications, cascading impacts are really going to be affecting different communities differently.

And there needs to be some control at the local level to be able to respond to these things. The conversation that we've had so far, it's fantastic to hear the issues around safety and labor, but I guess one of the main points is that that is not the only questions that are important for AV deployment, and we really need to be working at the local level to be able to answer some of these things.

To answer your question about the role of the federal government, I would say what's really important is that the federal government actually does many of the things that we've been talking about here, help support pilots and help support research into these topics, and support cities. but making sure that it's not only about safety and about the technology itself, but really looking at these cascading impacts.

SETH MOULTON: But to follow on, on that, Mr. Wolf, look the US can be first in market-wide AV deployment or we can cede that leadership to countries like Germany, allies, or competitors like China. How will the US market and efforts to create a federal framework be impacted if we don't act first, if China sets the rules of the road for AVs?

ARIEL WOLF: Thank you so much for the question, Congressman. I think it's a critical issue that I don't think we've discussed enough today, and that is American leadership in this technology. America is the birthplace of autonomous vehicle technology. And in many respects, it's got the largest amount of investment, and we are the leader in that technology. Where edges are eroding is in the regulatory framework component.

The national framework piece is a critical aspect of being able to scale the technology, and in that respect, the countries that you mentioned and others are catching up and being able to allow technology to scale and deploy there. So the biggest thing that needs to happen from the industry's perspective, and I think from a lot of, sounds like from the perspective of a number of folks, is actually we need to proceed without delay to enact this national framework that has a couple of components, and the way we structure it is really two pieces.

It has to be able to enhance consumer and public trust in the technology. That's first and foremost. And that comes from completing a number of rulemakings that NHTSA has underway and Federal Motor Carrier Safety Administration has underway, and a number of other initiatives that can help on that front. But the second part, and they must go hand in hand, is to maximize deployment of the technology.

The vice mayor is correct. One of the key things that comes from being able to scale the technology in the interim while rulemakings are in process is the information that regulators and policymakers can get from being able to deploy the technology. So raising exemption caps, being able to put new and different kinds of vehicles on the road there in the interim.

That's critical. We have to maximize deployment to keep that position, that leadership position.

SETH MOULTON: So, Mr. Wolf, just following on that, and specifically on your first point about consumer trust. I hear a lot of concerns from constituents, from technology experts, perhaps most concerningly from some artificial intelligence experts about the degree of trust that drivers currently place in their Teslas.

So it's a rather technical question, but why is Level 3 and above automation different than what Teslas are using on the road with us today? And do you think these technologies are safe?

ARIEL WOLF: Appreciate the question, Congressman. I think the key thing there is that the AV Industry Association, we represent Level 4 and above, and the distinction is critical, because Level 4 and Level 5 autonomous vehicles do not have any - They're not designed to have nor do they have any expectation of a human involvement in the performance of the driving task.

SETH MOULTON: Right, but a lot of humans today read the newspaper behind their ***Tesla***. So there seems to be an expectation that they don't need to do anything.

ARIEL WOLF: Well, and to that exact point, Congressman, ***Tesla*** is not a Level 4 or Level 5 technology, its driver assistance technology. And as we were discussing a little bit earlier, it's very important to your point, sir, that we are very clear what the differences between those technologies are, so that consumers are not confused and engaged in dangerous activity with driver assist technology, when they assume it's autonomous vehicle technology.

Those things have, they are different industries, different business models, different technologies. All of it needs to be separated very clearly, and we welcome the dialogue and working with other stakeholders to do that.

SETH MOULTON: Well, thank you and thank you Madam Chair for giving me a little bit more time, because I do think this is a critical issue and clearly there's work that the federal government needs to do in this regard. So, thank you. I yield back.

ELEANOR HOLMES NORTON: Of course, Mr. Moulton. Ms. Williams, you are recognized for five minutes.

NIKEMA WILLIAMS: Thank you, Madam Chair, and I want to thank all of the witnesses here today that are testifying for sticking it out with us, for wading through the votes. When you get to a freshman member whose last name starts with a W, you know you're in the home stretch and it's almost time to go home. So thank you, thank you.

When people say that Congress writes the rules of the road, that's usually just an expression, except here on highways and transit subcommittee, because, yeah, we really do write the rules of the road. And our job is to be sure that we're writing the rules as quickly as the roads are changing while centering safety, workers and innovation simultaneously.

When it comes to writing the rules of the road for automated vehicle technology, this is no different, and we must ensure transportation workers and the people who rely on transportation systems every day. Vice Chair Castex-Tatum, in your testimony, you highlighted the importance of achieving zero fatalities on our roads.

What role do you see automated vehicle technology playing in achieving that goal? And how can Congress start writing policy in preparation for automated vehicle technology that prioritizes safety for both motorists and pedestrians?

MARTHA CASTEX-TATUM: Thank you for that question, Representative Williams. Zero is the only number that makes sense for us with fatalities on the road. NLCs position is, we are recommending more pilot partnerships with our cities.

That way we can have more testing in more places, more climates, more areas, our rural areas, the areas that are urban. We need more data so that autonomous vehicles can get their own safety standards. Until we have more information, I think that we will need to do more testing, more piloting, so that you can write the rules that would be equitable across the country.

NIKEMA WILLIAMS: Thank you. And last week I took the time to speak with state and local elected officials in my district about many of the programs and opportunities that exist in the bipartisan Infrastructure Law. One of the programs that garnered interest was the Safer Streets and Roads for All program, which funds projects aimed at reducing traffic fatalities.

Vice Mayor, I'm going to get it right this time, Vice Mayor Castex-Tatum, how could a critical program like this support projects that both advance responsible technology and reduce traffic fatalities?

MARTHA CASTEX-TATUM: We definitely want to take the human error out of the fatalities that are happening on our roads, and we feel like autonomous vehicles is that opportunity that can take that human error out of the numerous number of crashes that are happening on our roads.

The sensors that are on these autonomous vehicles have shown that they are stronger than the human eye. The vehicles can react faster than a human. This technology is very innovative. However, it's still very premature, and there still needs to be more piloting and more data collected so that we can do all of this innovation safely and make sure we are protecting the public trust.

NIKEMA WILLIAMS: Thank you. And Mr. Samuelsen, in your testimony you mentioned the importance of protecting collective bargaining principles at every stage of automated vehicle development, including during research, testing and implementation. Can you elaborate on this, and tell me how these principles can be implemented at each state of technology development to ensure that workers have a seat at the table every step of the way?

JOHN SAMUELSEN: Yes, and thank you for the question. So as the technology comes in and what needs to be done, definitely which has been referenced here many times today, is that the federal government needs to set up a framework that protects workers, protects jobs, doesn't allow a situation where transit providers, I'm speaking strictly in transit, transit providers implement technology in a blindside manner that eliminates workers.

So the federal government has an ability to compel transit operators, transit employers to develop, to engage in workforce development investment, and also to engage with communities and workers in such a way where ways of technology that are going to impact working neighborhoods and impact workers themselves are discussed well ahead of time, well before the time of implementation.

And those things are happening now where workers have power to compel that to happening, for instance, in New York City where that's very common. Its a very common element of the TW contracts that we have in New York. But the federal government needs to adopt this as a uniform standard so that it happens city after city after city, transit provider, transit provider and on.

NIKEMA WILLIAMS: Thank you, Mr. Samuelsen. My policymaking always centers those most marginalized and building a transportation system that is accessible for all is always the top priority for me on this committee. I do have additional questions that I will submit for the record, and I hope that I can get further answers.

And Madam Chair, I yield back the balance of my time.

ELEANOR HOLMES NORTON: Thank you, Ms. Williams, your time has expired.

NIKEMA WILLIAMS: No time to yield.

ELEANOR HOLMES NORTON: Mr. Stanton, you are recognized for five minutes.

GREG STANTON: Thank you very much, Madam Chair for holding this important hearing, and thank you to each of the witnesses for your important testimony today. Arizona and my district, in particular, has been at the epicenter for the development and testing of autonomous vehicles. In Chandler, Waymo is operating a fully driverless vehicle as part of its ride hailing service, Waymo One.

In Scottsdale, Nuro and Cruise have partnered with retailers for local deliveries, and in Tucson, Arizona TuSimple recently completed its first fully autonomous semi-truck run on the open road between Phoenix and Tucson. AVs have the potential to transform our transportation system by improving mobility for vulnerable populations or those who face barriers to transportation, enhancing vehicle safety, reducing vehicle crashes and deaths, and increasing productivity.

At the same time, we also need to recognize that AVs have the potential to alter our workforce, and we want to keep as many people employed as possible. As Congress continues to consider the federal role in the testing and employment of AVs, it will be important for this committee and all of the entities represented by the witnesses before this committee today, to have a seat at the table.

My first question is for the vice mayor, Vice Mayor Castex-Tatum. I'm a former mayor myself. I come from the city world, former mayor of Phoenix. I know firsthand that leadership at the local level is key to fostering innovation. What are your thoughts about what the federal government can do to support and collaborate with cities in AV testing and development?

MARTHA CASTEX-TATUM: Again, Ill re-iterate the importance of piloting with the cities. We want to see partnerships with cities that create more testing in more places, providing more data, and really working to get autonomous vehicles their own safety standards.

GREG STANTON: Thank you very much. My next question is for Mr. Marler. Mr. Marler, there are many public and private stakeholders involved in AV development. Your testimony calls for federal leadership to help direct the conversation surrounding AVs. What role can the federal government play to help facilitate the safe deployment of AVs to meet community needs?

SCOTT MARLER: Thank you for that question. In Iowa, we've convened a public-private, multi-sector vision for AVs, and we created a space for this in our state via the Iowa Automated Transportation Council. We've done this

regionally in the Midwest among our 10 Midwestern states, and it's our view that we need to replicate these types of engagements at the national level and establish a clear consistent vision, strategy and framework.

There is sufficient energy across the nation in terms of this conversation. Its been somewhat fragmented. In Iowa, we call them silos of excellence. Congress can foster this collaborative environment at all levels of government. We believe that you can convene a new national dialogue and conversation. You can make sure that we're engaging a broad cross-section for input, including local communities, both public and private.

And also, there are some great collaborative efforts already underway that support is critical for, like the Cooperative Automated Transportation Coalition. So those are some thoughts on how we might meet some community needs.

GREG STANTON: I appreciate. This is for yourself and any other witness that may want to answer. A significant number of roadway fatalities occur on rural roads. One of the challenges on the use of connected and automated vehicles is the lack of required infrastructure features to accommodate them in rural parts of our country. What can and should be done to prepare rural America for the expanded use of AVs?

SCOTT MARLER: I'd be happy to start with an answer to that question, and thank you for that question. Really two things that we're looking at. First is, we do need to look at our physical infrastructure and make sure that we have good condition pavements, our signs, our lane markings, that these things are in good condition in our rural areas especially, but the investment can still be challenging.

Our rural areas do struggle to have the available levels of funding to ensure that they're making those stewardship investments that they need. The second thing we can do is really an emphasis on digital infrastructure, really looking at our broadband, particularly in rural areas, looking at our mapping, looking at our connectivity and spectrum.

This is why the spectrum question is so critical. Of these things, these two components, both physical and digital for our rural areas, they really have the opportunity to lift our rural communities across our nation.

GREG STANTON: In the short time left, any other witness want it take it?

NAT BEUSE: I'll chime in here just to add from an industry perspective, two points you raised. One, we found a lot of value in the convening power both at the state level like Congress are doing today, but also even at the USDOT level to really bring all stakeholders together. My personal opinion is I don't know that we've done enough of that lately on these particular issues.

On your point about rural, part of our mission is to deliver this technology broadly. In fact, when you look at even some of our locations right now, they are what can sort to be rural America. And I think we need to keep that in the conversation as well. I mean, many of the paths that highways cut through our rural and nature, and there's a lot of needs that probably should be considered, again to support the efficiency and effectiveness of the rollout.

GREG STANTON: Alright, I've run out of time here, so I have to yield back, but I'd love to get at a later time maybe a separate conversation with our representatives of organized labor about some of the thoughts on that one as well. I yield back.

ELEANOR HOLMES NORTON: Thank you very much. I would like to thank each of the witnesses for your testimony today. You can see by how many members came back after the votes to ask questions that this was an important hearing in our committee today. Your comments, you who have testified today, have been very informative and very helpful.

I ask unanimous consent that the record of today's hearing remain open until such time as our witnesses have provided answers to any questions that may be submitted to them in writing. I also ask unanimous consent that the record remain open for 15 days for any additional comments and information submitted by members or witnesses to be included in the record of today's hearing.

Without objection, so ordered. The subcommittee stands adjourned.

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