ALASKA STATE LEGISLATURE
JOINT MEETING
HOUSE TRANSPORTATION STANDING COMMITTEE
SENATE TRANSPORTATION STANDING COMMITTEE
March 17, 2016
12:55 p.m.

MEMBERS PRESENT

HOUSE TRANSPORTATION STANDING COMMITTEE

Representative Shelley Hughes, Co-Chair
Representative Benjamin Nageak
Representative Louise Stutes
Representative Matt Claman
Representative Dan Ortiz

SENATE TRANSPORTATION STANDING COMMITTEE

Senator Peter Micciche, Chair
Senator Click Bishop, Vice Chair
Senator Dennis Egan

MEMBERS ABSENT

HOUSE TRANSPORTATION STANDING COMMITTEE

Representative Neal Foster, Co-Chair
Representative Charisse Millett

SENATE TRANSPORTATION STANDING COMMITTEE

Senator Mike Dunleavy
Senator Bert Stedman

OTHER LEGISLATORS PRESENT

Representative Harriet Drummond

COMMITTEE CALENDAR

PRESENTATION(S): INTEGRATION OF DRIVERLESS CARS IN ALASKA

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

Ron Barnes, Head of State Legislative Affairs
Google, Inc.
Washington, D.C.
POSITION STATEMENT: Presented on the integration of driverless cars in Alaska.

Eric Taylor
Statewide Plan & Transit
Division of Program Development
Department of Transportation & Public Facilities (DOTPF)
Juneau, Alaska
POSITION STATEMENT: Provided testimony related to the integration of driverless cars in Alaska.

Jomo Stewart, Project Manager
Energy, Military, and Mining
Fairbanks Economic Development Corporation
Fairbanks, Alaska
POSITION STATEMENT: Provided testimony related to the integration of driverless cars in Alaska.

ACTION NARRATIVE

PRESENTATION(S): Integration of Driverless Cars in Alaska

1:08:43 PM

CO-CHAIR SHELLEY HUGHES called the joint meeting of the House and Senate Transportation Standing Committees to order at 1:10 p.m. Representatives Nageak, Ortiz, Claman, and Hughes, and Senators Egan and Bishop were present at the call to order. Representative Stutes and Senator Micciche arrived as the meeting was in progress.

CO-CHAIR HUGHES announced that the only order of business would be a presentation from Ron Barnes, Head of State Legislative Affairs, Google, Inc.

CO-CHAIR HUGHES mentioned that the integration of driverless cars may or may not be a good fit for Alaska. She said there were some states that have embraced new technologies and some that have been resistant. She stated her belief that Alaskans should be innovative, out-of-the-box thinkers with regard to

economic development. She noted that there were unique features in Alaska, such as snow, ice, cold, fog, and mountainous terrain, which could be considered barriers or opportunities. She related that in the case of driverless cars, there was some testing going on in other states, the technology had not yet mastered the snow and ice and there might be an opportunity for Alaska in that regard. She also mentioned that although the presentation was specific to Google, there were a number of other manufacturers working on similar technology. She stated that the committee was trying to get a witness from the Alliance of Automobile Manufacturers online to discuss the topic.

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CO-CHAIR HUGHES requested that Mr. Barnes discuss policy prior to the presentation for the purpose of discussing the actions that other states have taken and the associated perspective of industry.

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MR. BARNES, Head of State Legislative Affairs, Google, Inc., ("Google"), stated that about half of the states had taken up over 50 pieces of legislation pertaining to autonomous vehicle technology. He explained that with only a small number of exceptions, the pieces of legislation had been unique approaches and did not represent a cohesive approach to interstate transportation. He said in the Lower 48 people lived closer to borders and pointed out that there was not a different set of requirements to drive from Pennsylvania to Maryland than from West Virginia into Maryland. He explained that with 53 pieces of legislation from half of the states, if every state had its own way, the vehicle would have to stop at every border to meet a different set of legislative requirements. He suggested that [a lack of cohesive policy] was not a good recipe for fostering a technology and developing something with great potential to save lives and provide increased mobility and an opportunity for convenience, as autonomous vehicles did. He stated that Google viewed autonomous vehicles as a nascent technology. He emphasized that it was a very exciting technology, he did not want to dampen enthusiasm. He stated that the enthusiasm from lawmakers would eventually flatten the peaks and valleys of approaches, because it would help a state develop regulations that at the right time, will help the state exert whatever authority it needed to over the vehicle. He further explained that the autonomous vehicles were road worthy vehicles that adhered to existing federal safety standards. He said the new

aspect was that instead of being guided by a human, it would be guided by software and mechanics. He suggested an important [policy] question was: whether anything needed to be applied specifically "to the new operator of the vehicle." He stated that at this point Google did not think so.

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MR. BARNES said that Google had not identified any impediments against the operations of autonomous vehicles, with the exception of a few states that created legislation and regulations prematurely. He recommended that for the time being states let the technology develop to see where it would land, before making policy assumptions about what it should or should not do. He related that the "wishfulness" of [autonomous vehicles] had existed since 1939 and the practicality had existed since the mid-2000s. He said in ten years the technology had progressed from not being able to do anything with an autonomous vehicle to the vehicle displayed on the screen, which could drive passengers where they wanted to go safely and efficiently. He noted that it had been a quick ramp-up, but there was still a long way to go in order to understand how the technology would be deployed, what the best way for deployment would be, and what the necessary guidelines would be in the regulatory world.

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CHAIR MICCICHE asked how mechanical issues or break-downs were addressed with driverless vehicles.

MR. BARNES responded that if someone was in the vehicle, they would use his/her cell phone to call for a tow truck. He related that [Google] monitored its vehicles and knew everything that was going on in them at any given second. He stated that [operation of driverless cars] involved a very controlled set of circumstances where vehicles were being operated without someone inside. He offered that in addition to redundancies built into the car for the sake of safety, there would also be a mechanism by which the car could notify someone in case of an emergency, much like existing systems that [made contact on behalf of the driver] in the case of incidents such as sudden braking, airbag deployment, or a side crash.

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CHAIR MICCICHE noted that there were some people who assumed that Google knew everything about what all vehicles were doing. He said that liability for a vehicle was attributed to the driver and not the vehicle, and he asked where liability would fall for driverless vehicles in the instance of an accident resulting in injury or property damage.

MR. BARNES replied that the vehicle did not exist on its own, and someone would be the responsible party for the vehicle, ultimately. Liability was a complicated issue; even in low-speed crashes in city intersections it could be difficult to sort out fault. The vehicles would be owned by someone and operated by somebody; therefore, they would be under someone's legal control. He mentioned that this line of inquiry was one that had piqued the interest of the insurance companies. They have had more than 100 years of experience with human mismanagement of vehicles. He acknowledged that generally humans were pretty good behind the wheel, but there were times when that was not the case. He related that in addition to insurance companies being interested in the developing technology, the legal system was paying attention with relation to torts. He stated that the aforementioned were areas of interest for everyone who was involved in development of the technology, as it was very transformative to take the human element out of the front, left seat. He said it was something that his team considered on a daily basis.

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SENATOR BISHOP mentioned that he had a mechanical background, noted that the vehicle required the use of sensors and lasers, and asked what had been done for cold weather testing and where it had occurred.

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MR. BARNES replied that cold weather and certain weather formations were a challenge for sensing technology. He said there were millions of raindrops falling from the sky during a rainstorm, but not each of those raindrops was something that a vehicle needed to stop for; it would not make a lot of progress in that situation. He noted that the same was true of snowflakes. He said that the issue of sensing the environment in challenging weather situations was known, and he related that Google was trying to graduate the technology out of the South Bay Area, where it was sunny and 75 degrees every day, into

conditions which more approximated the rest of the country and the world. He stated that it would take time to get there.

SENATOR BISHOP requested that Google entertain the possibility of cold weather testing in Alaska.

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SENATOR EGAN mentioned that he used Google Earth for fun, and it worked fairly well until global positioning system (GPS) connection was lost. He asked what would happen when the vehicle lost interaction with the GPS system.

MR. BARNES replied that although the mapping was based on Google Maps, it didn't work exactly like a smart phone or tablet that may be used for directions from one location to another. He indicated that the vehicle could not, in its current form, be taken to "Anytown, U.S.A." and told to drive to the pizza shop or the library. He stated that if Google hadn't mapped it, then it was unprepared to operate the vehicle in that area. He explained that prior to driving in an area, the car team would travel to the intended operational area and map it in great detail. The car relied solely on the computer within to compare the outside world to the detailed map, in order to determine where it was and to be able to maneuver autonomously.

SENATOR EGAN opined that Google Maps worked great and Google Street View was right at the driveway of his house. He joked that he wished Google would come back because there was a whole bunch of junk in the driveway when the imaging was done. He asked what would happen when the vehicle lost connectivity.

MR. BARNES stated that as of now, the autonomous car did not rely on connectivity. The car relied solely on the map, which was loaded in the car.

SENATOR EGAN requested clarification that as long as Google Maps was precisely accurate, losing satellite connectivity would not create a problem.

MR. BARNES responded that was correct.

1:28:30 PM

CO-CHAIR HUGHES asked about liability requirements and offered her understanding that some states were requiring steering

wheels and brakes and she inquired about what the industry thought.

MR. BARNES advised care in not prejudging the application and design of technology. He stated that Google was responsible for the actions of the car and wants to ensure a safe product. The car was a result of research, but fostering the technology shouldn't be "providing the recipe for the technology." He noted that the secretary of the [U.S.] Department of Transportation announced a working group out of National Highway Traffic Safety Administration (NHTSA) that would make suggestions. He emphasized the need for cohesiveness and continuity across the states relating to the regulatory scheme for driverless vehicles.

CO-CHAIR HUGHES reiterated her understanding that some states were requiring brakes and steering wheels to be placed in all autonomous vehicles. She said Google was not a manufacturer and that requiring breaks and steering wheels would make state to state travel difficult. She suggested those were some considerations the House Transportation Standing Committee should be thinking about.

MR. BARNES shared his comments on the federal state interplay issue. He explained that there were federal motor vehicle standards that were applied nationally and that Google would like to see regulations solidified on a national level. He said that the role for states might become evident as the technology was deployed. He explained that his role within Google was to offer advice to state legislators for how to view self-driving cars and to visit state legislators and explain what Google was doing.

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MR. BARNES began a PowerPoint presentation and directed attention to slide 2. He said that the picture showed an exhibit from the 1939 World's Fair, called Futurama, where people were looking at a city populated by autonomous vehicles. He pointed out that 1939 was not too far away from the day of the Ford Model T, when already people were thinking of ways to remove the driver from the equation.

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MR. BARNES said slide 3 [showing a family of four playing a board game in a self-driving vehicle] depicted the 1950s version

of autonomy. He said the picture was an advertisement from a power company. He said that the idea for this technology resulted from the electric company seeing an opportunity to use electric magnets, the hash marks in the road [shown on slide 3], to guide the vehicle along the road.

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MR. BARNES turned to slide 4, titled "Leading Causes of Death in the United States," and stated that the causes listed here - not the ability to play checkers or dominoes in the car, as depicted in slide 3 - provided the impetus to take the driver out of the equation. He directed attention to the peaked red line, which indicated [the percentage] of motor vehicle accident deaths. He stated that 32,000 people in the United States and 1.2 million people worldwide died annually as result of a motor vehicle accident. He indicated Google thought that was an unacceptably high number - zero would be great - especially for something that might be able to be corrected by removing some of the human variable. He added, "Also by removing some of the human variable you get humans back into the equation."

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MR. BARNES moved to slide 5, which showed Steve Mahan, who was one of the first people to ride in a Google self-driving car and was also blind. He said that when Google asked where Mr. Mahan wanted to go or what he wanted to do, he simply wanted to go to the cleaners and to Taco Bell. He explained that although Mr. Mahan's work was only 30 minutes from his home, he had to rely on other means and it took him two hours to get there. He explained that there were a lot of other places that used mass transit, and he assured the committee that Google was not trying to replace mass transit with individual cars. He explained that self-driving cars could be a transformative technology for elderly or disabled people. He said self-driving vehicles would allow a level of independence that many previously may not have had. He said a self-driving car would have safely extended his grandmother's mobility for a few more years when she may not have been as aware and attentive. He explained that self-driving cars could also appeal to people who would much rather get started with work in the driveway instead of upon arrival at their desk.

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MR. BARNES turned to slide 6 to address the topic of traffic. He claimed he did not know much about traffic conditions in Alaska, but he said that heavy traffic was a problem across the globe. He shared Google's thought that autonomous vehicles could be one way to alleviate traffic congestion, because they could provide more efficient options, such as shared vehicles that could transport 10 different people throughout the course of the day. He said that there were a lot of potential ways that a vehicle left to its own devices, without having to be guided by a human from point "A" to point "B" every day, could result in some societal benefits.

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MR. BARNES moved to slide 7. He discussed that Defense Advanced Research Projects Agency (DARPA) held a series of contests to encourage engineering schools and researchers to develop practical autonomous solutions. He said that the first contest race was a 132-mile course were the furthest any car got was only 7 miles. He said that by the third contest race, every car finished the course. He said that over the course of 3 years autonomous vehicles went from ones that couldn't do anything by themselves to vehicles that could navigate a situation over long distances such as the contest course. He mentioned Larry Page, one of the founders of Google, had been following the project and was so impressed by the winning team that he went to the teams head engineer, Sebastian Thrun, and asked him to come to Google. He said that once at Google, Mr. Thrun assembled a team, which over the course of 9 to 10 years, developed the car seen on the very first slide.

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MR. BARNES explained that slide 8 displayed maps from some of the driving that Google conducted with its first self-driving vehicles. He noted that one of the maps showed a Google self-driving vehicle driving down the famous "serpentine like" Lombard Street in San Francisco, California. He described the famed street as being good for the tests because of all the externalities such as: being downhill, having left and right switchbacks, and having people standing along the road.

MR. BARNES moved to slides 9 and 10. He said that a Toyota Prius was used in the initial lineup of Google's test cars but the Lexus hybrid sport-utility vehicle (SUV) had been the long-standing model used for its self-driving vehicles. Mr. Barnes pointed out that a laser could be seen on top of the car and

there was a camera underneath the rear view mirror. He explained that those sensors were how the car viewed the world and knew where it was and what was happening around the car. He said that it was not enough for the vehicle to just know where it was, but it also needed the ability to recognize potential obstacles.

MR. BARNES explained that one lesson Google had learned from the earlier prototypes was that when a driverless vehicle tried to re-engage a human driver in the event something went wrong, unless that driver was already engaged, there was a lag time in getting back to situational awareness to take command of the vehicle and the situation. He told the committee that there was always someone in the driver's seat and another person in the passenger's seat.

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REPRESENTATIVE NAGEAK asked what would happen when a human driver was in the area under the influence [of drugs or alcohol].

MR. BARNES replied that Google no longer allowed human drivers to take over.

REPRESENTATIVE NAGEAK clarified that he meant another car not the self-driving vehicle. He stated that Google had no control over other drivers.

CO-CHAIR HUGHES offered her understanding that the question Representative Nageak was asking was how an autonomous car would handle a situation where another car was out of control in the vicinity.

MR. BARNES explained that the human driver in the autonomous car could override the system and take control to guide it out of the way. He said that for an autonomous car the default priority was to get into a situation where the vehicle was safe. He said he was not exactly sure how to answer the question because it would really depend on specific circumstances. He admitted that one of the major challenges in driving any vehicle was to be able to understand and respond to other vehicles around it.

REPRESENTATIVE NAGEAK offered a scenario where the human riding in the driver's seat of an autonomous car might have been reading a book and not paying attention. He said the book

reader would not be aware of others around them. He asked how Google's self-driving cars would react to situations that happened out of the blue.

MR. BARNES answered that driving 1.4 million miles like Google did was the key. He explained that much like for human drivers, Google autonomous programs had to use real life experiences to learn and build a profile for the self-driving vehicles. He explained that in Washington, D.C., there were a lot of bikers and bike lanes but not all bikers were always in the bike lanes. He explained that when bikers were present in bike lanes, that drivers had to anticipate what the biker might do. He said that Google was doing something similar with the autonomous car by having the car learn what to do in a situation that would bring the car back into safety.

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SENATOR EGAN offered his assumption collision avoidance technology was built into Google's vehicles.

MR. BARNES answered that was correct. He explained that the mainstream cars that were coming out now with collision avoidance technology were built to override a human's instinct to do something incorrect in a circumstance. He informed the committee that the view that a Google car had of the world was greater than the view of human drivers. He explained that the radar detector might be able to detect a bike rider through a hedge that maybe a human driver would not have been able to see until the bike was right in front of them. He explained that the instinct when programming these cars was to default to safety. He said that there were random other variables out there which Google could not control. He expressed one Google was to [offer mobility to those without it].

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CO-CHAIR HUGHES shared her idea of technology and thinking about the Wright brothers and how during their time no one imagined there would ever be jets that carried several hundred people and could crash. She asked Mr. Barnes if he could talk a little about safety. She said that she realized self-driving vehicles were still in the testing phase, but she wanted to know how many miles were driven and what types of accidents were caused by an error on Google's part.

MR. BARNES answered that Google had had only one incident in more than 1.4 million miles since 2010. He stated that the accident was at a very low speed, 2-5 miles per hour (MPH). He said that in comparison Google drove in a week what the average American drove in a year. He related Google has had a substantial amount of driverless cars on the road in Mountain View, California, for a while. He relayed that there had been a few incidents where someone rear ended one of Google's cars or someone ran through a stop sign, but none of which were the fault of one of Google's self-driving cars.

MR. BARNES elaborated that a benefit of incidences was that now all of the vehicles knew what happened, understood why it happened, and could account for those factors. He said that another benefit was that instead of one person having the learning experience, all of Google's cars now knew about the incidence and the experience could be multiplied greatly.

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REPRESENTATIVE CLAMAN asked Mr. Barnes if he had personally ever ridden in a Google self-driving vehicle.

MR. BARNES answered yes.

REPRESENTATIVE CLAMAN followed up with asking Mr. Barnes to explain what riding in an autonomous vehicle was like. He asked for clarification about Mountain View, where most of Google's cars resided, whether the terrain was mostly city streets or highway/interstate travel. He asked whether, when talking about the entire fleet of cars learning from one another, that was done through an artificial intelligence (AI) type software program or if there was actually someone in an office somewhere reprogramming and entering in new data. He offered his understanding that part of the effort with AI was to have computers learn from things and build that knowledge into their database without someone having to rewrite the program to accommodate for new information.

MR. BARNES replied that Google engineers looked at the incident and ran a few thousand scenarios based on the incident. He explained that that data got entered into the operating system of the vehicles so that the cars could anticipate any similar incidences.

REPRESENTATIVE CLAMAN offered his understanding that someone actually programmed in the new data.

MR. BARNES replied yes and no. He said that Google was advancing machine learning. He shared a story of one day when a Google self-driving car encountered a duck in the road that was being chased by a lady in a wheel chair waving a broom. He said that there was no one in the world who could have thought up that scenario, but what was accounted for was a sudden obstacle in the car's travel path followed by a continuing obstacle. He explained that Google's software and technology was able to account for experiences and build that into the profile of what might happen and what might be done to manage, much like a human driver would do. He shared his experience of riding in one of the Lexus models and how excited he was when he was watching the car make decisions, accelerate, steer, etc.

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MR. BARNES explained that Google's initial work was on highways and that ducks being chased by ladies wielding brooms did not occur on highways. He explained that Google started the self-driving cars on open road because there were fewer variables. He described the picture from slide 13 as being a complicated intersection with train tracks, cars, and stop lights, and he explained that the tests had to graduate in complexity. He said slide 13 was essentially what the car saw. He explained that the purple boxes were other cars, the red indicated pedestrians, and the yellow indicated bicycle traffic. He said that although in this scenario the Google car had the right of way, there was a red ladder in front of the car indicating that the Google car had not yet determined what the pedestrians and the cyclists were going to do. He said the interesting thing was that people in the Mountain View area said Google cars were the worst cars to be around, because they obeyed every traffic law. He said Google self-driving cars were also learning that they had to accommodate, such as how drivers have to signal their intent. He explained that the programing wasn't just taking motor vehicle code, converting to ones and zeros, and saying to follow [program commands], but that there were conditions where a car could turn right on a red light.

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CO-CHAIR HUGHES asked if Mr. Barnes knew what the average accident rate for human drivers was.

MR. BARNES replied no. He said that the challenge was comparing reported versus actual incidences. He shared some personal

stories about his own driving incidences. He said that although he had never been in a major accident, that didn't mean that something hadn't happened. He elaborated that he had bumped into another vehicle at a traffic light and that he had been rear ended at an intersection, while waiting to turn right. He explained that those incidences did not get reported, because there was no damage. He opined that the actual number of incidences were more than what was actually reported. He questioned whether humans were as safe as drivers as statistics showed. He stated that one incident in 6 years and over 1.4 million miles was a good safety record.

CO-CHAIR HUGHES agreed that was a good safety record. She mentioned the fact that Google cars were only operating at 25 MPH or less. She said human safety was a big concern when deciding whether or not to implement the use of self-driving vehicles.

MR. BARNES answered that 25 MPH or less was correct.

2:08:04 PM

SENATOR EGAN asked whether driving at 25 MPH under the posted speed limit created a hazard.

MR. BARNES replied that Google's highway vehicles traveled at faster speeds, but the city cars drove 25 MPH or slower on the surface streets. He said that Google's self-driving vehicles were the result of not just understanding the software but also the hardware too. He said that Google refined devices in a way to seamlessly incorporate with software and the vehicle.

2:09:44 PM

REPRESENTATIVE DRUMMOND asked whether Google's cars required wireless access.

MR. BARNES replied no. He explained that once the maps were loaded into the car, it was then familiar with that particular area. He said that was different from the way phones and tablets worked, and Google Maps could be taken offline. He explained there were technologies that allowed vehicles to talk to each other. He stated that Google had one approach: using existing computing technology, brainpower, and resources that Google already had to make autonomous vehicles work. He stated that Google would love for everybody to focus on their car, but there was an entire vehicle industry that contributed a lot to

the economy of America and had a great deal of expertise in vehicles. He said there were lots of questions that needed to be answered such as: how self-driving vehicles were deployed, whether someone developed it privately, whether they licensed it or not, and whether the technology was implemented into low-speed cars or high-speed cars.

2:12:38 PM

CO-CHAIR HUGHES asked Mr. Barnes how Google taught a program ethical decisions such as to choose between hitting a cat or hitting a child, or hitting a pedestrian verses a vehicle. She inquired as to how the program made that choice.

MR. BARNES replied that was an interesting philosophical question with very concrete practical outcomes. He said that the important thing was being able to account for what type of situation was upon the vehicle. He said that in terms of ethical decisions, much like the duck in the road, the cars cannot be programed with every possible scenario. He explained that self-driving cars had to evolve into a situation where the best decision could be made under the available set of circumstances to bring the situation back into safety. He said that in some ways it's not too different from human decision making. He said humans were programming the vehicles, so the values of humanity went into the cars. He told the committee that Google's director of the safety program spent 30 years in the federal government advising federal safety standards for motor vehicles and cared deeply about public safety. He assured the committee that it was not just a bunch of engineers staring at their screens all day determining the programming for the autonomous vehicles.

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CO-CHAIR HUGHES offered her assumption the programming contained some sort of ranking system to tell the car to hit a vehicle instead of a person.

MR. BARNES interjected that he did not know how to answer Co-Chair Hughes' specific question given that set of circumstances. He said he did not know which choice the car would make, because those were undoubtedly not the only set of circumstances that governed any given situation. He opined that there were more than just the two options, because he said he could envision a scenario where the car veered to the right and avoided both the pedestrian and the vehicle. He said Google understood that

there were some situations where a moral choice had to be made to determine for the "least worst" situation. He referred back to the dad from slide 3, who was not thinking about the deer that could be leaping over the fence, and he said the dad was divorced from his responsibilities as a driver. He said the human element could be a detraction as much as it could be a boon. He said that an autonomous vehicle might be able to react better than a human, because the car might have more options.

2:18:07 PM

CO-CHAIR HUGHES said that representatives from the Department of Transportation & Public Facilities (DOTPF) were here and she would like to hear from them in response to her questions. She shared her interest in knowing how fast autonomous vehicle technology would proceed, whether driverless cars would be on the road in 3-5 years or further out than that. She asked about frustrations from manufacturers and people in the industry towards states that were not considering autonomous technology and incorporating it into the long term transportation planning. She inquired as to how the road ways and traffic signals might look different in the future with the implementation of autonomous vehicles. She shared her wishes for Alaska to always be thinking outside the box.

2:19:32 PM

MR. BARNES replied that he expected there would be a mix of autonomous vehicles and people who still liked to drive for themselves. He said perhaps the full-speed vehicles took longer than the high-speed vehicles, and the low-speed vehicles would be best suited for an urban environment. He said that he envisioned parking might change to be more peripherally located from a downtown area since the autonomous cars could drop drivers off and then go park. He said that there might be less parking space needed with smaller autonomous cars taking the place of larger cars and trucks. He said as far as long-term planning, states could look now through state codes and ensure there would be nothing that would create a hindrance for the deployment of autonomous vehicle technology. He noted some key questions were, "How do we like to see all of this play out, what needs to be done to get there, and do we think the technology was going to develop in a way that will get us there?" He mentioned one use for autonomous vehicles could be to shuttle individuals around for medical appointments.

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CO-CHAIR HUGHES shared her curiosity about what DOTPF was thinking, what the state's involvement was, and where Alaska was in tracking autonomous vehicle technology.

2:22:00 PM

ERIC TAYLOR, Statewide Plan & Transit, Division of Program Development, Department of Transportation & Public Facilities (DOTPF), said that he managed the statewide long-range transportation plan and that the department was working on an update to that plan and it hoped to have plan drafts out later in the spring. He explained that it was a policy level plan, so a lot was considered when DOTPF tried to forecast out for 20 years. He briefly mentioned that he had attended a national conference last year that highlighted the up and coming issue of autonomous vehicles. He said that DOTPF considered what it called "connected autonomous vehicles" and that the department realized it was an up and coming issue. He explained the issue was not just in terms of personal vehicles, like what was being discussed in today's committee, but also in freight shipping. He explained that the department has made considerations to include preliminary technology that would allow fright trucks to travel right up behind one another in platoons for fuel efficiency. He said that the draft transportation plan contained a statement, which he read as follows:

> We will follow national developments and intelligent infrastructure and connected autonomous vehicles and seek opportunities to cost effectively and sustainably apply changing technology in Alaska.

He said that the statement was a blanket statement and not very specific, but it did indicate the department had autonomous vehicle technology on its horizon and was taking that into consideration in its planning.

2:24:33 PM

CO-CHAIR HUGHES asked Mr. Taylor whether his attendance at the conference would allow him to speak more about Audi, BMW, and other manufactures out there and what different things those companies were doing.

MR. TAYLOR replied no, not specifically.

2:25:21 PM

REPRESENTATIVE CLAMAN offered his comments about the moral dilemma Co-Chair Hughes raised earlier. He offered his recollection of the San Francisco earthquake of 1989 where the Oakland Bridge cracked and the only person who actually got hurt was the guy who tried to jump his car over the crack. He concluded that human drivers don't always make the right choices. He asked whether a computer could distinguish a duck from a police officer. He said that the statistical advantage was that Google self-driving cars obeyed all traffic laws. He opined that insurance companies would probably say that if humans drove more like the Google cars there would be a lower frequency of incidences. He said that he was aware that didn't solve moral dilemmas.

2:27:26 PM

MR. BARNES offered his belief that the moral dilemma was demonstrated in crash statistics and that obviously humans didn't do as well with dilemmas. He reiterated that it was humans who were doing the programing. He said Google programmers knew the results of their actions. He explained that if Google programmers miss located a fish restaurant that was really in Anchorage to be in Juneau, that mistake probably wasn't "an end of the world situation." He said that he knew all of the programmers personally, and one engineer by the name of Chris Urmson had told him that he was helping develop autonomous vehicle technology because he recognized the dangers of driving and never wanted his son to have to drive a vehicle. Mr. Barnes asked what dad would invent technology that could harm their children. He said that with that question he was asking the House Transportation Standing Committee to trust in the humanity of the people who worked for Google. He said that in practice sometimes people didn't do what they should, but in the aforementioned case about driver safety everyone understood the ramifications. He said that ultimately choices needed to be made very carefully and with decisions that would bring an autonomous vehicle to a "least worst" outcome when that was the only choice.

2:29:49 PM

SENATOR EGAN asked whether Google cars were the only ones using Google [street view].

MR. BARNES answered that as far as he knew, Google cars were the only ones using Google Maps. He said there were undoubtedly

other manufacturers out there who were developing similar software. He explained that Google Maps was an open source program, so it could be overlaid to create other platforms.

SENATOR EGAN opined that even for a community the size of Juneau, under 35,000, it must take an immense amount of data in those little boxes just to cover Juneau.

MR. BARNES reiterated that self-driving car technology was new. He said that it would be very difficult in the next two weeks to map the entire country. He said that the maps were not updated on a daily basis; there was an additional overlay of information added to the maps.

SENATOR EGAN asked Mr. Barnes about a possible scenario where in he traveled on the Alaska Marine Highway System (AMHS) to Ketchikan, and he inquired how his car would know to download data for Ketchikan.

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MR. BARNES answered that would not be possible at the moment. He said that illustrated his larger point about the situation today not being a viable situation with which to go forward. He said Google still needed to figure out how to make the data operate in real time and everywhere under every circumstance. He said he thought the exciting part was the computer in the back and what Google had been able to do. He said Google was able to take information and software and use machine learning to make its cars' software and its computers assimilate new information to understand the situation and develop a reaction related to that. He said that Google's AI system, "AlphaGo," had just recently defeated the reigning "Go" game champion in Seoul, South Korea. He explained that Go was not like computer chess and there wasn't someone sitting there giving the computer movement commands, but rather it was the computer analyzing the situation and interpreting the game, including the human variable of playing against a person. He said the ultimate goal was for the computer to understand and learn and was not for it to simply process information.

SENATOR EGAN offered his assumption that Google dealt directly with municipalities and DOTPF to keep up-to-date information on road construction projects.

MR. BARNES mentioned one thing that Google liked as a company was open data from governments. He explained that making

government data publicly available would allow others to take that information and turn it into something useful. He illustrated the fact that Google Maps was initially a static map until someone from outside the company in San Francisco decided to plot the locations of rental housing units on the map. He said that Google thrived off of open data to determine when a bridge or a road might be closed or if there was a warning or alert issued. He said that those factors would become increasingly more important as autonomous technology was developed.

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CO-CHAIR HUGHES offered her understanding that at some point in time autonomous cars might not have a person riding along in them. She offered a hypothetical question of what would happen if an autonomous car had no rider and got hit by a car driven by a human, and she questioned how law enforcement would handle that situation.

MR. BARNES answered that was a real scenario. He said that the cars needed to be able to not only recognize an emergency vehicle but also determine whether an emergency vehicle was coming at it to pass or if it was actually in pursuit of the self-driving vehicle. He said that the ability for one of Google's self-driving cars to be able to get in touch with someone was an important factor. He said that currently Google self-driving cars operated in a closed universe, in that there were no vehicles operating unattended.

CO-CHAIR HUGHES asked whether Google had an actual human-driven car keeping the autonomous car in its line of sight during tests.

MR. BARNES responded that he did not know the answer. He said that the autonomous vehicles were never unmonitored, but he did not know about the line of sight question.

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CO-CHAIR HUGHES offered her understanding that if the computers in the vehicles were self-contained, not connected to a computer, then there must be a person nearby. She explained that Legislative Legal and Research Services researched Alaska policy to check for anything that would inhibit the use of autonomous vehicles in the state. She said at this point there were no conflicts. She offered her understanding that industry

was not happy about other states wrestling over requirements such as requiring: a licensed driver to be in the vehicle; the car to have a steering wheel; and the car to have brakes. She asked if Mr. Barnes would comment on the licensed driver issue.

MR. BARNES said that the whole premise of a driver's license was to demonstrate a qualification to handle a vehicle and acknowledgement of the rules of the road. He explained that requiring a licensed driver in the vehicle would prevent people like Mr. Mahan and other disabled or elderly people from gaining the mobility and independence Google had intended for its autonomous vehicles. He declared that he in no way understood the premise of that requirement. He said that Google had fought to speak out against special requirements from states, such as a licensed driver and a special license plate. He explained that if autonomous vehicles were required to have specially designated plates announcing to the world it was an autonomous vehicle, then the incidences of "hot dogging" might increase. He explained "hot dogging" as where another driver swerved or did something similar to see how the autonomous car would react. He said the notion of requiring an announcement to the world to look out because there was an autonomous car nearby undercut the benefits of the technology on the whole.

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JOMO STEWART, Fairbanks Economic Development Corporation, testified that one of the big projects in Fairbanks was cold weather testing. He said that Fairbanks had marketed itself as the premier location to do cold weather testing for its affordability, accessibility, and reliability. He explained that extensive infrastructure had been built to attract researchers. He said that the military had done a good job of boosting interest and facilities in Fairbanks.

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MR. STEWART said that legislation was usually passed for the safety and harmony of the people, but from time to time legislation was passed for the pursuit of opportunity. He said that it occurred to him, after listening to this discussion that the focus had mostly been geared toward mitigation of back-end eventualities from sometime far in the future when autonomous cars were fully operational. He said that as an economic development professional, he saw an opportunity to be on the front end of autonomous vehicle technology testing. He explained that the way to do that would be to let the technology

be tested and matured. He said that Google was going to need to test its autonomous cars in cold weather and Fairbanks would like to invite Google to come there for testing. He said the regulatory and legal structure could be worked out once autonomous vehicle technology was operational. He noted that the University of Alaska Fairbanks (UAF) Research had successfully worked with industry on Unmanned Air Vehicles. He stated the fact that he wanted Google to come to Anchorage, Fairbanks, and Juneau.

CO-CHAIR HUGHES said that economic development was what prompted her to invite Google to present to the House Transportation Standing Committee. She thanked Mr. Barnes for traveling all the way from Washington, D.C., for his presentation.

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ADJOURNMENT

There being no further business before the committee, the House Transportation Standing Committee meeting was adjourned at 2:51 p.m.