**ALASKA STATE LEGISLATURE**
**JOINT MEETING**
**HOUSE TRANSPORTATION STANDING COMMITTEE**
**SENATE TRANSPORTATION STANDING COMMITTEE**
March 17, 2016
1:08 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:** Provided a presentation 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**

1:08:43 PM

CO-CHAIR SHELLEY HUGHES called the joint meeting of the House and Senate Transportation Standing Committees to order at 1:08 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.

**PRESENTATION(S): Integration of Driverless Cars in Alaska**

1:09:25 PM

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

CO-CHAIR HUGHES mentioned that the integration of driverless cars may or may not be a good fit for Alaska. She said there

are 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 are unique features in Alaska, such as snow, ice, cold, fog, and mountainous terrain, which could be considered barriers or opportunities. She related that there is testing going on in other states, and it is apparent that the technology has not yet mastered snowy, icy conditions, which could provide an opportunity for Alaska. She noted that although the presentation is specific to Google, there are a number of other manufacturers working on similar technology, and the Alliance of Automobile Manufacturers has been invited to participate in the meeting.

1:12:18 PM

MR. BARNES, Head of State Legislative Affairs, Google, Inc., ("Google"), stated that about half of the states in the union have introduced over 50 pieces of legislation pertaining to autonomous vehicle technology. He explained that with only a small number of exceptions, the pieces of legislation have been unique approaches and don't represent a cohesive approach to interstate transportation. He said in the Lower 48 people live closer to state borders, and pointed out that there is not a different set of requirements for driving from Pennsylvania to Maryland than there is for driving from West Virginia into Maryland. He explained that, with 53 pieces of legislation from half of the states, if every state were to have its own way, the vehicles would be required to stop at every border to meet a different set of legislative requirements. He suggested that a lack of cohesive policy is not a good recipe for fostering a technology and developing something that has a great potential to save lives, provide increased mobility, and afford an opportunity for convenience, as autonomous vehicles did when introduced. He stated that Google views autonomous vehicles as a nascent technology, and emphasized that it's a very exciting technology. Attention from lawmakers will eventually flatten the peaks and valleys of the approaches taken, because it will help the states develop regulations to exert whatever authority is needed to cover the vehicles. He further explained that the autonomous vehicles are road worthy and adhere to existing federal safety standards, while allowing software/mechanics to guide it rather than a human. He suggested an important policy question would be what, if anything, needs to be applied specifically "to the new operator of the vehicle." He stated that at this point Google would say, "Nothing."

1:16:28 PM

MR. BARNES said that Google has 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 will land prior to making policy assumptions about what it may or may not do. He related that the "wishfulness" for autonomous vehicles has existed since 1939 and the practicality has existed since the mid-2000s. In the last ten years the technology has progressed from functionless, to having a prototype vehicle which can drive passengers where they want to go safely and efficiently. He noted that it has been a quick ramp-up and there is still a long way to go in order to understand how the technology will be deployed, the best means for deployment, and the necessary guidelines for regulation purposes.

1:18:14 PM

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

MR. BARNES responded that the person in the vehicle could use their cell phone to call for a tow truck. He related that Google monitors its vehicles and is aware every action, every second, they are on the road. He stated that operation of driverless cars involves a very controlled set of circumstances, and offered that in addition to redundancies built into the car for safety purposes, there are also mechanisms by which the car can issue emergency alerts similar to existing systems that intercede on behalf of the driver such as sudden braking and airbag deployment.

1:20:47 PM

CHAIR MICCICHE asked, assuming Google knows everything about a driverless vehicles movements on a given highway, and considering that under current statutes liability is attached to the driver, who is liable for damages or injuries incurred in a collision.

MR. BARNES replied that the vehicle does not exist on its own, and ultimately someone would be the responsible party for the vehicle. Liability is a complicated issue; even in low-speed crashes in city intersections it could be difficult to sort out fault. The vehicles may be owned by one entity and operated by

another; therefore, they would be under someone's legal control. He mentioned that this line of inquiry is one that has piqued the interest of the insurance companies, which have had more than 100 years of experience with human mismanagement of vehicles. He acknowledged that generally humans are pretty good behind the wheel, but there are times when that is not the case. The legal system is paying attention for how this will be applied to laws governing torts; an area of interest for everyone who is involved in the technological development, as it's very transformative to take the human element out of the front, left seat. He said this is something that his team considers on a daily basis.

1:23:28 PM

SENATOR BISHOP noted that the vehicle requires the use of sensors and lasers, and asked what's been done for cold weather testing and where has it occurred.

1:23:59 PM

MR. BARNES replied that cold weather and certain weather formations present a challenge for sensing technology. He said there are millions of raindrops falling from the sky during a rainstorm, but not each of those raindrops is something that requires a vehicle to come to a stop for, and the same is true of snowflakes. The issue of sensing the environment in challenging weather situations is a known, and the technology has been developed in southern California where it is typically sunny and 75 degrees. Google is working to graduate the technology to function in conditions which more approximate the rest of the country and the world.

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

1:25:18 PM

SENATOR EGAN noted that the technology for the vehicles is dependent on interfacing with the Google Earth application and the global positioning system (GPS). He asked what happens when a vehicle loses its GPS connection.

MR. BARNES replied that although the vehicles mapping is based on Google Maps, the driverless technology doesn't work exactly like a smart phone or tablet that interfaces with GPS coordinates to obtain directions from one location to another.

He reported that the vehicle could not, in its current form, be taken to "Anytown, U.S.A." and be directed to drive to the pizza shop or the library; requiring specific Google mapping for the area. He explained that prior to operating the driverless vehicle in an area, the Google car team first maps the locale in great detail. The driverless vehicle relies solely on its operating computer to provide a comparison to the detailed map, in order to determine where it is and to be able to maneuver autonomously.

SENATOR EGAN opined that Google Maps worked great and asked what happens when the vehicle loses connectivity.

MR. BARNES stated that as of now, the autonomous car does not rely on connectivity to Google Maps, but on the downloaded, detailed map of the area...

SENATOR EGAN confirmed that losing satellite connectivity would not create a problem.

1:28:30 PM

CO-CHAIR HUGHES asked about liability requirements and offered her understanding that some states are requiring that steering wheels and brakes be retained in the vehicles.

MR. BARNES stated that Google is currently responsible for the actions of the car and wants to ensure a safe product. The car is a result of research, but fostering the technology shouldn't be construed as "providing the recipe for the technology." He noted that the secretary of the U.S. Department of Transportation has announced a driverless vehicle working group through the National Highway Traffic Safety Administration (NHTSA). 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 are requiring brakes and steering wheels be retained in all autonomous vehicles. She said Google is not a manufacturer and that requiring breaks and steering wheels could make state to state travel difficult; considerations for the committee to ponder.

MR. BARNES commented on the federal state interplay issue, explaining that there are federal motor vehicle standards that are applied nationally. Google would like to see autonomous

vehicle regulations solidified on a national level. The role for state legislation may become evident as the technology is deployed. He explained that his role within Google is to offer advice to legislators regarding how to view self-driving cars and provide insights into what Google is doing.

1:33:36 PM

MR. BARNES began a PowerPoint presentation, available in the committee packet, directing attention to slide 2, which provided a picture of an exhibit from the 1939 World's Fair, called Futurama, where people are viewing a scale model of a city populated by autonomous vehicles. He pointed out that 1939 was not far away from the initial days of the Ford Model T, and already people were thinking of ways to remove the driver from the equation.

1:34:56 PM

MR. BARNES said slide 3 [showing a family of four playing a board game in a self-driving vehicle on a freeway] depicts the 1950s version of autonomy, and was used in an advertisement for a power company. The idea for the technology depicted was a result of the electric company imagining an opportunity to use electric magnets to guide the vehicle on the road; depicted as hash marks in the image.

1:35:36 PM

MR. BARNES turned to slide 4, titled "Leading Causes of Death in the United States," and pointed out that the causes listed have provided the impetus to take the driver out of the equation. He directed attention to the peaked red line, indicating the percentage of motor vehicle accident deaths, to state that 32,000 people in the U.S., and 1.2 million worldwide, die annually as result of motor vehicle accidents. Google considers this to be an unacceptably high number, especially for an action that could be corrected by removing the human variable. He added, "Also by removing some of the human variable you get humans back into the equation."

1:36:49 PM

MR. BARNES moved to slide 5, and explained that Steve Mahan, a blind man, was one of the first people to ride in a Google self-driving car. Google asked where Mr. Mahan wanted to go or what he wanted to do, and the answer was to go to the cleaners and

Taco Bell. Although Mr. Mahan's work is only 30 minutes from his home in a personal vehicle, reliance on other travel means requires two hours. Certainly, he assured, Google is not trying to replace mass transit with individual cars; however, self-driving cars could be a transformative technology for the elderly or disabled to regain a level of lost independence. He explained that self-driving cars may also appeal to people who prefer to start work as they leave their driveway instead of upon arrival at their desk.

1:38:56 PM

MR. BARNES turned to slide 6 to address the topic of traffic, and said heavy traffic is a global problem. Google executives think that autonomous vehicles could be one way to alleviate traffic congestion by providing efficient options, such as a share vehicle which could transport 10 individuals throughout the course of the day. A multitude of potential uses for a vehicle left to its own devices exists. A vehicle that doesn't require a human to guide it from point "A" to point "B", could even result in societal benefits.

1:39:58 PM

MR. BARNES said the Defense Advanced Research Projects Agency (DARPA) held a series of contests to encourage engineering schools and researchers to develop practical, autonomous vehicle solutions. The first contest was a race over a 132 mile course. The furthest any car got was 7 miles; however, by the third event, every car finished the course. He said that over the course of three years, autonomous vehicles have evolved from non-independent function to being able to navigate a situation over long distances. The founder of Google, hired the winning teams head engineer, whose team assembled the self-driving car depicted on slide 1.

1:42:25 PM

MR. BARNES explained that slide 8 shows maps from some of the driving that Google has conducted using its first self-driving vehicles. One of the maps was created by driving down the famous "serpentine like" Lombard Street in San Francisco, California. This famed street is good for testing the vehicle, due to the multitude of externalities, which include: a downhill grade, left and right switchback turns, and the presence of numerous pedestrians.

MR. BARNES moved to slides 9 and 10, and said that a Toyota Prius was among the initial lineup of Google's test cars but the Lexus hybrid sport-utility vehicle (SUV) has emerged as the long-standing model. Mr. Barnes pointed out the laser located top of the car and the camera underneath the rear view mirror. He explained that it's through these sensors that the car views the world and orients to everything happening around it. He said it's not enough for the vehicle to sense its orientation, it must also recognize potential obstacles. One lesson Google learned from the earlier prototypes is that when a driverless vehicle tries to re-engage a human driver, for safety reasons, there is a lag time for the human to gain situational awareness in order to assume command. Thus far, there is always someone in the driver's seat and another person in the passenger's seat.

1:45:58 PM

REPRESENTATIVE NAGEAK asked what happens when a human driver is under the influence of alcohol or drugs.

MR. BARNES replied that Google would not allow an impaired human driver to take over command.

REPRESENTATIVE NAGEAK clarified that he meant the driver of another car, not the self-driving vehicle; Google has no control over other drivers.

CO-CHAIR HUGHES restated the question, to ask how an autonomous car would handle a situation where another car in the vicinity was out of control.

MR. BARNES responded that the human driver, in the autonomous car, could override the system and take control to guide it out of the way. The autonomous vehicle default priority is to maintain a safe situation. He admitted that one of the major challenges in driving any vehicle is the ability to comprehend and respond to other vehicles/drivers.

REPRESENTATIVE NAGEAK offered a scenario where the human riding in the driver's seat of an autonomous car is reading a book and not aware of others on the road. He asked how Google's self-driving car reacts to situations that occurs out of the blue.

MR. BARNES answered that driving 1.4 million miles, which is what Google has undertaken, is the key. He explained that much like human drivers, the Google autonomous programs rely on real life experiences to learn and build a profile for the self-

driving vehicles. In Washington, D.C., there are many bikers and bike lanes, but not all bikers are in the bike lanes. He explained that when bikers are present in bike lanes, a driver anticipates the biker's action. Google is doing something similar with the autonomous car by situation programing that directs the car to a position of safety.

1:50:22 PM

SENATOR EGAN offered his assumption that collision avoidance technology is built into the Google vehicles.

MR. BARNES concurred, and explained that the mainstream cars being produced, now have collision avoidance technology to essentially override a human's instinctive response in a known circumstance. He informed the committee that the view that a Google car has of the world is superior to that of human drivers. For example, the radar can detect a bike rider through a hedge before he/she enters the human driver's visibility. The instinct, when programming these cars, is to default to safety, he said, noting that there are random variables over which Google has no control.

1:52:36 PM

CO-CHAIR HUGHES considered how, during the time of the Wright brothers, no one imagined the jets of today and their capacity to fly several hundred people at once and possibly crash. The self-driving vehicles are still in the test phase, she acknowledged and asked how many miles have been driven and what types of accidents have occurred that are attributable to Google technology.

MR. BARNES answered that Google has only experienced one incident, with an excess of 1.4 million miles being driven since 2010. The accident was at a very low speed, between two and five miles per hour (MPH). He reported that, in one week, Google drives its test vehicles in excess of what the average American drives per year. A substantial number of driverless cars are on the road in Mountain View, California. He relayed that there have been incidents of the Google cars being rear-ended or a collision when a driver ran through a stop sign, but none of these incidents were the fault of the self-driving cars. The benefit of such incidences is that now the Google vehicles know what happened, understood why it happened, and can account for the factors in future situations. Additionally, instead of one driver/person having a learning experience, all of the

Google cars have received information regarding the incidents and the benefit is thus multiplied.

1:56:07 PM

REPRESENTATIVE CLAMAN asked Mr. Barnes if he has had an opportunity to ride in a Google self-driving vehicle.

MR. BARNES answered yes.

REPRESENTATIVE CLAMAN asked Mr. Barnes to describe his firsthand experience. Additionally, he asked for a description of the Mountain View area, where most of Google's cars reside, whether the locale is comprised of primarily city streets or highway/interstate travel. He asked whether, when speaking about the entire fleet of cars, how the learning advancement occurs: via artificial intelligence (AI) software, or human reprogramming by someone in an office entering in new data. He offered his understanding that part of the effort with AI is to have computers learn from things and build knowledge into the database without someone having to rewrite the program to accommodate for new information.

MR. BARNES replied that Google engineers reviewed the incident and ran a few thousand scenarios based on what happened. The generated data was then entered into the operating system of the vehicles allowing the cars to anticipate similar incidences in the future.

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

MR. BARNES replied yes and no; Google is advancing machine learning. He shared an anecdote of a Google self-driving car which encountered a duck in the road that was being chased by a lady in a wheel chair waving a broom. What the vehicle accounted for was a sudden obstacle in its travel path followed by a continuing obstacle. The Google software and technology is able to account for experiences and build that into the profile of what might happen and what might be done to manage the situation, much like a human driver does. He shared his experience of riding in one of the Lexus models and how exciting it was to experience the car as it made driving decisions, such as acceleration and steering.

2:00:13 PM

MR. BARNES explained that Google's initial work was on highways because there were fewer variables on the open road. He described the picture, slide 13, as being a complicated intersection with train tracks, cars, and stop lights, and explained that the tests are designed to graduate in complexity. He said slide 13 is essentially what the car sees. He explained that the purple boxes represent other cars, the red boxes are pedestrians, and the yellow boxes represent bicycle traffic. Although in the scenario the Google car has the right of way, a red ladder in front of the car indicates that the Google car has not yet determined what the pedestrians and the cyclists are going to do. The interesting thing is that people in the Mountain View area have reported that Google cars are the worst cars to be around, because they obey every traffic law. The Google self-driving cars are also learning to accommodate human driver idioms, such as how they indicate their directional intent. He explained that the programing isn't about just converting motor vehicle code into ones and zeros and having the vehicles follow preset commands.

2:03:58 PM

CO-CHAIR HUGHES asked whether Mr. Barnes could report on the average accident rate for human drivers.

MR. BARNES replied no, and pointed out that it's important to distinguish between reported accidents versus incidences. He said that although he's never been in a major accident, that doesn't mean there haven't been close encounters. He elaborated that he's bumped into another vehicle at a traffic light and he's been rear ended at an intersection. He explained that those incidences did not get reported, because there was no damage, which if reported would put a significant boost in the accident rate. He questioned whether humans drive as safely as statistics indicate. He stated that for the self-driving vehicle to have one incident in 6 years, over 1.4 million miles, was a good safety record.

CO-CHAIR HUGHES agreed and noted that Google cars are operating at 25 MPH or less. She said human safety is a big concern when deciding whether or not to implement the use of self-driving vehicles.

2:08:04 PM

SENATOR EGAN posited that driving at 25 MPH under the posted speed limit creates a hazard.

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

2:09:44 PM

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

MR. BARNES replied no. He explained that once the maps are loaded into the car, it becomes familiar with that particular area. He explained there were technologies that allowed vehicles to interface. He stated that the goal for Google is to use existing computing technology, brainpower, and resources to make autonomous vehicles work. He said are many questions that needed to be answered such as: deployment of self-driving vehicles, will they be privately developed, licensing requirements, and whether to implement the technology into low-speed or high-speed cars.

2:12:38 PM

CO-CHAIR HUGHES asked whether an ethical program has been developed to provide decisions such as choosing whether to hit a cat versus hitting a child, or a pedestrian verses another vehicle.

MR. BARNES replied that it poses an interesting philosophical question with very concrete practical outcomes. The important thing is being able to account for the type of situation being encountered. He said that in terms of ethical decisions, much like the duck in the road, the cars can't be programed with every possible scenario. He explained that self-driving car decisions evolve from gathering information from situations, based on the available set of circumstances, to bring the situation back into safety. He said that in some way it's not too different from human decision making. Humans are programming the vehicles, thus the values of humanity are inherent to the cars. He said that Google's safety program director worked for the federal government for 30 years advising federal safety standards for motor vehicles, and assured members that the safety standards are not being determined by unqualified, technicians or engineers.

2:15:29 PM

CO-CHAIR HUGHES offered her assumption that the programming would contain a type of ranking system to direct the car to hit another vehicle instead of a person.

MR. BARNES offered that there could be a myriad of variables versus two choices. Google executives understand that there are situations where a moral choice may need to be made to arrive at the "least worst" result. The human element may be a detraction as much as a boon, if a driver is distracted or not aware of an approaching situation. An autonomous vehicle may provide an improved response time as well as quickly analyze the various options.

2:18:07 PM

CO-CHAIR HUGHES pondered whether driverless cars would be in general use road use in three to five years or longer. She asked how industry/manufacturers are handling states that are not considering autonomous technology and a means for incorporating it into their long term transportation planning. Additionally she queried how the road ways and traffic signals might look different in the future with the implementation of autonomous vehicles.

2:19:32 PM

MR. BARNES replied that roads will continue to host a mix of people who prefer to drive themselves, as well as autonomous vehicles. The full-speed vehicles will take longer to refine than the high-speed, and low-speed cars will be best suited for an urban environment. He envisioned that parking may change to be more peripherally located from a downtown area since the autonomous cars will be able to drop drivers/passengers off and then park independently. Requirements for parking space may be lessened with smaller autonomous cars taking the place of larger cars and trucks. Regarding long-term planning, he advised that states review existing codes now, to eradicate hindrances when the autonomous vehicle technology is deployed. He noted that there are some key questions for states to consider in the future scenario, and offered: "How would we like to see all of this play out; what do we need to do to get there; and do we think the technology is going to develop in a way that will get us there?" He mentioned one use for autonomous vehicles would be to shuttle individuals to medical appointments.

2:21:29 PM

CO-CHAIR HUGHES inquired about the state's autonomous vehicle involvement, and where Alaska stands 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 the statewide long-range transportation plan is undergoing an update and the draft is due later in the spring. It represents a policy level plan, with considerations being reviewed to provide a 20 year forecast. He reported having recently attended a national conference which highlighted the issue of autonomous vehicles being on the horizon. He said that DOTPF is considering not only vehicles for the type of uses being discussed here today, but also for freight shipping. The department is reviewing preliminary technology that would allow freight trucks to travel in platoons for fuel efficiency. He said that the draft transportation plan contains a statement, which he read as follows:

> [DOTPF] 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, although this is a blanket statement, it indicates that the department has autonomous vehicle technology on its radar screen and is incorporating it in the agency's long range plans.

2:24:33 PM

CO-CHAIR HUGHES asked whether his attendance at the conference would allow him to speak more about individual manufactures the different things the companies have planned.

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, and the only person who was injured, when the Oakland Bridge cracked,

was a driver 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 is able to distinguish a duck from a police officer. The statistical advantage of a self-driving car is that it will obey all traffic laws, and conjectured that insurance companies could experience a lower frequency of incidences, if everyone were in a Google driven vehicle. The moral dilemma remains, he finished.

2:27:26 PM

MR. BARNES offered his understanding that the moral dilemma is demonstrated in crash statistics and that obviously humans don't do well when faced with a dilemma. He reiterated that it's humans who are doing the programing, and they are aware of the results of their actions. It's one thing if a technician miss programs the location of a restaurant, as such a mistake doesn't represent "an end of the world situation." One engineer has confided in him that his participation in developing autonomous vehicle technology stems from his not wanting his own son to face the dangers of driving a vehicle. Mr. Barnes pointed out that a father would be loath to invent technology that would harm his children, and he asked for committee member's trust in the humanity of the people who work for Google. Ultimately choices will be carefully made decisions programmed to bring an autonomous vehicle to a "least worst" outcome.

2:29:49 PM

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

MR. BARNES answered yea, as far as he is aware; however, there are undoubtedly other manufacturers developing similar software. He explained that Google Maps is an open source program, which allows it to 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 to cover the city.

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

SENATOR EGAN asked Mr. Barnes about a possible scenario of traveling between cities in Southeast on the Alaska Marine Highway System (AMHS). When traveling to Ketchikan from Juneau, would the self-driving car know to download the data for Ketchikan upon arrival.

2:32:01 PM

MR. BARNES answered that the technology does not yet allow for that type of adjustment. Google technicians are still working out how to make the data operate in real time and everywhere under every circumstance. He opined on the exiting advancements that Google has accomplished, primarily in the area of "machine learning," where the vehicles computer assimilates new information to understand a situation and develop an appropriate action. He said that Google's AI system, "AlphaGo," recently defeated the reigning "Go" game champion in Seoul, South Korea. [The game of Go is considered to be extremely complex with more variables than chess and requires an intense anticipation of the opponent's probable moves and options.] The computer analyzed the situation and interpreted the game, including the human variable of playing against a person. Thus, the computer attained the ultimate goal of understanding and learning and was not simply processing 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 explained that making government data publicly available allows others to take that information and turn it into something useful. To the point, he said Google Maps was initially a static map until someone, from outside the company, decided to plot the locations of rental housing units, which they were able to do because it was open data. He said that Google thrives off of open data to determine when a bridge or a road might be closed, as well as if a warning or alert has been issued. He said that those factors will become increasingly more important as autonomous technology continues to be developed.

2:37:26 PM

CO-CHAIR HUGHES noted that autonomous cars might not have a person riding along, and asked how law enforcement would handle a collision involving two cars, one with a driver and one without a human presence.

MR. BARNES answered that is a real scenario. Emergency vehicles required certain treatment depending on their approach, and the recognition of whether or not it's in pursuit. It's also important for an officer to be able to have someone to contact when an accident occurs. He said that currently Google self-driving cars operate in a closed universe, and are not operating unattended.

CO-CHAIR HUGHES asked whether Google has actual human-driven cars keeping the autonomous cars in a line of sight during tests.

MR. BARNES offered that the autonomous vehicles are never unmonitored, but he said he is not familiar with whether there is a line of sight protocol.

2:40:06 PM

CO-CHAIR HUGHES conjectured that, if the computers in the vehicles are self-contained, there must be a person nearby. She reported that Legislative Legal and Research Services have reviewed state policy for requirements that would inhibit the use of autonomous vehicles and there appear to be no conflicts. She asked for comment on the conflicting requirements held by some states, such as: a licensed driver must be present; vehicles will have a steering wheel; and vehicles will have brakes.

MR. BARNES said that the premise of a driver's license is to demonstrate a qualification to handle a vehicle and an understanding of the rules of the road. He explained that requiring a licensed driver in the vehicle is inhibitive and prevents elderly or people with impairments from gaining the mobility and independence that Google has intended its autonomous vehicles to serve. He declared that he does not understood the premise of the requirement for a licensed driver. Google has argued against special requirements from states, such as a licensed driver and a designated license plate. He explained that the use of a designated plate announces to the world that it's an autonomous vehicle. He suggested that incidences of "hot dogging" might increase, and explained the term to mean a driver who swerves or demonstrates other adverse activity to see how the autonomous car will react. He opined that requiring that type of announcement to the world undercuts the benefits of the technology on the whole.

2:44:23 PM

JOMO STEWART, Fairbanks Economic Development Corporation, said that a major project in Fairbanks is cold weather testing. He said that the city has marketed itself as the premier location to do cold weather testing due to its affordability, accessibility, and reliability. He explained that extensive infrastructure has been built to attract researchers and that that the military has done a good job of boosting interest and facilities in Fairbanks.

2:46:34 PM

MR. STEWART opined that legislation is usually passed for the safety and harmony of the residents, but from time to time legislation it is adopted for reasons aligning with the pursuit of opportunity. He offered his observation that the today's conversation has focused on the mitigation of back-end eventualities that will occur far in the future when autonomous cars are fully operational. He said that, as an economic development professional, he is interested in the opportunity to be on the front end of autonomous vehicle technology testing. Google needs to test its autonomous cars in cold weather and Fairbanks would like to extend an invitation to the company for that purpose. The regulatory and legal structure can be worked out once the technology is fully operational. He noted that the University of Alaska Fairbanks (UAF) Research has successfully worked with industry on Unmanned Air Vehicles. He expressed a desire for Google to visit Anchorage, Fairbanks, as well as Juneau.

CO-CHAIR HUGHES thanked the day's participants.

2:50:54 PM

**ADJOURNMENT**

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