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Chair

The Honourable Judy A. Sgro

Standing Committee on Transport, Infrastructure and Communities

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● (1525)

[*English*]

The Chair (Hon. Judy A. Sgro (Humber River—Black Creek, Lib.)): I call the meeting to order.

Before we start the testimony, I need permission from the committee to try to get some testimony in before the vote in spite of the fact the bells are ringing. Do I have unanimous consent from the committee to hear the witnesses?

Some hon. members: Agreed.

The Chair: Okay, that's good. Thank you very much. We'll go on.

This is the Standing Committee on Transport, Infrastructure and Communities, 42nd Parliament. Pursuant to Standing Order 108(2), we are doing a study of automated and connected vehicles in Canada.

With us today are Jeremy McCalla, Global UAV Technologies Limited; Bern Grush, from Grush Niles Strategic; and Mark Aruja, Chairman of the Board, Unmanned Systems Canada.

I understand, Mr. Grush, that you have a short video you would like to show us at the end of your testimony with the others today. It's in English only, but you have brought the transcript, which the interpreters have.

Do we have unanimous consent to allow Mr. Grush to show us the video after the testimony of the other gentlemen? Is that all right?

Some hon. members: Agreed.

The Chair: Mr. McCalla, would you like to begin?

Mr. Jeremy McCalla (Manager, Business Development and Operations, Global UAV Technologies Ltd.): Sure.

The Chair: You have five minutes, please.

Mr. Jeremy McCalla: Good afternoon, everyone, and thank you for the opportunity to speak in front of you today.

I am proud to stand here before this committee and discuss some aspects of the unmanned aerial systems industry in Canada.

My name is Jeremy McCalla. I have been involved in almost every aspect of the unmanned aerial systems industry, from UAV piloting to owning my own business, over the past several years.

Currently I work with Global UAV Technologies, a vertically integrated, publicly listed unmanned aerial systems company in Canada. Our company owns and operates service companies specializing in unmanned airborne geophysical surveying and photogrammetry, a Canadian UAV manufacturer, and a regulatory consulting business. All of our current operations are under the existing regulatory framework of Transport Canada, and we are currently working very hard towards a compliant unmanned aerial system and full compliant operator status for our survey companies.

Most of our survey work takes place in remote areas, away from aerodromes, towns, and even public roads. A lot of times we fly unmanned aerial vehicles at low altitudes, sometimes only 10 metres above the treetops. This type of airborne geophysical surveying is performed mainly by piloted aircraft today.

Flying manned aircraft for geophysical surveying is extremely hazardous and dangerous, even for the most experienced pilots, given the monotonous nature of the flying and the low altitude. In fact, according to the International Airborne Geophysics Safety Association, between the year 2000 and the year 2017 there were between five and 15 deaths per year for survey operations.

Currently visual line of sight operations for unmanned aerial systems are permitted in Canada with special flight operations certificates. Although this system is sometimes slow and can be convoluted, it works, and it gives us an environment that allows us to be economically successful. However, to enable growth in the unmanned aerial systems industry, move manned aviation away from dangerous jobs, and enable Canada to lead other countries on the global stage, routine operations beyond the visual line of sight are required, especially in remote areas.

The business prospects, both nationally and internationally, could far be enhanced by a more aggressive time frame on opening up beyond visual line of sight operations and solidifying visual line of sight operations into a regulated, as opposed to a case-by-case, environment. Furthermore, allowing for an alternative unmanned aerial system solution to dangerous manned aviation jobs such as airborne geophysical surveying could save lives.

The ability for Canadian companies to access capital, plan for the future, and invest in research and development could also be enhanced by a more aggressive time frame for opening up beyond visual line of sight operations and solidifying visual line of sight operations into a regulated environment.

Currently, without a clear path forward, companies and investors are sitting idle or looking toward expansion plans in other countries where regulations appear to be moving in a direction favourable to the unmanned aerial systems industry.

We understand that aviation is, and always will be, heavily regulated, and we understand and agree that the flying public and people we fly over need assurances of safety. We also feel that given past resources, Transport Canada has done a good job handling the enormous growth of the unmanned aerial systems industry in Canada.

With budget 2017 allocating more money for Transport Canada, dedicated groups such as Unmanned Systems Canada, and a hard-working unmanned aerial systems sector, Canada still has an unbelievable opportunity to become recognized around the world as having one of the most progressive approaches towards regulating unmanned aerial systems, something that is not only good for Canada but also good for Canadian businesses, research institutions, and students.

We believe that the beyond visual line of sight proof of concept recently released by Transport Canada and some of the proposed changes to visual line of sight operations are a positive step in the right direction. However, there is room for improvement.

What we ask is that industry stakeholders be more involved in the process of developing routine beyond visual line of sight operations and developing a regulated environment for visual line of sight operations that works for everyone, ensures safety, and allows for economic growth.

We also ask for more transparency from Transport Canada in how they are developing their regulations and a timeline for regulations that can be adhered to.

Thank you.

The Chair: Thank you very much.

Would you like to go on, Mr. McCalla? Oh, it's the next gentleman over there. I'm sorry.

Go ahead, Mark.

Mr. Mark Aruja (Chairman of the Board, Unmanned Systems Canada): Good afternoon. I appreciate the opportunity to speak to you today once again on behalf of Unmanned Systems Canada, the national association that represents the unmanned vehicle systems community and our 500 members.

I bring to you today insights gained from over a decade of unmanned aerial systems experience with policy and regulatory development, an integral component of the autonomous vehicles discussion.

Whether airborne or on the ground, these mobile devices are part of a much larger enterprise connected through communication networks to data processing systems and analytical tools. This integrated ecosystem is already demonstrating significant improvements in our productivity, safety, and security, and we've only just begun.

My talk today connects hockey and farming.

As public policy-makers, you need to firmly grasp, as Gretzky said, where the puck is going to be. I'm going to start with where the puck is today, using agriculture as an example, and then share experience with where the puck has been, and end with a few recommendations and requests.

Two major technological trends are driving a change that is transforming our society. These are human sensing being replaced by machine sensing and human decision-making being replaced by data analytics and deep learning. What will that future look like?

Effective public policy will allow us to shape the expected benefits to society, create opportunities, and balance those with an understanding of the risks. That's how we get to where the puck is going to be.

Where is the puck today?

The advent of precision agriculture is truly revolutionary, opening up great possibilities. Starting this spring, every day UAVs will be flying automated missions to image fields for precision such that individual corn plants can be distinguished and characterized. The imagery is combined with many other data sources. It is processed and analyzed, with decisions made often within hours. These decisions on matters such as pesticide applications or seeding are fed digitally into autonomous tractors or other UAVs, which precisely apply that prescription. Farming is becoming evidence-based. Decisions that used to be applied to a field are now applied by the square metre.

Where has the puck been?

In 2006, we first engaged Transport Canada to develop UAS regulations, regulations for unmanned aircraft systems. By 2010, we had implemented a jointly developed road map with a crawl-walk-run strategy. Those efforts guided investment and innovation. In a decade, the UAS industry grew from 80 companies to over 1,000. However, as talented and dedicated as the staff at Transport Canada are, they were not resourced for the task until a decade later, in the budget of 2017.

The result was that in July of last year the first draft regulations for drone operations were published in the *Canada Gazette*, part I, reflecting a view of the puck being in our skates—obsolete on arrival. As I briefed you in 2016, the economic demand today is to survey that farm on a scale of thousands of acres at a time, not hundreds, meaning that we must be able to operate beyond visual line of sight, which is not yet permitted.

We have two critical concerns. When we had a road map to define manageable goals, we demonstrated success. Let's get back to doing what works. Today we have no road map from Transport Canada to guide the urgent work that we need to jointly undertake. We are steadily losing our global competitiveness, falling behind Europe, the United States, and Australia, to name a few.

Second, Transport Canada needs a formalized risk assessment process. Industry has a vested interest in managing safety risk and has worked for the last two years to develop that capability. Our needs are mutual, and this shortcoming will implicate automated road vehicles as well.

How can we get the puck out of our skates?

We commend the Advisory Council on Economic Growth report as a framework for shaping national policies to spur market development and accelerate the adoption of autonomous systems and new business processes. We also commend the recommendation in the Senate committee's report “Driving Change” to develop a pan-government policy-making framework. There is no government department that isn't implicated by the changes that are under way.

Our advice to the autonomous vehicles industry and government is to set policy to describe the future. Develop best practices and then incrementally validate them through testing. Then, when you're really confident, make regulations. Expect this process to take a long time—but if you do it the other way around, it will take a lot longer.

Ensure that Transport Canada is resourced now to undertake the challenge of autonomous systems. As a footnote, do not separate autonomous cars from UAVs and the other elements in this common ecosystem.

● (1530)

Finally, we have two specific requests for this committee. We ask that you request Transport Canada to develop a road map enabling the UAS industry to move forward without further delay, and second, that they work with industry to develop a formalized risk management process.

Thank you.

The Chair: Thank you very much. I appreciate that.

Mr. Grush, would you like to present your video now?

Mr. Bern Grush (Strategist, Autonomous Transit, Grush Niles Strategic): I want to open with a few words.

Thank you, Madam Chair and members of the committee, for the opportunity to comment regarding impacts of vehicle automation on cities and public transportation systems. My name is Bern Grush. My background encompasses human factors, human attention, artificial intelligence, and systems design engineering out of the University of Toronto and the University of Waterloo.

I'm a founder of Grush Nile Strategic, a think tank focused on finding ways to deploy automated vehicles to promote environmental sustainability, social equity, and urban livability with regard to human transport.

[*Video presentation*]

I would like to make two additional observations about vehicle automation specifically for moving people. First, the future of automobility will include two markets, market one for selling and buying personal or family-owned vehicles and market two for selling and buying rides hired only for the duration of a single trip.

Today market two includes all forms of for-hire vehicles, such as taxis, ride hailing, and car share, and includes all forms of transit. This is critical, because these two markets give us two distinct worlds for urban planning. AVs will sustain the 125-year-old competition between public and private modes. Both markets will be very large and will continue to challenge planners to accommodate large numbers of personal vehicles while concurrently seeking ways to harness massive fleets of shared vehicles to benefit urban populations.

Planners, concerned with efficiency and environment, are biased toward fleets of shared vehicles, but the revealed preference of the majority of travellers is biased toward private automobile ownership. Current assertions that this will change significantly are based on wishful thinking and are without reliable evidence. A shift to shared-vehicle mode will occur only if we take strategic and proactive policy decisions.

I recommend three things: that government begin an immediate migration to regulations that require AVs to be zero-emission vehicles, impose distance-based road user fees, and implement demand-based parking fees in all public, commercial, and employee spaces.

My second point is that during their early decades, AVs will not achieve full SAE level 5 automation. Market one personal vehicles will retain user controls, allowing them to be driven anywhere. These vehicles will increase average trip distance and frequency. They will increase sprawl by reducing the discomfort of driving in congestion.

● (1535)

This will encourage more families to acquire these vehicles, further worsening congestion. These vehicles will continue to demand an average of four parking spots each, since they will still be parked a majority of the time and will still tend to remain near their owners.

At the same time that this is happening, market two driverless for-hire vehicles will be geofenced—i.e., constrained to carefully mapped roads. These will be robotic taxi and shuttle systems that will appeal first to travellers who are already using taxis, ride-hailing, or using transit. Such fleets will recruit heavily from existing public systems, disrupting transit just as ride-hailing disrupted our taxis. Without government oversight, this will threaten social equity.

I recommend incentives for today's commercial ride providers to encourage rides from and to transit hubs, to increase average vehicle occupancy, and to add transport for disabled travellers and for people from transit deserts, all in a way that accelerates the process of reducing the number of urban trips in personal vehicles in order to prepare ourselves for the AV robotaxis that are coming.

Thank you.

● (1540)

The Chair: Thank you, gentlemen, very much. I appreciate your patience.

We are going to suspend and go off for the vote. We will immediately come back down. Please be prepared for some questions.

● (Pause)

●

● (1555)

The Chair: I'm calling the meeting back to order.

Thank you, gentlemen, for being patient.

We will go to Mr. Jeneroux as the first questioner.

Mr. Matt Jeneroux (Edmonton Riverbend, CPC): Thank you for waiting for the votes, and thank you for your presentations.

I do want to get your thoughts, particularly Mr. Aruja's, on where artificial intelligence is going in relation to agriculture, because we're seeing it in a lot of rural and remote areas in my province of Alberta with farm tractors and whatnot.

What aspect would rural broadband play into that? I know it's a concern for many small businesses in the area. I wonder if you have any comments on that.

Mr. Mark Aruja: Rural broadband is a major issue for agriculture. It's also a major issue for the mining sector and others that are trying to move data so that it's processed in a timely fashion. For agriculture it's really important, because although mining might be able to process the data later, agriculture has a real turnaround time criticality.

Rural broadband strategy, I think, is part of this. It also has to do partly with spectrum management and things like the auctioning in due course of 5G spectrum with new generation networks. Moving the data so that these artificial intelligence processors can use it is critical.

● (1600)

Mr. Matt Jeneroux: We had some witnesses here earlier this week with regard to where the technology is now and where we are going. Mr. Grush, I believe you said in your presentation that it was about 2035 or 2040 when the threshold would be crossed and fully automated vehicles would start to take over from self-driven vehicles. Correct me if I don't have the dates right.

Is there concern with regard to that incident in Arizona that perhaps it's moving too quickly, or do you have thoughts that we're not moving quickly enough on the regulation side? I'd love to have your feedback.

Mr. Bern Grush: That's a good question, and the answer is quite involved.

Very briefly, that accident had aspects of technology failure. There was no reason to hit a pedestrian. The technology is beyond running over pedestrians. There was something turned off or something not working. We're not sure what that was and we can't speculate yet until the NTSB sorts that out.

We're not moving quickly enough to anticipate the changes in society, which is what my work is about. I won't say that we should move more quickly with testing in Canada, for example. I do think we should be thinking more about deployment as opposed to just testing, because we're a little bit lopsided in Canada. I'm from Ontario, and Ontario has testing programs, but that testing is about the technology itself. Clearly the technology is not ready; I'm not saying it is.

Also, the safety regulations that were in play in Arizona were very clearly insufficient. There are errors being made technically and errors were made in the regulatory area. I don't think we're making those regulatory errors here yet, but I also think we need to be pushing into further layers of anticipation about the social and infrastructural changes and not just the technology itself. The technology itself is a tiny part of a whole picture.

Mr. Matt Jeneroux: What are some of those infrastructure changes? What would you suggest? It doesn't necessarily fall on the federal government to do a lot of that, but the municipal and provincial governments, I'm sure, would be interested.

Mr. Bern Grush: When I say “infrastructure”, just as you include broadband in the infrastructure for UAVs, I'm including our transit fleets in the infrastructure for transportation.

Our habit for the past 100 or more years, for the most part, has been for government to acquire and operate transit systems, all the way from rail to buses. That “acquire and operate” methodology is very slow. The technology of the new mobility is moving very quickly. I'm suggesting that from that perspective, we need to move from the “acquire and operate” to a “specify and regulate” mode.

We have to use the technologies that are there now. We can't make those decisions quickly enough. Governance of transportation is far harder than some entrepreneurs inventing some new LIDAR or something like that.

Government can't keep up with the technology, but government has to keep the fundamental values of transit, which have to do with congestion management, moving large numbers of people to their jobs, and social equity. All of those elements of transit need to be preserved, and that's what's under threat if we just wait until these systems push transit aside. That's my greatest fear.

I hope that's a sufficient answer for you.

Mr. Matt Jeneroux: Maybe you can answer some of the other questions. I won't expect a response now, but what about in terms of actual physical infrastructure—lines on the road, stop signs, red lights, green lights, and that sort of thing?

The Chair: We'll go to Mr. Badawey now.

Mr. Vance Badawey (Niagara Centre, Lib.): Those are great points, great questions, Matt.

Sometimes I think we get caught up in the minutiae of the technology. Quite frankly, the technology isn't our priority. It's not our area. That's industry's priority. Let them drive that process—no pun intended. I think what's up for us to be concentrating on is being ready for that technology to hit us.

Mr. Grush, you're bang on with respect to the culture, with being prepared with the proper infrastructure, the proper integration of methods of transportation—whether road, air, rail, water—and integrating all methods of transportation that may be automated.

As well—and sometimes we don't think too deeply into this—there's the integration of the distribution logistics side of it when it comes to data management, information, and things like that. It goes a lot further than just the obvious.

My question is to all three of you. In your professional opinions, how would you recommend we start layering that dialogue in terms of what I alluded to, the other aspects, versus the actual technology of the vehicles themselves?

● (1605)

Mr. Bern Grush: The first thing we need to do is ask what the purpose is. Again, I'm focusing back on transit. Why do we have transit? What are our goals and reasons for it? It's not about how we go about it and how we did it before and how we can tune it, but why do we have it in the first place? If we don't understand why we have it, we're not going to be able to defend it in the face of the technology changes that are coming. That's the very first layer.

If we are clear, for example, on whether we agree or not that it's about social equity, whether we agree or not that it's about moving a large mass of people through a dense space.... If we agree that we're going to densify cities—and I'm not saying we should or shouldn't—then we need to ask how we're going to keep transit in that environment.

A very specific example is that it is absolutely certain that the robotic shuttles and taxis and so forth will threaten our municipal bus systems. There are a couple of thousand cities in Canada, and only a couple of hundred of them have transit systems. Many of those are threatened by these robot taxis and so forth now. What happens is that in those five or six larger cities that have subways, for example, these technologies are going to take away buses first, and that will take away some of the funnel into your light rail and urban rail systems. Those would then be the second systems under threat. How do we keep all of those people on those rail systems in spite of the convenience of coming out of their doors, getting into robotic taxis, and taking those taxis all the way to work, all 20 or 30 kilometres? I think that's the huge threat. How do we preserve our rail systems?

We're still investing in rail now in many cities. How do we think about preserving that value in spite of these robotic taxis?

Mr. Vance Badawey: Mr. Grush—and Mark, I'll go to you in a second—I think it's critical, and correct me if I'm wrong, that we establish that strategy, that plan, before we go to the next step, because we don't want to be going forward and then coming back. It's essential to know exactly how it's going to integrate, and then move forward with infrastructure adjustments, distribution logistics, integration, and things like that.

Mr. Bern Grush: But we have to say how it's going to integrate. We can't wait for Tesla or Uber to tell us. We have to decide how it's going to integrate.

Mr. Vance Badawey: Right.

Mr. Bern Grush: Then we have to put the regulations and motivations in place for it to happen that way, right? They'll build what you ask if that channel has been narrowed to that solution.

Mr. Vance Badawey: Mark, would you comment?

Mr. Mark Aruja: There are a couple of facets to this. One is—and I agree with Bern, in terms of the urban environment, for sure—that we have a lot of converging pieces to this puzzle. I would recommend this committee also talk to the Nokias, the Ericssons, the Teluses, and the AI industry to get a bit of a picture. They are driving a big part of this puzzle

I'll go back to the agriculture example. The advisory committee on economic growth recommended we set a policy of moving from fifth to second globally in the exporting of agricultural products. That is a really straightforward policy statement that will absolutely drive innovation that is connected directly to these systems.

I'll give you a really simple example of what you could do tomorrow—not next week, but literally tomorrow morning. You could say that the federal government will partner with any province that wishes to step up to test the driving of automated tractors on public roads. These tractors are all automated, but they can't go from field to field on a rural road. There's no technological barrier whatsoever to that, so it would be a very simple case study that would provide societal input in a very economic outcome-driven piece, if you will. The societal acceptance in that community would feed part of what Bern is talking about. Not everything is centred around Toronto and how they view things. There might be a different view in Lethbridge.

That would be an example of picking your battle, if you will. I think the advisory group has done a good job of that.

● (1610)

The Chair: Thank you.

[*Translation*]

Mr. Aubin, the floor is yours.

Mr. Robert Aubin (Trois-Rivières, NDP): Thank you, Madam Chair.

Gentlemen, thank you for being here and for your patience.

I was born in 1960. In my youth, we thought that, by the year 2000, people would retire at 55, that the work week would be four days and that there would be flying cars. Here too, we are looking 40 years into the future.

I tend to believe that technological change over the next four decades could lead to what you are describing. However, when I look at the other line that marks the decline in personal cars, it seems to me that the analysis needs to change. Somehow, you have to get rid of the pleasure of driving and the pleasure of owning a car.

How will it be possible to have those two lines cross, that is to say that the technology allows the development of autonomous cars, but also that consumers are willing to give up their cars?

What I'm seeing now, and it will probably be the trend for the next few years, is that clean cars, electric cars, are attracting a lot of interest. We can see it in Tesla's success, for example.

What will motivate people to opt for autonomous cars and lead them to lose the pleasure of driving?

The question arises all the more because, right now, we are not able to develop public transportation between major urban centres. This means that people are going to drive between Montreal and Toronto or between Quebec City and Montreal anyway. Why, once there, would they really have a blast driving an autonomous vehicle?

[*English*]

Mr. Bern Grush: Thank you.

That is a huge problem. The solution is not to make it miserable to own your car; the solution is to make it wonderful to use a shared vehicle.

There's a natural aversion to the sense of losing your car. I have a car, and I think from your question you have a car. There is a loss. You feel like there might be a loss of something. We're averse to that kind of loss. In order to have someone change something, the thing that they're going to change to has to be almost twice as good as the thing they're leaving. That's the challenge.

To make the activity of using a vehicle and not owning attractive is a much larger challenge than the actual technology challenge of making a vehicle run by itself. Your question is so far unanswered. When you hear people say that no one is going to need to own a car, that's true rationally, but it's not true behaviourally and economically. From a behavioural economics perspective, everything that you're saying is true. Many people prefer to keep their car, and that's a huge problem.

I wish I had the answer. If I had the answer, I would be very wealthy.

Here's what's worse. Right now in Canada, fewer than 10% of all trips are taken in a non-family vehicle. If we get 75% of all trips in a non-owned vehicle 30 years from now, the whole world population of cars will still be the same as now, because our demand for trips will increase, and our wealth increases. That's one of the reasons we demand more trips. A small change of moving from 8% to 18% won't make any difference at all. Our congestion problems are far bigger than a few people shifting to robotaxis. It's a very big problem.

Thank you for that question.

[*Translation*]

Mr. Robert Aubin: Thank you.

Mr. Aruja, you highlighted the importance of the roadmap.

Mr. McCalla, you talked about the importance of Transport Canada being transparent with the whole process that will be implemented over the next few years.

Could you tell us more specifically what you expect from Transport Canada to better align the industry's wishes with the government's ability to support those technological changes?

[*English*]

Mr. Mark Aruja: Thank you very much.

In 2007, we had an agreed joint plan developed, which had four phases. We are almost finished phase one, which is the initial regulatory release we're expecting with CG2 this summer. Phase two is kind of halfway, and phases three and four are about beyond visual line of sight—for example, how do we do sections of land, and how does Jeremy get to do hundreds of kilometres of line survey?

We know the industry–government working group relationship is fabulous. It's a great working relationship, but we're totally stopped. There's no visioning. We need something. It's not as if we don't know what we need to do, but it is not written down, it is not transparent, and there's no senior-level oversight, managerially or politically, to make this thing happen.

There are great aspirations. We want to grow our sector of agriculture from 6.7% of GDP to something north of that, but we have these sticky wickets in the way.

It irks me no end that the United States had no road map at all three years ago, but I can go on their website—and I know they're going to be updating their website in a couple of weeks—and I will have full transparency into that, and I will have that transparency for many other jurisdictions.

We need to not have folks just trying to addle their way through every day to what they think industry needs. Let's sort this out. We're not going to have a perfect plan, but let's get your one, two, three sorted out, because we have to deal with the technological change. It is unbelievably rapid, but we can't afford to have regulations drafted that don't reflect reality.

● (1615)

The Chair: Thank you very much.

We'll go on to Mr. Hardie.

Mr. Ken Hardie (Fleetwood—Port Kells, Lib.): Thank you, Madam Chair. It's a fascinating discussion today.

Mr. Grush, I'll probably spend most of my time with you because you've said some fairly provocative things. Let's put it that way. I suppose that's what you wanted to do, right?

Let's go forward to the time when most vehicles are automated, autonomous, etc. What do you predict the average speed to be on roadways?

Mr. Bern Grush: I'm actually going to answer that even though I have no idea. That's not been studied in the sense that I could provide a reliable answer, but I will say that when you say “most”, we're talking about the point where our highways, for example, in Ontario—

Mr. Ken Hardie: I would appreciate a short answer, if you could, please, sir.

Mr. Bern Grush: We're going to be very fast on highways and we are going to have to be much slower in cities. Just for pedestrian and bicycle safety, I would say in cities we'll probably be slower than we are now.

Mr. Ken Hardie: Okay.

One of the attributes of some mass transit systems is that they can move more quickly than the surrounding traffic if they're grade-separated. Has that kind of approach to mass transit factored into some of your strategy?

Mr. Bern Grush: No. I haven't really thought much about speeds, and the reason is that I'm just thinking mostly about social equity. My answer about slow is for safety.

Mr. Ken Hardie: Okay, but average speed will mean something to people who are interested in getting to where they need to go in a reasonable time frame.

Talk about the built environment. We have streets, curbs, cutouts for pedestrians, and a lot of other things. Will the built environment at street level need to change substantially for autonomous vehicles?

Mr. Bern Grush: At the very least, we need to do massive amounts of changes to our curbs. I would hope—and this is just a hope—that we would be removing street parking by then, "then" being 2040 or 2050, when a majority of vehicles will be automated. There would be no need for street parking. There would be a lot of need for cars to pull over and let passengers in and out, but we wouldn't need parking. Our curbs in our cities need to change dramatically.

Mr. Ken Hardie: It was interesting to hear you speculate that the number of vehicles on the road would not go down, and in fact might go up, which suggests that the land space we dedicate to roadways and parking will be not the same but even larger than we allocate right now. However, at the same time we're seeing a shift to the shared economy in a number of areas. We have shared ride services right now—we have shared cars, Uber, and a lot of things. Have you factored that proclivity toward more sharing of assets, as opposed to owning, into your estimates and strategies with respect to the onset of automated vehicles?

● (1620)

Mr. Bern Grush: When I talk about more congestion, I'm talking about more cars on the road. What would be absent would be parking. The expectation that I've drawn from my research is that parking would go up a little bit for a little while, plateau at some point, and then go down, but the actual number of cars on the road would go up and keep going up.

The reason the traffic is going up is that there are more people travelling further. Sprawl means more congestion. Sprawl means the average trip is longer. If the robotic services are inexpensive, it's far easier to hop into a vehicle. In other words, there would be more cars on the road, but almost none of them would be parking during peak hours.

Mr. Ken Hardie: If we have vehicles that are autonomous, that are in the Internet of things, that are well connected, that co-exist quite well with each other, will we come to the point where we will not be allowed to have hands-on driving anymore?

Mr. Bern Grush: I think so, at some point, in the same sense that I can't take a bicycle onto a highway or that I can't take a horse on most streets. I know it's kind of a silly example, but it is the case that there was a 40-year period in which horses and cars were mixed. I'm expecting about a 30-year or 40-year period in which driven vehicles and driverless vehicles will be sharing roadways in some way. They may be somewhat grade separated, but there is no way we can afford grade separation everywhere, so there is going to be mixed traffic at some point.

Mr. Ken Hardie: Mark, I want to build on your comments about the spread of high-speed broadband. Is that necessary for the operation of unmanned aerial vehicles?

Mr. Mark Aruja: That's a great question, and the answer is no.

Mr. Ken Hardie: Okay.

The Chair: Thank you very much.

We'll move on to Mr. Iacono, please.

[*Translation*]

Mr. Angelo Iacono (Alfred-Pellan, Lib.): Thank you, Mr. Chair.

My thanks to the witnesses for being here today.

I understand the importance of being proactive on this issue. I agree with my colleague Mr. Aubin. I love driving cars. What will happen to the Ferrari of tomorrow? Will it exist only so that we can admire its style?

Still, I have some doubts about the automobile. Even today, the automobile can be perceived by outsiders as a sign of wealth. I continue to believe that the need to own a vehicle will not diminish.

Congestion is already a problem. How can autonomous vehicles overcome this problem?

My question is for one of you three, and I would like the answer to be short.

[*English*]

Mr. Bern Grush: All of my work says that car ownership would still be 25% of all vehicles at the best. There is no way that car ownership is going to go away completely. I actually think it will be fifty-fifty.

[*Translation*]

Mr. Angelo Iacono: So, do you agree that we will have to build special roads for autonomous vehicles?

[*English*]

Mr. Bern Grush: In the end, no, but in the interim, yes. There needs to be some degree of thought and separation in these first 15 or 20 years. One of the biggest risks is that we will build something that's going to be for 10 or 15 years that we then don't need anymore, so there is a double hit here, a double expense.

[*Translation*]

Mr. Angelo Iacono: Could you explain to me whether the following scenario is possible?

Suppose I am in an autonomous vehicle, and suddenly I'm on a public road and the vehicle stops. At that point, is it possible for the vehicle to function as a regular car? It would be sort of like the cruise control option we have today. Would it be possible to have a dual system, an autonomous vehicle with some of the features of today's automobile?

[*English*]

Mr. Bern Grush: Yes, those already exist. Those are called "level 3" in those five SAE levels. Level 3 is called "conditional automation". You can turn it on, and it drives for you. When you don't want it to drive—for example, if you're in a place where it can't drive—then you turn it off, and you can drive. Those already exist.

● (1625)

Mr. Mark Aruja: I may have a bit of a different perspective, and let me tell you why. When you own a fleet of delivery vehicles, you can buy an application to track all of those vehicles. If someone stops at a Tim Hortons for more than 15 minutes, it will tell you. That technology is in your cellphone.

That technology, I believe, is going to be far more adoptable today, rather than grade separation and all of those things. We can put that into driving cars today to prevent going into a lane that has, let's say, autonomous vehicles in it. We have the technology today to do that, and we're implementing it today for UAVs. We're just putting a propeller onto the cellphone to manage it.

One of the things that was mentioned by Bern is called geofencing. This technology is now widespread out there. It makes sure that autonomous systems or unmanned systems do not go past a geographical barrier, and it goes right into the control system. The technology is here today. It is very simple to adopt it in a manually driven car.

[*Translation*]

Mr. Angelo Iacono: This week, witnesses have told us that the infrastructure to accommodate autonomous vehicles was not entirely necessary, but desirable. Manufacturers are designing their products on the assumption that such infrastructures will be poorly developed.

First, is it possible to do without specific infrastructure, or not?

Second, what kind of infrastructure is needed? Is having smart cities an advantage?

[*English*]

Mr. Bern Grush: I think it would be an advantage to have a smart city. I have to caution everybody in the room that these smart city ideas are new in the last couple of years, and they call for changes that would cost trillions of dollars. The city I come from can't fix its potholes, so I don't know how we're going to do this kind of infrastructure that you're describing, which is why the manufacturers in the autonomous space are saying they will develop systems that require no changes.

The problem is that if virtually all the cars are automated at some point in 30 to 40 years, but 10% to 20% are not, how will those last few cars survive in that environment? This is unresolved.

Your question is a very good one. There hasn't been a pathway to that solution yet.

Mr. Mark Aruja: You're going to have a shift from talking about cars to talking about data, and the UAV industry has made that transition, because the money is in the data. Cars are going to be a commodity. When the day comes that it's a shared system and it just shows up, you have no brand allegiance and you don't care what colour it is. You just care that it gets you there. There'll be no more attachment to it.

The data will drive it. The data is going to be where the money is, and cities and jurisdictions will need to figure out what slice of that revenue stream they need. We had this discussion in the case of Netflix. Where is that industrial Internet of things? Where is the carve-out on the taxes to support that infrastructure for the public good?

The discussion 10 years from now is going to have nothing to do with cars. I suggest it's going to be about the data moving on those networks, and those cars will be just a data source and a data sink.

Thank you.

The Chair: Thank you.

Do you want two minutes, Michael?

Go ahead.

Hon. Michael Chong (Wellington—Halton Hills, CPC): This is more of a comment.

When I listen to testimony, I wonder if the federal government has its infrastructure funding program set up right. For example, the public transit infrastructure fund, a $3.5 billion fund, is putting money into renewing bus fleets. In 2012 the TTC retired their last General Motors fishbowl bus that was purchased in the 1980s. These buses last for 20 to 30 years.

I hear about automation and the elimination of jobs and I listen to people like Mark Carney, who was referring to a Bank of England report that 15 million jobs in the U.K. are going to disappear. PricewaterhouseCoopers reported last year that 38% of all jobs in the United States will be eliminated in the next 12 years because of automation. I hear about the rapid transformation of vehicular traffic. Are we making the right capital investments by purchasing buses in our transit fleets in our large cities?

I also wonder about what happens to all these bus drivers and jobs and everything else.

It's more of a comment and something for us to think about as we embark on this study.

The Chair: Thank you to our witnesses. We very much appreciated your information.

We will suspend for a moment while our other witnesses come to the table.

● _____ (Pause) _____ ●

● (1630)

The Chair: I call the Standing Committee on Transport back to order. Under Standing Order 108(2), we are doing a study of automated and connected vehicles in Canada.

Welcome to all our guests: Denis Gingras, Professor, Laboratory on Intelligent Vehicles, Université de Sherbrooke; Scott Santens, Writer and Advocate of Unconditional Basic Income; and from QNX Software Systems Limited, Grant Courville, Head of Product Management, and John Wall, Senior Vice-President.

Mr. Gingras, why don't you start? You have five minutes, please.

[*Translation*]

Dr. Denis Gingras (Professor, Laboratory on Intelligent Vehicles, Université de Sherbrooke, As an Individual): Thank you very much for inviting me to appear before you and for giving me the opportunity to share my opinions on the field in which I have been working for more than 30 years.

We often have to ask ourselves questions about the motivation that drives us to make autonomous vehicles. Let's first look at our transportation system and our mobility issues.

In fact, it would be difficult to imagine a more inefficient transportation system than the one we currently have. Our transportation system is based on a business model that relies on the sale of vehicles and the individual ownership of cars. Population growth is constant, and part of the population moves to larger cities at the expense of the regions. In economics, the just-in-time method has been used. All goods that were transported by train are now being transported on our roads by road trains, which has contributed to destroying our road infrastructure. We just have to look at the current state of our roads to see it.

The occupancy rate of the vehicles is to the tune of 5%. Furthermore, 80% of people still travel individually in vehicles. You just have to compare the average weight of a person with the average weight of a vehicle, which is increasing because, according to statistics, people are buying more and more SUVs or vans: this is not going in the right direction at all.

There are still pollution-related issues. More than 80% of vehicles still have combustion engines.

In addition, vehicles are used for approximately one hour per day. Once again, the vehicle usage rate is about 5%, which is completely ineffective. Ask any business owner if they would buy equipment that they would use for only 5% of the time. Nobody would invest money for that.

As we can see, this is significant.

Fortunately, the transportation sector is currently experiencing a revolution around three major pillars. Clearly, there is the electrification of propulsion systems, but I will not talk much about it today. There is also the automation of driving, and the whole area of connectivity, of telecommunications systems. Those three aspects are bringing about a revolution in the transportation sector. This revolution will have major repercussions both in terms of business models and in terms of possible solutions to mobility problems. However, it is up to us to make drastic decisions in order to change course and improve our transportation systems. Like it or not, despite the digitization of our society and the importance of information technology, we remain physical beings manipulating physical objects and we will always have the need to move around.

I will now talk about automated driving.

Why do we want to have autonomous vehicles? There are two major reasons.

First, we want to improve road safety, because computers have a much faster response time than humans. In addition, because of the diversity of on-board sensors and current processing systems that are highly advanced and that continue to improve, including through artificial intelligence, we can come up with solutions to improve road safety and reduce the number of accidents, injuries and fatalities.

The second reason is that autonomous vehicles, as far as the concept of robotic taxis is concerned, can help us reduce the number of vehicles on the roads. Traffic congestions is really one of the major problems, besides the aspects related to the danger of travelling by road.

Telecommunications is also an interesting aspect because it allows us to consider the sharing of intelligence between vehicles and road infrastructures. So far, car manufacturers have invested all their efforts in including embedded intelligence in vehicles, while transportation agencies, departments and all public agencies that deal with road infrastructure have invested very little in their infrastructure to make them smarter. In the current situation, there is an imbalance. We need to further harness the communication capacity in order to try to optimize the sharing of intelligence between infrastructure and vehicles.

● (1635)

In terms of the recommendations, I think we urgently need serious and detailed work on regulations and legislation to accommodate these new vehicles, vehicles that can communicate and drive autonomously.

In particular, in the short term, it is essential to oversee the way pilot projects are carried out on public roads and to invest in the development of vehicle testing and validation procedures, including through Transport Canada and testing sites such as the ones we have in Blainville, north of Montreal.

I will stop there.

● (1640)

[*English*]

The Chair: Thank you very much, Mr. Gingras.

We'll go on to Mr. Santens for five minutes.

Mr. Scott Santens (Writer and Advocate of Unconditional Basic Income, As an Individual): I would like to thank the committee for having me here today.

In 2014 I went on a road trip with my fiancée, and on the road trip from Louisiana to Florida we had a conversation about the potential effects of driverless trucks. Months later I self-published an article born from that conversation, which went viral globally, and in these past four years, despite my own warnings about it, even I have been shocked by the speed of development of this technology.

I have no Ph.D. I'm not a programmer or a truck-driver. I'm simply a citizen who spends a lot of time researching topics of interest to me and writing about them. The area that tends to interest me most is the effect of technological advancement on human civilization. With that in mind, I wish to spend my time attempting to convey the monumental impacts automated vehicle technology will have on society as we know it, and the utmost need to understand what's coming down the road, so to speak.

To begin, I want to share a quote that I feel summarizes why this technology will happen. “It's not fantasy,” says the CFO of Suncor in regard to a fully automated fleet of driverless trucks operating in their mining operations. He went on to explain, “That will take 800 people off our site. At an average...of $200,000 per person, you can see the savings we’re going to get from an operations perspective.”

That's the cold calculus of self-driving technology.

Humans are expensive. Their labour is expensive. Their benefits can be expensive. They're costly to train. They get injured. They get tired. They make mistakes. They drink and use medications. They get distracted. They look at their phones. They go on strikes. They get involved in lawsuits. They get angry and depressed. They have physical and biological limits. They quit.

Machines do none of these things. Machines are the perfect worker as long as the cost is right and the output is good.

When it comes to driverless trucks, the cost of fuel also enters the equation. Trucks that drive themselves offer incredible efficiencies in fuel costs. Driverless trucks can travel longer distances in shorter times, thanks to not needing to sleep. They can travel in convoys to increase aerodynamic efficiencies. Fewer accidents can save a lot in human and capital costs. There are many reasons driving the adoption of this technology, and billions of dollars—both invested and at stake—for those who get there first.

I'm here speaking only a week after the first death of a pedestrian by a self-driving car, but that accident itself says a lot about the status of this technology. It's already as good as a human, such that people already expect superhuman abilities from it. Why didn't its radar and laser-based system see the woman before tragically colliding with her in the dark? Why didn't the car immediately detect her and immediately slam on the brakes?

We are talking about a matter of seconds, where below-average human drivers would have caused the same death, just as they cause over 3,000 deaths a day and 1.3 million deaths every year all over the world. The first human being has died, but this technology will save lives, money, and time, and it will impact our economies in ways governments needed to start preparing for years ago.

Don't be fooled into thinking this is just about eliminating driving jobs. The automation of vehicular transport will ripple through the economy. Think of cars and trucks as blood cells in a circulatory system, carrying oxygen throughout the body in the form of income and spending. There are businesses that depend on drivers spending their money. There are businesses that depend on car ownership. There are businesses that depend on vehicles getting into accidents, parking, and requiring insurance. These businesses are themselves then depended upon by other businesses, and so on, like falling dominoes.

The challenge that lies ahead for lawmakers is in helping guide this process in a way that doesn't discourage its advancement but enables it to flourish, while leaving as many people as possible better off. This means not just assisting people in learning new skills for new jobs, but also creating a safety net that acknowledges the transformation of work in this 21st century of great uncertainty.

Requiring former drivers to jump through an arduous system of forms and bureaucrats to receive income as they retrain and search for the next opportunity for employment is not the best way forward in a world of work where more and more people are between increasingly insecure jobs of shorter duration and greater monthly income variance.

This is why I also believe any conversation about automation of future work requires a conversation about a basic income guarantee. You're ahead of the curve in that you're already testing it, but I do wish to urge you of its importance. Self-driving tech will absolutely create winners and losers, and all of those who lose cannot be ignored or expected to just easily find a new job with equal pay, hours, benefits, skill requirements, security, meaning, and distance from home. It is imperative that you as lawmakers work to make sure that technology like driverless vehicles, and the AI that makes it possible, effectively works for everyone, not just its owners. Without that focus, danger lies ahead. It's up to you to negotiate our way around these dangers as best you can, so we can all arrive at a place our ancestors perhaps never even imagined possible.

Thank you.

● (1645)

The Chair: Thank you very much.

Mr. Courville, you don't have opening remarks?

Mr. John Wall (Senior Vice-President, QNX Software Systems Limited): No, I do. I have a short....

The Chair: Mr. Wall, go ahead.

Mr. John Wall: Chairperson, thank you for inviting BlackBerry to speak to you today about connected and autonomous vehicles.

As this committee is aware, the automotive industry is undergoing a major transformation wherein a collection of computers, software, sensors, actuators, and connected networks will eventually take over the driving function from humans. BlackBerry is playing a leadership role in this transformation. We are proud to be a Canadian company that employs tremendous Canadian talent and constantly innovates to be at the forefront of technological progress.

BlackBerry QNX has been a trusted technology supplier to the automotive industry for approximately 20 years. Its software is used by more than 40 automakers, is in over 60 million cars, and will provide the foundation for autonomous drive systems into the future. The new generation of vehicles will increasingly be dependent on software and connections to external networks to perform critical functions. This will present increased safety risks if the vehicle systems are not developed in accordance with best practices and industry standards for safety and security.

BlackBerry has developed a framework of disciplines for securing modern cars to reduce the risk of cyber-attacks. We work closely with automakers and their suppliers and we know they are taking the issues of safety and security very seriously. They are aware of the public's concern and are aware that failure to adopt reasonable measures to ensure the safety and security of the vehicles will negatively impact the adoption of this technology, not to mention their reputations.

This is not to suggest that government does not have an important role to play. Governments have a responsibility to ensure that the next generation of vehicles is safely deployed and does not introduce unreasonable risk. Governments should endeavour to harmonize regulations across jurisdictions such that a patchwork of divergent laws and standards does not emerge. This will require coordination between multiple departments and levels of government, including foreign governments. The sharing of test results, ideas, and experiences among agencies and jurisdictions will also provide an efficient way for government to keep pace with rapid technological changes.

Thank you.

The Chair: We will go to five-minute rounds of questioning, starting with Mr. Chong.

Hon. Michael Chong: Thank you, Madam Chair.

[*Translation*]

My thanks to the witnesses for their presentations.

I have a question for Professor Gingras and the two representatives from QNX Software Systems Limited.

[*English*]

Can you describe quantitatively or predict quantitatively what percentage of the vehicle fleet on the roads in 2030 will be level 0 through level 5? What will be the mix of the fleet on the roads? I know it's a prediction.

Dr. Denis Gingras: Sorry, that was zero to what?

Hon. Michael Chong: Level 0 to level 5—how many cars will there be that are like today, level 0, and how many cars will be level 3, and how many cars will be level 5?

I have two questions, very briefly. First, what will the fleet mix be of vehicles on the road in 2030 among the different levels of autonomous driving? Second, what will the percentage of new vehicle sales be in 2030 among the different levels of autonomous driving?

Those are my two questions for the two groups of witnesses.

Dr. Denis Gingras: Thank you for your question.

It's a bit tricky to make precise predictions for this—we need a crystal ball—but there will definitely be a kind of hybrid traffic. If you look at the pace of evolution of the technology, right now we have achieved ADSs, automated driving systems, that are commercially available between levels 2 and 3. I assume probably in 2030, 12 years from now, you'll probably have level 4 vehicles commercially available, but probably not level 5. I would really doubt that.

There are so many parameters involved in terms of the business model: social acceptance, how the OEMs will deal with the marketing strategy in selling these automated vehicles and autonomous vehicles, how the insurance companies will react to that, how the legislation will evolve, what kind of collaboration there will be between people in charge of the road infrastructure versus the people in charge of the vehicles, all the different sharing mobility strategies—

● (1650)

[*Translation*]

Hon. Michael Chong: Do you think that, by 2030, the vast majority of vehicles will be at the third and fourth levels of automation?

[*English*]

Dr. Denis Gingras: I'd say probably half and half.

Hon. Michael Chong: To our other two witnesses, do they have quantitative protections? Obviously we're not going to hold you to this—

Mr. John Wall: I completely agree there's a lot of talk about level 5 autonomous drive, but that's very far off, and 2030 is not when it's going to happen. Level 5 means go anywhere, anytime, under any conditions.

The programs we're working on today are L-3 plus and L-4. These are typically 2023-24 time frames. It trickles down typically to the less expensive vehicle. If I had to hazard a guess, based on the programs we're working on, I'd say that you're going to see probably 30% L-4 and L-4 plus, 30% L-3 and L-3 plus, and probably 40% L-2 in that time frame. There are just different levels of safety features.

The OEMs that we speak to talk about conditioning the public with safety features preventing accidents—not necessarily about autonomous drive, but automated driving which is—

Go ahead.

Mr. Grant Courville (Head, Product Management, QNX Software Systems Limited): I was going to say that the thing to keep in mind as well is there is no big switch that's going to be thrown. All of the millions and hundreds of millions of vehicles you have globally that are on the road today aren't just going to go away. There's what's on the road today, and just as we have level 2 vehicles today, today the vast majority of vehicles on the road aren't even connected, so the transition period to get to, say, any kind of majority of automated and autonomous cars is easily decades away.

Mr. John Wall: Yes. When I talk about the distribution, I'm talking about new cars sold in 2030.

The Chair: Thank you very much.

Go ahead, Mr. Badawey.

Mr. Vance Badawey: Thank you, Madam Chair.

I have to say this is going to be a monumental process going probably decades ahead into the future. I want to ask you the same questions I asked the previous witnesses who were here about a half an hour ago.

It doesn't necessarily attach itself to the technology, because the technology is going to be driven by two sources: the customer, in terms of establishing their needs, and then the industry itself to try to meet those needs with that new technology. What I want to discuss is how we as government, with U.S. partners, prepare for that new technology when it comes to establishing conducive investments for infrastructure.

The second example is ensuring that we facilitate the integration of methods of transportation as it relates to road, rail, air, and water, because we're not just talking about cars on the roads, buses on the roads, trucks on the roads; we're also talking about ships in the water, trains on the tracks, and airplanes in the air.

The last one is business logistics and distribution to ensure that lobbies, vehicles, and methods of transportation are moving around nationally and internationally, that they integrate methods of transportation while integrating the different business and logistics distribution interests.

I would throw one more in there as it relates to revenue opportunities. There is no question that with the new ability to collect data, there are going to be new revenue opportunities for those who are in the industry, but equally as important, if not more important, is that there are going to be revenue opportunities for customers to be able to collect that data with their own methods and do what they want with it to create revenue opportunities for themselves individually.

With that all said, I want to pick your brains and listen to you in terms of your thoughts on those different bullets that I've brought up, and I'm looking for the “how” to the “what” with respect to attaching ourselves as government and as partners and preparing ourselves with infrastructure, integration, business logistics, and data integration.

It's all for you.

Mr. Grant Courville: I think you mentioned infrastructure investment. Traditionally, people think of infrastructure as bricks and mortar, concrete, etc. I think the thought has to be towards technology and connectivity. In infrastructure investments looking forward, you have to look at vehicle-to-vehicle connectivity, vehicle-to-traffic-light connectivity, and what not, and put programs together to help accelerate and drive that, as opposed to what we traditionally call infrastructure. I think that would definitely be one area.

Also, safety features can be democratized in the sense that they can be available across vehicle lines. That often is driven by volume, just pure economics. The example I always like to use is government stepped in and mandated rear-view cameras in cars. What happened? By 2018, every vehicle has a camera in it. The cost has come way down. The industry adapted. I think we can look for opportunities like that, where government to step in and accelerate that process.

● (1655)

Mr. John Wall: From a monetization perspective, I think the bigger change in automotive, although we all talk about autonomous drive and automated drive, will be the change in the architecture of the vehicle. There's going to be an ecosystem built around the car.

The best comparison is Android for the phone. There will be an Android for the car. There will be two or three ecosystems, just as today there are iOS and Android, but it won't be Android, because there are very specific properties around security and safety.

However, I think there's a huge opportunity. The car makers are looking at a completely different business model of how to make money in the future. Part of it is data, and the other part is how they sell services into the car. The way people will own cars will be very different in the future. You may own a convertible during the summer and then a sport utility during the winter, but people are going to want their features to follow those cars—seating positions, for example. When people talk about a smart phone on wheels, it actually is headed in that direction.

Mr. Vance Badawey: You both make a good point with respect to infrastructure and the new normal of what that infrastructure is. When you look at gridlock, for example, digging a bit deeper we can now find ways to eliminate that by timing perfectly not only the infrastructure, but the vehicles that are taking advantage of that infrastructure. Now you've got a seamless movement and flow, strategically timed to eliminate gridlock and have better environmental outcomes, etc.

To your point with respect to data, who actually will be the benefactor of that data when it comes to the financial revenues that will be created from it?

Mr. John Wall: That will be very interesting.

Mr. Vance Badawey: Is it the companies or is it the individual?

Mr. John Wall: Why do you think Google wants to get into cars? It's about data. It's all about data. The OEMs know they can monetize it, but they don't know how yet.

Mr. Vance Badawey: Then again, if you take it a step further, it might be the individuals who take advantage of the Google apps who can sell the data, versus Google or the actual car companies.

Mr. John Wall: It remains to be seen, but today Google and Facebook make all the money.

The Chair: Thank you very much.

It's on to Mr. Aubin.

[*Translation*]

Mr. Robert Aubin: Thank you, Madam Chair.

This discussion is exciting. I will dive in right away.

Mr. Gingras, with your presentation, a light bulb went off in my head when you talked about the just-in-time model, which we launched when greenhouse gases were not such a known problem.

Do these technological developments in transportation also require reflection on the need to revise our economic models, or are we strictly focusing on the notions of transportation, vehicles and automation?

Dr. Denis Gingras: Absolutely. I think mobility and transportation are just two of the pillars of our society. Right now, many notions about how we live and how our society works need to be questioned. We just have to think about climate change, social inequalities, cybersecurity or threats to democracy. Mobility is one of the pillars of the development of our society, since it allows people to go to the office, school or grocery store, or to transport goods. This physical mobility is therefore necessary, in parallel with the mobility of data and knowledge that information systems allow us to exchange.

If we really want to solve the major problems we face in terms of mobility and transportation, we will have to look at this entire issue holistically, in a comprehensive way. We will also have to have the courage to make painful decisions about our current economic models.

Mr. Robert Aubin: Thank you.

Mr. Santens, I noticed earlier that you wanted to react to personal data. Let me give you the opportunity to do so.

[*English*]

Mr. Scott Santens: Yes, thank you.

I just wanted to mention that as far as monetization of data is concerned, I think it's important, as regards the future, that we stress that people do own their data. If as lawmakers you set the precedent that people own their data, then it makes sense not only from a privacy perspective that the data cannot be leaked and resold, but also that when it is sold and people agree to its being sold, they receive something in return for it.

It's interesting too that there's data that most people think of as data, but there's also ambient data, which is the data that we generate just by being ourselves, doing nothing, walking along the street near a camera. There's a lot of data out there that isn't necessarily seen as data, but it is.

● (1700)

[*Translation*]

Mr. Robert Aubin: Thank you.

Mr. Courville and Mr. Wall, I have a more technical question for you.

We always hear that automated vehicles are safer, since their computers react faster than humans. However, all the examples that I am given are where the car stops faster than I could in order to avoid an accident.

But last year, I managed miraculously, but also thanks to my driving technique, to avoid being involved in a pileup caused by black ice. In that case, the solution was not to stop, but to perform a controlled skid. Are automated vehicles capable of doing that?

[*English*]

Mr. John Wall: Yes, I think that the algorithms are going to be sophisticated enough to understand black ice, slippage of the wheels, etc. They'll be able to identify more quickly than you what's happening to the vehicle from a geometry perspective.

It's also one of the reasons that I believe autonomous driving is further out than, say, Uber would like to claim. Uber has a business reason for wanting autonomous drive. It's their business model. They don't survive without it.

There's very little testing in Canada for autonomous drive. We have an autonomous car at QNX, and in the winter it behaves much differently on snow and ice. We're nowhere near being prepared to handle those situations. I think people are still better at handling those situations, but I think the technology, with machine learning and AI, will be able to react appropriately to those types of situations.

[*Translation*]

Mr. Robert Aubin: Is that—

[*English*]

The Chair: Mr. Aubin, I'm sorry. We're going on to Mr. Sikand.

Mr. Gagan Sikand (Mississauga—Streetsville, Lib.): Thank you, Madam Chair.

A witness on the previous panel pre-empted my question by describing the period when a horse overlapped with a car on the road. It's amazing that we're here talking about driverless cars.

I was reading a report by the U.K. House of Lords in 2017 entitled "Connected and Autonomous Vehicles: The future?". From the report, the study discussed the transitional period when traditional vehicles would share the road with CVs and AVs. The report expressed concern that the effects of CVs and AVs sharing the road with traditional vehicles are not fully understood. It recommended that the U.K. government undertake mixed-fleet modelling to inform policy development.

My first question is this: what modelling work, if any, has been undertaken here in Canada to assess the impact of a mixed fleet of autonomous and non-autonomous vehicles on Canadian roads?

Mr. Grant Courville: That's very admirable. We wholeheartedly agree with that recommendation, because humans by definition are unpredictable. You're absolutely right. The reality is that it will be a mixed fleet, as we discussed earlier.

With regard to what John was saying earlier, the testing we do in inclement weather with all of the sensors is not so much to handle when things are going well but to handle when things are unpredictable and things aren't going well. It's to handle things we haven't foreseen and to find out how we can react to that intelligently. Can cars communicate to each other? John mentioned artificial intelligence, so we wholeheartedly agree.

Part of what we do with the sensors is to deal with obstacles that are not predicted and whatnot. That's one of the other reasons that we have a long way to go before we get to level 5. One of the things we tend to say is that there are connected cars, there are automated cars, and then there are autonomous cars. We tend to jump from connected to autonomous, but there's automated, which is a major step. You're seeing that already with a lot of automated features in the cars. The cars are getting safer, and those are all building blocks on the way to autonomous cars.

Mr. Gagan Sikand: To that point, how can modelling reflect human interactions?

Dr. Denis Gingras: HMI problems, human-machine interaction problems, are very critical. Actually, there are a lot of unconscious details when we interact between humans—for example, the body language. If you take a pedestrian simply crossing a road, he will probably look at the car and see the driver. Without any talking, he understands that the driver has seen him or her, and he will say he's confident because the car is slowing down. We don't have this kind of interaction with a fully autonomous vehicle yet, and we have no clue on how to predict it precisely.

There's a lot of model-building with psychologists in connective science, and mathematicians trying to develop driver models and HMI models in order to have safer interactions between these highly autonomous vehicles or highly automated driving functions and humans.

To give you an example, there are some German car makers who have developed graphic interfaces with a big smile on the front of the cars, showing the pedestrian that the machine has seen you, so you can safely cross the street. We are exploring all kinds of solutions in that aspect.

This is not a trivial problem. This is also one tiny problem among an ocean of problems before we reach a full, mature solution at level 5. We're not there yet.

● (1705)

Mr. Scott Santens: I'd like to give an example too. In the case of this mix of human and self-driving cars, you can imagine that the way a traffic jam can form is just through, let's say, rubbernecking. Someone will be driving by. You'll look, and you'll slow down. That will cause the car behind you to slow down, and then the car behind, and suddenly there is a big traffic jam. It just snakes its way back.

One possibility is that this will cause all the automated cars to get into that jam as well. If you have some kind of a hybrid system, however, and you still have a human driver, but it detects that the car in front of you has started to slow down, it wouldn't slow down as much as a human would, and the car behind it would be affected differently. Then you would avoid that traffic jam that would otherwise have been caused by a human driver without any kind of assistance.

There is a kind of hybrid system there that could be implemented.

The Chair: Thank you very much, Mr. Santens.

We'll move on to Mr. Iacono.

[*Translation*]

Mr. Angelo Iacono: Thank you, Madam Chair.

Professor Gingras, this morning, tests were conducted in Blainville on emergency braking systems. Could you tell us more about that?

Dr. Denis Gingras: Thank you for your question.

I have actually been at Transport Canada's and PMG Technologies' Motor Vehicle Testing Centre in Blainville for two days. In collaboration with the National Research Council of Canada and Transport Canada, we held a workshop to create what we call a community of practice, in other words, a network composed of all Canadian stakeholders in the road transport and smart vehicle sectors, with a view to developing a national strategy in the area.

The workshop brought together experts from NRC and Transport Canada as well as from universities such as Waterloo and Sherbrooke. There were also representatives from certain organizations in Quebec and Ontario, but also from the City of Calgary, since tests are being done there.

Mr. Angelo Iacono: What did you learn?

Dr. Denis Gingras: This morning, we did some tests, some with dummies, to check the emergency braking systems of various models of vehicles, specifically from Kia. As we have already seen in previous tests over the last two years, the emergency braking systems on the market do not really work beyond a speed of 40 kilometres per hour. The technology has not yet been refined, and the situation is all the more dangerous because the public has not been made fully aware.

This presents a challenge for transportation regulators, particularly in the provinces. I am referring to the organizations that offer driving courses or issue driver's licences. If someone buys a smart vehicle with automated features, such as a Tesla with an autopilot system, governments need to ensure that the new owner is well informed about the technical limitations of these functions and knows when and how to use them. This is in order to keep within their parameters and to avoid dangerous situations. It is extremely important.

There is also the whole issue of developing new regulations for these new technologies.

● (1710)

Mr. Angelo Iacono: In terms of computer security, is any programming system safe from piracy?

Dr. Denis Gingras: I do not think any of the current computer systems can claim to be completely safe from a cyberattack.

As soon as a vehicle is connected and is able to communicate and exchange information with the road infrastructure, with other vehicles or with pedestrians, I believe there is a risk that the data will be intercepted and that unauthorized people will be able to control the vehicle remotely.

We have already had an example of that potential danger in the United States, two or three years ago, with a Jeep Cherokee.

Mr. Angelo Iacono: Thank you.

[*English*]

The Chair: Mr. Graham, you have one minute.

Mr. David de Burgh Graham (Laurentides—Labelle, Lib.): Okay.

[*Translation*]

Mr. Gingras, you bring up a subject that I wanted to raise. It was exactly that Jeep that was the target of a computer attack in 2015, a zero-day exploit, as it is called.

[*English*]

These are fly-by-wire vehicles, and you can take control of them remotely and take them off the road. What are we doing to prevent that from happening in the future? If you jailbreak a QNX vehicle, what are the consequences of that?

Mr. John Wall: Specifically on the Charlie Miller hack that we're talking about, we're pretty intimately familiar with that hack.

Mr. David de Burgh Graham: Was it a QNX vehicle?

Mr. John Wall: It was a QNX-based vehicle, and the way I would describe it is that somebody left the door wide open. There was no security in mind at all in that vehicle. It was a wake-up call to the auto industry that a lot more had to be done.

Mr. David de Burgh Graham: But anytime you have a network vehicle, that's going to be in the case anyway—

Mr. John Wall: No, no, there was very serious things that were done in this vehicle to leave the door open. I'm talking scripts that say “update me” with this. It was ridiculously open.

Mr. David de Burgh Graham: That says something to the major point here, which is that no program is better than the programmer who wrote it.

Mr. John Wall: Yes, there is programming and then there is the methodology of how you put the system together, and cybersecurity is never going to be an absolute certainty. It's a cat-and-mouse game in which you will always be staying ahead in a technology, because we've seen vulnerabilities in things like OpenSSL Heartbleed that happened. You don't know they're there.

We've had just recently Spectre and Meltdown with hardware. I think the—

The Chair: I'm sorry, Mr. Wall; I have to cut you off.

Mr. Liepert is next.

Mr. Ron Liepert (Calgary Signal Hill, CPC): The first set of witnesses we had expressed concern that it has been three and a half years since the Emerson report and that there have been subsequent reports done, including the one by the Senate. Their presentation was about being here again studying it again when it's time for government to move on this issue.

I'm also wondering about this. We've heard a lot about infrastructure, and it seems to me that's one area where government may be able to be moving to accommodate this eventuality, because infrastructure planning should be done for a number of years down the road.

I'd just like to get a sense of whether you feel government is moving fast enough on its infrastructure investments in the right areas to be accommodating this maybe not even 10 years from now. I'd like a sort of general comment on that.

Dr. Denis Gingras: Certainly, the federal government and the different levels of government could provide some incentives in order to encourage municipalities, for example, to instrument some critical locations. For example, instrumentations and communications capability could be put into critical intersections in order to help improve safety in those regions.

It would be unrealistic to say that we have to instrument and make more intelligent all of the infrastructure that we have. It's impossible. We don't even have the money to fill in our potholes, so I don't see how we could spend that much money on instrumentation.

● (1715)

Mr. Ron Liepert: Well, that's sort of my point. Are we spending this infrastructure money today thinking about 10 to 15 years down the road? My guess would be that we're investing infrastructure dollars today for projects that are no different from the projects we were investing in 10 to 20 years ago.

I'm not making a partisan thing here; I am saying government in general. Are there some things that government should have maybe been doing two to three years ago—and if not then, at least today and tomorrow—to be ready for this when it comes? It's around the corner.

Mr. John Wall: It's an interesting question, because we know from working with the car makers on putting V2X systems into the cars today that they don't bother doing it because they can't make money with it—

The Chair: I'm going to ask Mr. Wall to stop for one second.

The bells have rung. Do I have unanimous consent to complete the meeting?

Some hon. members: Agreed.

Mr. John Wall: Can I carry on? Okay.

It's almost a chicken-and-egg thing. A car maker can't sell this feature because there is no infrastructure. If there were infrastructure, the car maker could sell that feature, whereby you would have accident avoidance at a very congested intersection, for instance.

Exactly as was mentioned here, you don't have to do all the infrastructure, but certainly there are places where it would make sense.

Mr. Ron Liepert: There was other testimony that said testing is going on in Arizona today because it has the perfect conditions for testing. We have anything but perfect conditions, so how do you move from there to here, and then how does it work 10 to 15 years from now on my country road? When I pull out of the driveway, sometimes I don't know where the ditch is. Is that a whole other issue?

Mr. Grant Courville: Yes, it is.

That's one of the things we're testing. If you think about a human on a country road where there are no markers, how do we judge where we are if we're in the middle of a snowstorm? We're probably looking at tree lines, hydro poles, ditches, etc. We have to teach the machines, the computers in the car, to think a bit like we do, and as we were talking about earlier, act in a safer fashion.

These are basic problems. If you look at the DMV in California and the number of disengagements in autonomous cars, guess what? Most of them have to do simply with rain. When it starts to rain, the sensors start to fail.

We've learned here, for instance, in Ottawa, because we have interesting weather at times—which is great for testing, by the way—that LIDAR is not very good in the snow or the rain or when there's slush on your bumper, whereas radar is. We've learned that yellow lines on the road are much better than white lines. Just by what I'm sharing here, you can see this is the kind of learning and testing that we're doing.

Mr. Ron Liepert: Should the government be thinking about those little things in infrastructure investments—painting yellow lines instead of white lines?

Mr. Grant Courville: As a very simple example, I can share with you what our findings are, but if you were to talk to engineers doing research, they'll tell you they can recognize yellow lines much better than white lines, especially when it's snowing.

It's a bit of a chicken and egg. There are dedicated short-range communications systems, DSRC systems, in cars today that can talk wirelessly, but they have no one to talk to except for the cars among themselves, and automakers can't monetize it because there's no infrastructure, so there's no value necessarily to the consumer. That's just a reflection of where we're at today.

If intersections had this capability, then all of a sudden you could have a safety feature in the vehicles that would benefit the consumer.

Mr. Ron Liepert: I'm glad I'm 68 years old, Chair, and I don't need to deal with this stuff.

Voices: Oh, oh!

The Chair: We need to stop because we have to go in camera for an issue on our agenda today.

To our witnesses, thank you very much. Who knows? We may have to have you back, because clearly the committee has lots more questions.

If you could just exit the room as quickly as possible, it would be appreciated.

[*Proceedings continue in camera*]