CAVCOE

CAV Update

A monthly newsletter on the CAV ecosystem

November 2021

From the Editors

In previous issues of *CAV Update*, we have advocated for better planning in Canada for the coming CAV era. That is still true, and Canada is a paradox: an excellent CAV innovation sector, but there needs to be more planning on how Canada will deploy CAVs in all their many forms.

Barrie Kirk expanded on this topic in a recent op-ed that was published in the Ottawa Citizen. Titled "*Robo taxis are coming, and the city of Ottawa needs a plan",* with a sub-title: "*We have an excellent, world-class technology ecosystem, especially in research, development and testing of connected and automated vehicles. But Ottawa doesn't have a strategy for using these CAVs*." The full op-ed is here.

Canadian CAV News

A new facility is now available in Canada to advance research and development of connected and autonomous vehicles as well as *Advanced Driver Assist Systems* (ADAS). Known as the **Invest WindsorEssex Virtual Reality** (VR CAVE), the facility enables developers of CAV and ADAS systems to perform virtual drive scenarios, do component simulation, examine *Human-machine Interface* (HMI) and a host of other tests and functions. More information is at this link. and this link.

We have previously reported on the excellent work by Bern Grush of **Harmonize Mobility** and his work to develop a new standard, ISO 4448, for sidewalk and curbside management. Bern has moved this activity to the Canadian non-profit **Urban Robotics Foundation** (URF) which brings together municipal, corporate and academic partners to ensure robotic technology is implemented in a way that is beneficial for all users. Currently, they continue to develop the ISO 4448 series, which sets the parameters and procedures for automated motor vehicles at the curbside, and the movement of robotic service vehicles within pedestrian spaces. URF is the drafter of the ISO 4448 series for ground-based automated mobility. This standard also sets up the parameters and procedures for loading and unloading of passengers and goods with automated motor vehicles at the curbside, and the movement of robotic service vehicles within pedestrian

spaces (sidewalks, crosswalks, bikeways, etc.) in cities, towns and suburbs. More information is here.

We had previously reported on the *Indy Autonomous Challenge* (IAC) held at the **Indianapolis Motor Speedway** (IMS) on October 23, 2021. The **University of Waterloo** in collaboration with the **Massachusetts Institute of Technology** (MIT), the **University of Pittsburgh** and the **Rochester Institute of Technology** designed, built and entered a vehicle into this race. The first prize was US$1 million and won by the **Technical University of Munich** (TUM). The race was organized by *Energy Systems Network* and IMS, and backed by a long list of sponsors. The event was to promote advance technologies for the commercialization of autonomous vehicles and advanced driver-assistance systems. More information is at this link.

Visteon Corporation is a global automotive electronics supplier that was spun off from the Ford Motor Company in 2000. Visteon specilizes in the design and manufacture of vehicle cockpit electronics and connected car services. In early October 2021, **BlackBerry Limited** announced a partnership with Visteon to incorporate QNX software and services in the next generation of digital consolidated cockpits, digital instrument clusters and connected car services for multiple auto manufacturers utilizing Visteon products.More information is at BlackBerry's site at this link.

As we reported in the July 2021 edition of CAV Update, automated truck company **Embark Trucks** was planning to merge with a *Special-purpose Acquisition Company* (SPAC) called **Northern Genesis Acquisition Corp. II** to go public. The merger valued Embark at US$5 billion. On November 11, 2021, Embark started trading on the NASDAQ market under the symbol EMBK. Embark started its humble beginning in 2015 in Canada when a couple of enterprising University of Waterloo students turned a used electric golf cart into a self-driving machine. The firm is now based in San Francisco and has about 200 employees. Winnepeg-based company **Bison Transport**, has partnered with Embark to trial its technology in Canada. More information is at this link or this link.

On October 22, 2021, **driving.ca** published an article titled *How automakers are going to screw you with subscriptions*. The article describes how all major car manufacturers are planning to introduce *subscription services* for all kinds of enhanced services that will be included in future vehicles. For example, the vehicle may be equipped with self-driving hardware and software which will be activated only upon purchase of a subscription from the manufacturer. Or it might be an enhanced navigation system or even heated seats which will only emit heat for subscribers. To be able to pull this off, the manufacturers will build all the necessary hardware/software into all their future cars regardless of whether the customer wants them or not. In other words, owners will have to pay extra through subscriptions to use the hardware they already own. The *subscription economy* is predicted to become a big moneymaker for car companies. The article can be viewed at this link.

As we reported in the September 2021 edition of *CAV Update*, The **Town of Whitby** in Ontario was planning to launch a self-driving shuttle dubbed the *Whitby Autonomous Vehicle Electric* (WAVE) in collaboration with Durham Region Transit (DRT) and other partners. This shuttle service is now operational and carrying passengers. At 6 Kilometres, this is claimed to be the longest such route in North America. More information is at WAVE's site at this link. A short YouTube video of WAVE in action can be viewed at this link.

Winter Weather Testing

Winter weather testing was one of the topics covered in an excellent *Hungarian-Canada Seminar on Electromobility and Autonomous Vehicles* earlier this month. It was organized by the **Embassy of Hungary** and featured 10 Canadian and Hungarian speakers. The event was opened by Dr. László Palkovics, the Minister of Innovation and Technology of Hungary, and Ambassador Mária Vass-Salazar (photo on the right). Barrie Kirk of **CAVCOE** was pleased to be one of the speakers at this event. He described the **Thompson Winter Weather Testing Campus**, which we have reported on previously, including the history, current status and vision. A couple of the other presentations described the **ZalaZone Science Park**, one of the largest electric and autonomous driving projects in Europe, which includes control tracks and laboratory facilities for testing EVs, CAVs, and conventional vehicles at multiple levels of development, from early research to final product. The moderator of the event was Katalin Négyessy, the Economic Counsellor of Hungary to Canada. CAVCOE believes that there are multiple synergies between Canada and Hungary that can be explored. For more information, please contact Barrie Kirk for an introduction to his contact in the Embassy of Hungary.

Winter weather creates issues for EVs and CAVs, and significant resources are being invested in solving these issues. Some of these issues are well known, such as the impact of cold weather on EV driving range and charging times. Not to be forgotten, of

course, is that humans in the cabin need to keep warm, which uses power from the battery.

What happens when other self-driving cars encounter snow or other severe weather? Like human drivers, CAVs sometimes have trouble “seeing” in some low-visibility situations and adapting quickly to loss of traction. To date, many of the self-driving cars being tested have experienced difficulty in this area, which is why a lot of the CAV testing has been conducted in warmer US states. Snow and ice can block sensors and impact their ability to “read” road signs and markings. One approach to solve this uses high-resolution 3-D maps that include data about road markings, signs, geography, topography and landmarks. With this more detailed information, a CAV can know the exact position of the curbs, lane lines, trees and signs, along with local speed limits and other relevant rules. The more a car knows about an area, the more it can focus its sensors and computing power on detecting temporary obstacles—like people and other vehicles—in real time. Those maps have another advantage: a CAV can use them to precisely figure out where it is at any given moment. In addition, there are other key issues and various solutions that are being addressed.

Testing of these solutions is key. Simulations and cold chambers are part of the process. But there is no substitute for real-world winter weather testing.

International CAV News

A recent article on *thenextweb.com* titled *Where are all the robotaxis and autonomous cars we were promised?* delves into why the long-promised robotaxis have not materielized yet. For instance, back in 2019, Elon Musk claimed that **Tesla** would have one million fully-autonomous robotaxis on the road by the end of 2020. This clearly did not happen and Tesla has exactly zero robotaxis on the road as of this writing. The former Chief Scientist for **DARPA** (Allen Steinhard) was interviewed to learn why this is the state of affairs. Part of the answer is the fact that our infrastructure was built for humans, eg. stop signs, traffic lights, lane markings and many other visual cues were designed to alert human drivers to what’s going on. To make an autonomous vehicle make sense of these visual clues is a major technical challenge. Another weak link in the system is the bullet-proof communication needed by AVs who need external data to be able to operate safely. For example, a flood could wash out a bridge. This needs to be communicated to all vehicles immediately and reliably to be effective. The article can be viewed at this link.

In a related development, Amazon-owned robotaxi developer **Zoox** has announced plans to test its AV technology in the city of Seattle. Zoox is not deploying its own custom robotaxis in Seattle. Instead, it has equipped four **Toyota** Highlander vehicles with the required sensors, computing hardware, vehicle controls and its own software for performing these tests. Not everyone is on board with these test plans. The critics point to risks to pedestrians, bike riders and others. This includes the fomer mayor of Seattle as well as organizations promoting walking and public transportation. More information is at this link .

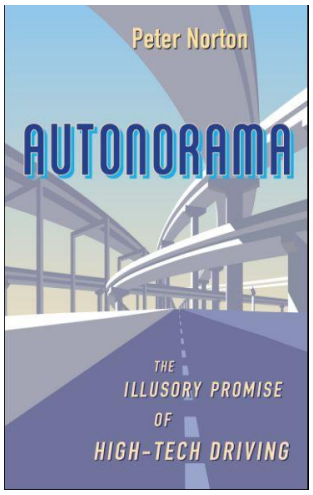
In yet another article on robotaxis, the **Forbes** magazine takes a deep dive into the topic in an article titled *Some Say Self-Driving Robotaxi Isn't A Business; Billions Are Being Bet That It Is*. The author (Brad Templeton) presents an argument on how the advent of robotaxis could convince many families with a second or third car to give them up in favour of using a robotaxi. Furthermore, robotaxis may be able to beat the 50 cents/mile currently collected by ride-sharing companies like **Uber** and **Lyft** by eliminating the driver. Robotaxis are not considered feasible for deployment in rural areas due to low density of population, long distances and long driveways into the property. It is expected that robotaxis will take a fair share of transit users due to its door-to-door convinience and lower cost. The conclusion is that the billions invested in the robotaxi technology is likely to be profitable in the future. The Forbes article can be viewed at this link or this one.

Many CAV experts do not have much faith in feasibility of *Level 3* automation where self-driving is a part-time affair. If the vehicle is unsure of what it has to do in self-drive mode it will alert the driver and hand over the vehicle control to the driver. Going against the trend, **Honda** has introduced what is claimed to be the world's first Level 3 self-driving car. According to Honda, when the self-drive systems wishes to hand over the control to the driver, the system will alert the driver by vibrating the driver's seatbelt or other means. If the driver is unresponsive, the system will assist with an emergency stop by decelerating

and stopping the vehicle on the shoulder, while alerting surrounding cars with hazard lights and the horn. If there's no shoulder, the vehicle will creep to a halt with its hazard lights flashing and blasts of the horn. Honda will produce only 100 of the Level 3 cars and deploy them only in Japan. The cost of the vehicle is quoted at US$102,000. More information is at this link.

On October 23, 2021, **The Economist** magazine published a short article on how autonomous vehicles are made smarter through techniques similar to those used in computer games. Researchers at **Porsche** in Germany are using *game engines* to create photo-realistic environments through which an AV can drive. Once taught this way, the environment is re-created on an actual test track. Computer simulation is an essential tool in the development of AVs. The **RAND Corporation** has calculated that to develop a system 20% safer than a human driver, a fleet of 100 self-driving cars would have to operate 24 hours a day, 365 days a year, and cover 14bn kilometres. At average road speeds, that would take about 400 years. This obviates the need for advanced computer simulations. The article can be viewed at this link or this one.

The combination of electric vehicles and automated driving can help drive up the utilization rate of such a vehicle much higher than the current situation where the average utilization rate of a private automobile is about 4%; if it is driven for one-hour/day. This is according to analysis by **Morgan Stanley**'s *Adam Jonas* who has done the math on shared electric/autonomous vehicles of the future. The author states that when it comes to ride-sharing services, the greatest cost is the person behind the wheel. Replacing this person with a few million lines of code and some commoditized sensors can result in big savings in operating such vehicles. The author concludes by saying that *The shared car, the autonomous car, and the electric car are inextricably linked*. More information is at this link.



Many people believe the promise of electric vehicles in reducing air pollution and autonomous driving for reducing deaths, injuries and property damage caused by humor error. A dissenting voice is Prof. Peter Norton at **University of Virginia**. In his new book titled *AUTONORAMA: The Illusory Promise of High-Tech Driving* (published on October 21, 2021, US$27 on Amazon), he argues that for decades the carmakers, oil companies and governments have worked in tandem to make our cities car-centric, and continuously promising that the next innovation is going to solve all problems with air pollution, traffic congestion and other ills caused by our modern transportation system. History has shown that this has not been the case. By extension, the professor is skeptical that electric and autonomous vehicles will bring about the nirvana promised by the advocates of these technologies. His view is that society needs to wean itself off cars instead of looking to technology to do the job. More information and an interview with Prof. Norton can be viewed at this link.

And finally, a four-year collaborative research between the **Massachusetts Institute of Technology** (MIT), and **AMS Research** in Netherlands has led to the creation of an autonomous boat called *Roboat*. The electrically powered Roboat is designed to silently navigate on its own the canal system of Amsterdam. The Roboat's initial task is to act as floating trash containers, scooting back to base when they are full. This job is normally done by garbage trucks, but they are a safety hazard on the city's narrow streets and cause traffic jams. The Roboat is packed with sensors. This includes LiDAR for laser imaging, GPS systems on front and back, and multiple cameras on the sides to help with positioning. The City of Amsterdam is one of the backers of the project. It is hoped that the Roboat will one day become a passenger service too. More information is at this link. A short YouTube video of the Roboat in action can be viewed at this link.

Upcoming CAV-Related Events

Dec 1-2, 2021	Autonomous Vehicles Europe 2021, Berlin, Germany
Dec 2, 2021	CAV Canada, hybrid conference: virtual and Ottawa
Dec 14-17, 2021	UITP Global Public Transport Summit; Melbourne, Australia
Feb 27–Mar 2, 2022	Ontario Good Roads Association's Conference, Fairmont Royal York, Toronto
Mar 1-2, 2022	Autonomous Vehicle Technology Expo, San Jose CA
Jun 20-23. 2022	HxGN LIVE Global, Las Vegas, Nevada
Nov 16, 2022	North American Winter Weather Conference, Thompson, Manitoba, Canada

About CAV Update

CAV Update is a free, monthly summary of news and analysis in the world of connected and automated vehicles, and the impact on the private sector, government, and society.

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***CAVCOE** (formerly the Canadian Automated Vehicles Centre of Excellence) advises the public and private sectors on planning for the arrival of self-driving vehicles.*

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