CAVCOE

CAV Update

A monthly newsletter on the CAV ecosystem

January 2023

From the Editors

The December 2022 issue of *CAV Update* included a look back on CAVs in 2022. This month, we will make 10 forecasts for 2023 and beyond.

The background is that publicity about Connected and Automated Vehicles (CAVs) has included some truths, some misinformation, and too much hype. Here is a New Year's list of ten predictions about what will and will not happen with CAVs:

1. Automated non-passenger CAVs are already in use and will experience large scale deployment in the 2020s. Automated freight vehicle use-cases will include inter-city logistics, "middle-mile" within a city, last-mile delivery robots, and off-road freight applications such as on airports, warehouses, and mine sites. These automated freight CAVs will help solve the shortage of truck drivers and improve transportation efficiency. The business cases are strong, and the safety issues can be easier to address than with self-driving passenger vehicles.

2. The 2020s will also see the deployment of a wide range of automated service vehicles for agriculture, snow clearing, garbage collection, grass cutting, security and surveillance, etc., for the same reasons: strong business cases and an easier safety environment because many will not be on public roads or will have fixed routes.

3. Although some self-driving robotaxis currently carry passengers, large-scale deployment of self-driving passenger vehicles will not happen until the 2030s. Looking back into history, 1885 saw the Benz Patent-Motorwagen, the first practical car. It was not until 1908, 23 years later, that Henry Ford started mass-producing the Model T. Clearly, technology development is faster today and geographically limited robotaxi deployments will expand. But developing a full self-driving passenger car that can go anywhere at any time is proving to be more challenging than people first thought. Car manufacturers are focused on driver assistance technologies that are stepping stones to full self-driving, as well as electric vehicles. Technology improvements will continue throughout the 21st Century.

4. We know that the introduction of cars in the 20th Century changed everything: society, economies, employment, industry, and government. CAVs will result in similar wide-ranging and major changes in the 21st Century, including the supply

chain, auto insurance, policing, etc. The transition period during which some vehicles will be driven by humans and some by computers will be particularly challenging.

5. Sadly, there will continue to be collisions and fatalities, but far fewer than currently. The predictions of a utopian future with zero fatalities and crash-proof cars are wonderful objectives but pure fantasy. I predict that full deployment of CAVs will lead to just 20% of the collisions and fatalities that we now have.

6. There will be a major impact on the nature of work, leading to push-back and social unrest. We saw this with clashes between Uber drivers and traditional taxi drivers. When livelihoods are threatened and there are impacts on families as well as individuals, people get angry and aggressive.

7. Public acceptance of self-driving cars is low, partly because people feel they do not know enough. There will be more education, and this will help.

8. There will be significant use of robotaxis and decreased personal ownership of cars. I predict that many two-car suburban families will move to one car plus the use of robotaxis. When the technology is mature enough, children will be chauffeured to school and back in CAVs.

9. A major technical issue is the cybersecurity threat, given that the vehicles will be complex computers on wheels. I predict that these threats and counter-measures will be an arms-race that no-one will win.

10. If and when data shows that self-driving vehicles are safer than human-driven ones, there will be a debate on banning human drivers. Will it be ethical to allow humans to keep driving and causing all those deaths? This will be controversial!

In summary, Cars 1.0 started in 1908 and impacted virtually all aspects of peoples' lives in the 20th Century. Cars 2.0 will have a major impact on virtually everything for the remainder of the 21st Century. Now is the time to plan for this major disruption.

Canadian CAV News

In December 2022, **CTV News** published an article titled *The self-driving era is here, the question is what comes next?* The article presents a snapshot of where the AV industry is at present. The CEO of Canadian AV developer **Waabi** is quoted as saying *people think there will be a magic day where suddenly everything will be autonomous, but that's not how this is going to work*. Furthermore, she believes that to make the leap to a truly autonomous system that can handle any road situation, there have to be step changes to next-generation artificial intelligence systems. And beyond the technical challenges of making it all work, there are also serious challenges in the regulatory, legal, cybersecurity, and ethical frameworks that need to be addressed before the large scale deployment of AVs. The CTV News article can be viewed at this link.

Toronto-based **Waabi** was also in the news for announcing that it will start testing its AV truck technology on public roads in Ontario. So far, Waabi has been training its *Waabi Driver* AI-based software in an advanced simulation environment known as *Waabi World*. The company is in talks with a number of truck manufacturers to integrate its self-drive technology into their vehicles during the manufacturing process. Waabi has not disclosed who these manufacturers are. Waabi believes it is far more efficient and cost-effective to develop AV technology through advanced simulation as opposed to what other AV firms have done by deploying a large number of actual vehicles on public roads or test tracks to collect data and train their AIs. In 2021, Waabi raised $100 million from investors and currently has about 100 employees. More information at this link.

In a first for North America, **Winnipeg International Airport** has launched an automated wheelchair service that can take passengers from the check-in counter through security and right up to their departure gate. The airport has been experimenting with the automated wheelchairs since 2019 in collaboration with the manufacturer – Tokyo-based **Whill Inc**. The wheelchairs have also been on trial at airports in Atlanta, San Jose, and Grand Rapids, as well as Japan. According to the Winnipeg Airports Authority, an estimated one in three travelers will need some form of assistance while traveling by 2038 due to a growing aging population. More information

is at this link. A short video of the automated wheelchair in action can be viewed at the same link.

Vancouver-based startup **GlüxKind Technologies** caused some excitement at the 2023 **Consumer Electronics Show** (CES) in Las Vegas with its automated stroller for kids. Dubbed *Ella* and priced at US$3,300 ($4,420), the stroller uses many of the same sensors and actuators used in autonomous vehicles. It is AI-powered and its cameras and other sensors enable the stroller to sense obstacles, avoid collisions and navigate its way on the sidewalk. Its dual motors can push a stroller uphill or on grassy surfaces. It has automatic braking for going downhill. It weighs 30-pounds (13.6 Kg). The company is taking orders now for deliveries starting in April 2023. More information is at this link. A short YouTube video of the stroller in action can be viewed at this link.

Staying with CES, Canada's **Project Arrow** attracted attention at the show too. Project Arrow is a 100% Canadian-designed and manufactured electric vehicle with the possibility of autonomy in the design. It is a one-off demonstration vehicle intended to showcase Canada's expertise in this particular automotive sector. The vehicle was designed and built in a collaborative effort between **Automotive Parts Manufacturers' Association** (APMA) and **Ontario Tech University** in Oshawa over the past year. Furthermore, 58 companies in the automotive and technology sectors contributed to the creation of Arrow. The project received funding of $5 million from the federal government and $1.8 million from the Ontario government. More details are at this link.

One of the areas of research and study at the Department of Political Science at the **University of Calgary**'s *Centre for Military, Security, and Strategic Studies* is the expanding field of autonomous robots designed for military purposes – the so-called *killer robots*. It appears that advances made in AI, machine learning, and robotics sciences developed for peaceful and civilian purposes have been adopted for military purposes too. The **International Committee of Red Cross** (IRCC) had made some attempts to get the nations of the world to ban autonomous military robots. According to the U of C, there has been no buy-in from world powers (United States, Russia, and China) as evidenced by the current war in Ukraine. It is suggested that the whole nature of warfare could change once robots are fighting other

robots. And countries may be more willing to engage in conflict if the human cost of the conflict is less than a conventional war involving real humans. More information is at the U of C site at this link.

International CAV News

Edge Cases are often cited as an impediment to the wide deployment of automated vehicles. These are cases that occur rarely or unpredictably. As can be expected, there are a very large number of such cases and the challenge for AV developers is to devise techniques for dealing with them. A recent article titled *Weird Incidents Reveal L5 Challenges* in **Semiconductor Engineering** delves into this issue by citing examples and some possible solutions. For example, there was an instance where an AV assumed a multi-level parking garage was in fact layers of vehicles piled on top of one another and re-routed its path around what it assumed was a horrific accident. In another case, the AV mistook the moon for a yellow traffic light and began to slow down. In yet another case, the AV did not know what to make of an open drawbridge, so it drove straight off the bridge and plummeted into the water below. And there are many more such edge cases. One of the solutions being developed is to mimic the brain, and the nervous perception systems of insects such as bees. Insects do not have a particularly high-resolution vision. This means information can be processed quickly where small amounts of information are sampled, and missing information is filled. Furthermore, if the right information is extracted at the sensor level, there is no need for intensive computation. The article can be viewed at this link.

SEMICONDUCTOR ENGINEERING
DEEP INSIGHTS FOR THE TECH INDUSTRY

The **State of Pennsylvania** has signed into law new legislation to further ease the testing of autonomous cars and trucks on its public roads. This includes provision for platooning where the lead vehicle must be driven by a human driver while the following vehicle can be driven by an automated driving system. A request for platooning tests must be filed with the Pennsylvania Department of Transportation for review before heading onto the highway. According to the state, approximately 7,000 people are working in the AV industry in Pennsylvania. Some of the state politicians have expressed concerns about how increased vehicle automation can impact workers in the state. More information is at this link.

PA COMMONWEALTH of PENNSYLVANIA

An article in **Forbes** magazine titled *Reports of the Death of Self-Driving Cars are Greatly Exaggerated;* examines this claim and concludes that it is not necessarily true. While 2022 was generally a bad year for technology companies, it was particularly bad for the AV industry where

Forbes

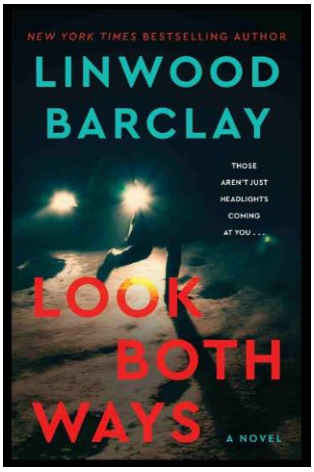
there was a great loss in the valuations of AV companies, and true commercial service in a meaningful way was still far off. Notable among all the bad news was the sudden shutdown of **Argo** in October 2022. Argo was backed by **Ford** and **VW** to the tune of billions of dollars. The article suggests that Ford and VW did not feel their traditional automotive businesses were being threatened by AVs anytime soon and decided to pull the plug on Argo. Even well-known companies such as **Oxbotica** and **Luminar** have tamped down their predictions of wide-scale deployment of AVs for several years. It is reported that Oxbotica is now focusing on industrial machines. Amid all this doom and gloom, there have been a few bright spots. **Mobileye** had a successful IPO in October 2022, and seems to be doing well. And, Cruise, Waymo, and some Chinese firms have expanded their robotaxi services in the cities they are already serving and have started robotaxi services in other cities. The Forbes article can be viewed at this link or this one.

Amazon has been working on its drone delivery system for over 10-years. In August 2022, the **Federal Aviation Administration** (FAA) granted permission to Amazon to deliver packages weighing up to five pounds by its MK27-2 autonomous drones. Amazon states that 85% of its packages weigh five pounds or less (2.27 Kg). Initial drone delivery service areas are in Lockford, California, and College Station, Texas. Orders placed with Amazon will be delivered by drone within 60-minutes. Since the drone delivery system is still experimental and in development, the capital and operating costs are quite high. Each delivery drone costs about US$146,000 and each delivery made by drone is estimated to cost US$484 at present. Amazon hopes to bring the delivery cost down to US$63 by 2025. More information is at this link.

Western Australian mining companies working in the mineral-rich Pilbara region embraced autonomous haul trucks early on. They were ahead of others in seeing the benefits of automation for reducing operating costs and increasing efficiencies. **Roy Hill** operates a major iron ore extraction and processing plant in Pilbara. Working in collaboration with Sweden-based **Epiroc** and Utah-based **ASI Mining**, it is converting its haul trucks to operate autonomously. By the time the conversion project is over in 2023, Roy Hill will have the largest such automated fleet in the world. According to the company, over the past two-years, the automated haulage system (AHS) achieved higher productivity rates than the conventional haul truck fleet. Autonomous haul trucks are running 24/7 in a dedicated autonomous operating zone. The automated technologies

developed by Epiroc and ASI Mining can be installed on any make of haul truck. Roy Hill primarily operates Caterpillar and Komatsu equipment. More information is at this link.

And finally, it was to be expected that someone sooner or later would write a fictional book on autonomous vehicles. Sure enough, a recently published thriller on autonomous vehicles weaves a plausible story around the subject where two rival AV companies tussle in a game of corporate sabotage, murder, and mayhem. The book is called **Look Both Ways**. The author is a Canadian thriller writer called *Linwood Barclay*. The book was published in October 2022. Although it is fiction, the mayhem it describes once the AVs have been reprogrammed by a bad actor could very well happen by a group of determined hackers. Cybersecurity is very high on the AV agenda, and organizations such as the FBI have written reports on how in the wrong hands, AVs can be weaponized and cause harm to life and property. The book is available on Amazon (Canada) in paperback for $24.74. Amazon reviewers (748 of them as of this writing) have given the book 4 stars out of 5. More information on Amazon's site at this link.



On the same theme, FBI Director Christopher Wray warned at the recent **World Economic Forum** in Davos, Switzerland that the expanding use of self-driving cars opens up new ways for terrorists to harm Americans. Speaking on a panel on national security, Wray said the FBI views autonomous vehicles as both a possible tool to cause physical harm and a potentially valuable source of personal data that could become a target. A report on Wray's speech is here.

CAVCOE Speakers' Bureau

CAVCOE provides speakers for many different types of events across Canada, the US and overseas. On the one hand, our keynotes and presentations have core messaging on the status of CAVs, their deployment scenarios, and the impact on business plans, government regulations, and almost all aspects of society. On the other hand, each presentation is customized for the audience and the time available.

To enquire about a speaker for your event, please write to speakers@cavcoe.com

Upcoming CAV-Related Events

Feb 1-3, 2023	UITP North America Forum 2023, Jacksonville FL, USA
Feb 17-26, 2023	AutoShow, Toronto ON
Mar 15, 2023	CAM Innovators Event 2023, hosted by Zenzic and held at IET Place, London, UK.
June 4-7, 2023	UITP Global Public Transport Summit, Barcelona, Spain
June 7-8, 2023	AutoTech: Detroit, Suburban Collection Showplace, Novi MI, USA
June 12-15, 2023	Hexagon | AutonomouStuff News, Autonomy & Positioning Reality Summit, HxGN LIVE Global 2023, Las Vegas NV
June 20-22, 2023	Autonomous Ship Expo and Conference, Amsterdam, The Netherlands
June 21-23, 2023	ADAS & Autonomous Vehicle Technology Expo, Stuttgart, Germany
July 12-13, 2023	VTM Michigan (Vehicle & Transportation Technology Innovation Meetings, Novi MI
Sept 24-27, 2023	2023 TAC Conference & Exhibition, the Transportation Association of Canada, Ottawa ON

About CAVCOE and CAV Update

CAVCOE *(formerly the Canadian Automated Vehicles Centre of Excellence) provides consulting services, information, analyses and recommendations to the public and private sectors on planning for the deployment of self-driving vehicles of all kinds.*

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

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