

CAV Update

A monthly newsletter
on the CAV ecosystem

March 2022

From the Editors

The CAV ecosystem continues to evolve. The early focus on passenger cars, shuttles, etc. is still there. However, in the 2020s, there will be more rapid growth and large scale deployment of non-passenger CAVs. There are a couple of articles in this issue that address this. **Amazon** uses 350,000 robots to move parcels around its warehouses world-wide. This makes Amazon one of the largest – if not the largest – user of robotic vehicles in the world. A related article in this issue is on CAV truck developers moving towards automated trucks used for depot-to-depot logistics. See the article on **Embark Trucks** and **Alterra Property Group**.

These – and other developments in robots – are moving quickly for two reasons: solid business cases and safety challenges that are easier to solve.

Passenger CAVs will be deployed in volume, but probably not until the 2030s. Because of the overlap in the technologies, today's non-passenger CAVs are paving the way for tomorrow's passenger CAVs.

Canadian CAV News

Toronto-based AV developer **Waabi** has created an AI-powered simulation system to make a *digital twin* of the real world that AVs are expected to operate in. Dubbed *Waabi World*, it bills itself as a driving school for AVs. The system builds a high-fidelity version of the physical world using physics-based models along with digital models of the typical sensors installed on an AV such as LiDAR, cameras and radar. The emissions from these sensors are reflected back from the virtual objects in the digital twin, fused together and used for making perception, navigation and driving decisions. The system is smart enough not to be confused with spurious LiDAR returns from exhaust and fog or multi-path returns from the radar. More information is at [this link](#). A short YouTube video of *Waabi World* can be viewed at [this link](#).



Drone Delivery Canada has announced the successful approval and implementation of dangerous goods transportation within the DSV intra-site drone delivery route. This route will enable the delivery of dangerous goods (“DG”) consumer products from the DroneSpots™ at DSV’s warehouse in Milton, Ontario.



Steve Magirias, CEO of DDC said “This is another milestone for DDC being the first DG transport by drone in Canada. DDC has been working with Canadian regulatory staff to permit the transportation of dangerous goods by remotely piloted aircraft (drone)”.

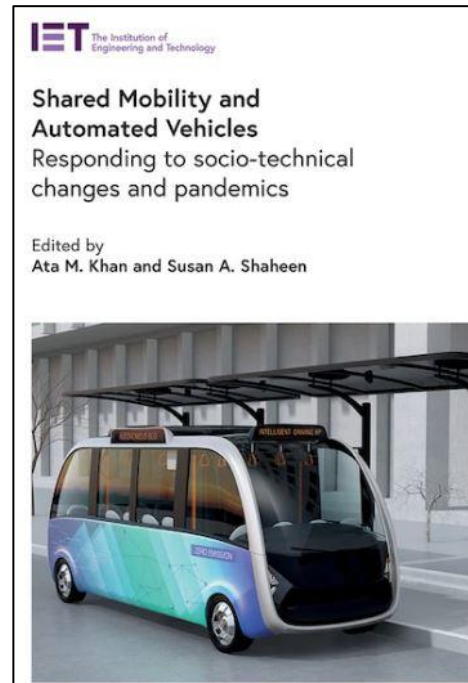
At DSV, moving dangerous goods is an essential service for cargo transported on a daily basis. Customers in key verticals such as retail & consumer products, pharma and healthcare, automotive, chemicals and oil & gas rely on efficient, timely, and safe transportation.

Staying with drones, last month we reported on planned demonstrations of drones in Thompson, Manitoba. Those demos have now taken place. The stakeholders included **Spexi Geospatial, AirMarket, Transport Canada**, and **SubZeroNorth**. The photo opposite shows part of the demonstration in Thompson. The drone is visible in the top-right corner.



The demonstration showed how the software platform has already been successfully used to take minute measurements of side-to-side rail track heights, as well as wear and tear on the track itself due to missing ties, vegetation encroachment, etc. During this demonstration, Spexi and AirMarket tested the ability to operate Beyond Visual Line of Sight (BVLOS). This supports the capability to pre-program a drone to complete its workload, even when it is out of view and kilometers away.

In February 2022, a book titled *Shared Mobility and Automated Vehicles: Responding to socio-technical changes and pandemics* was published by **The Institution of Engineering and Technology**. The authors/editors are **Ata M. Khan** (professor at **Carleton University**) and **Susan A. Shaheen** (professor at **UC Berkeley**). The book delves deep into the shared mobility concept (automated and non-automated) to make better use of the available transportation resources. Themes covered in the book include policy and regulatory frameworks, planning, design, technology, demand and supply models, algorithms, operations, management, economic factors, business models, social equity, environmental impacts, and pandemic effects. The book is available on Amazon (Canada) for C\$212.97. More information is at [this link](#).



International CAV News


When it comes to autonomous vehicle testing, the number of miles driven between *disengagements* serves a valuable purpose. Disengagements occur for a variety of reasons and circumstances. For example, the safety driver may disengage the automated driving system if he/she feels the vehicle is about to do something unexpected or dangerous.

Disengagements can also happen due to sensor/hardware malfunction or the software doing the driving deciding it is not sure what to do and wanting to hand the control back to the safety driver. AV companies using their own proprietary simulation software try to recreate these disengagements to get to the root cause of what made it happen in the first place.

California's **Department of Motor Vehicles** (DMV) requires all AV

companies testing vehicles in that state to submit detailed disengagement reports. More





information is at [this link](#). A copy of DMV's 2021 disengagement reports can be viewed/downloaded at [this link](#).

An educational online course on autonomous vehicle and town planning has been developed by the **European Institute of Innovation & Technology (EIT)**. It is being

offered through futurelearn.com. The course is titled *Planning for Autonomous Vehicles: A People-Centred Approach*. The 4-week course explores the potential capabilities of automated vehicles and how that knowledge



can be applied to typical town planning challenges. Rather than relying on hype and technology, the course is focusing on clean, sustainable transportation systems and how they should be designed to meet people's needs and be easy to use. The course is delivered by Canadian AV expert Bern Grush. The course can be taken for free (with limited access) or be purchased for US\$59. More information and a short video about this course are at [this link](#).

A recent article in **The Economist** magazine shone a spotlight on advances made in automated robots deployed in warehouses. Amazon alone uses over 350,000 of these robots in its huge warehouses. **Amazon** bought out Kiva System - the makers of these robots in 2012 for US\$775 million. It

is now renamed *Amazon Robotics* and manufactures robots exclusively for Amazon. Due to the Covid pandemic and significant increase in online shopping, the warehouse robots have become an indispensable part of operating such facilities. Consulting firm **McKinsey**, forecasts the warehouse automation market will grow at a compound annual rate of 23% and will be worth more than



US\$50bn by 2030. Amazon is not alone in this field. Britain's **Ocado Group** relies heavily on its army of warehouse robots to fulfil orders from customers. According to Ocado, it takes a human about one-hour to collect each item manually for a large order. By contrast, one of its custom-designed robots can fill an 50-item order in less than five minutes. The article can be viewed/downloaded at [this link](#).



UK's **Transportation Research Laboratory** (TRL) has published a 31-page report titled *Remote operation of Connected and Automated Vehicles*. The report is a roadmap for replacing the current practice of having a *Safety Driver* behind the wheel and a *Test Assistant* with a remote operator. The report brings together 11 thematic streams organized around three broader themes: 'Industry, Users and Society'; 'Vehicle and Technology' and 'Infrastructure'. The implementation of these will be through UK Government and the industry. As we have reported in previous editions of *CAV Update*, a few AV developers have already developed teleoperation technology for their cars and trucks. This effort by TRL puts a more formal framework on this technology. More details at [this link](#). A copy of the report can be viewed/downloaded from TRL's site at [this link](#).



On February 6, 2022, a 19-page paper titled *Opportunities, Challenges, and Uncertainties in Urban Road Transport Automation* was published by Swiss-based **Multidisciplinary Digital Publishing Institute** (MDPI). The author is *Steven Shladover* – one of the luminaries in advanced transportation systems. The paper suggests that the peak *hype cycle* for *Automated Driving Systems* (ADS) passed a couple of years ago; and the expectations of what is possible is a bit more realistic now. Furthermore, it is argued that ADS technology can improve urban transport of people and goods. Challenges, limitations and deployment timing are also examined in this paper. The paper considers ADS in the following areas:



- Existing Automated Urban Transportation Systems Already in Widespread Use*
- Automated Buses on Dedicated Busways*
- Automated Low-Speed Passenger Shuttle Vehicles on Fixed Routes*
- Automated Sidewalk Package Delivery Systems*
- Automated Local Package Delivery by Road Vehicles*
- Automated Ride Hailing (Colloquially Referred to as "Robotaxis")*
- Automated Driving of Private Personal Vehicles*

More information is at [this link](#). The paper can be viewed/downloaded at [this link](#).

The **British Standards Institution** (BSI) organized a webinar earlier in March on "*PAS 1884 and good practice for CAV safety operators*". The speakers dived into the standard "*PAS 1884 Safety operators in automated vehicle testing and trialing – Guide*" and shared how organizations can implement guidance for the selection and training of safety operators.

CAVCOE's Barrie Kirk attended and reports that it was excellent and recommended for



anybody who is planning and managing a CAV pilot. It provided a wealth of useful best practices.

The slide decks are not yet available – but they will be. If you are interested in receiving the link, please write to Barrie at info@cavcoe.com.

On February 18, 2022, **General Motors** (GM) and its automated driving arm (**Cruise**) petitioned regulator **National Highway Traffic Safety Administration** (NHTSA) to permit Cruise’s zero-emission, shared, electric vehicle (*Origin*) to be built and put into commercial service. This is the second time GM/Cruise make such a petition. In 2018, GM petitioned NHTSA to allow a self-driving car based on a *Chevrolet Bolt* without steering wheels or brake pedals on U.S. roads. In late 2020, GM withdrew the petition. The *Origin* is a joint design effort by GM, Cruise and **Honda**. It has been designed from ground up to have no *Human Machine Interface* (HMI) such as a steering wheel and brake/accelerator pedals. Assuming NHTSA approves Cruise’s petition, production is expected to begin in late 2022 in Detroit at a GM factory with vehicles delivered in 2023. More information is on Cruise’s site at [this link](#).



Editor’s note: On March 10, 2022, NHTSA published a 155-page ruling related to the above item. This rule amends the occupant protection of **Federal motor vehicle safety standards** (FMVSSs) to account for future vehicles that do not have the traditional manual controls associated with a human driver because they are equipped with Automated Driving Systems (ADS). This rule makes clear that vehicles with ADS technology must continue to provide the same levels of occupant protection that current passenger vehicles provide. The occupant protection standards are currently written for traditionally designed vehicles and use terms such as “driver’s seat” and “steering wheel,” that are not meaningful to vehicle designs that, for example, lack a steering wheel or other driver controls. The NHTSA’s ruling can be viewed/downloaded at [this link](#).

An AI-powered technology developed by the **Mitsubishi Electric Research Laboratories** may have application for autonomous vehicles. Known as *Scene-Aware Interaction Technology*, the system employs AI, cameras, LiDAR, microphones and natural language processing to provide more intuitive navigation information to the driver. For example, instead of



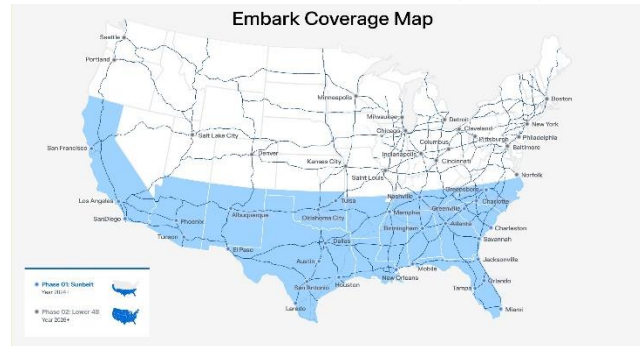
saying turn right in 30 metres, it might say follow the red truck that just turned right. If the driver is unable to see the red truck, he/she tells the system and it will immediately suggest a different object or landmark, e.g. a building with a large billboard on its side. The article was published by **IEEE Spectrum** and can be viewed at [this link](#). A short YouTube video demonstrating the Mitsubishi system can be viewed at [this link](#).

The vision gaining popularity among automated truck developers is the *depot-to-depot* concept (also called *transfer points*). A typical setup would be a depot along a highway just outside a major population centre.

An automated truck picks up cargo at one depot and delivers it to the other depot. A human-driven truck would then complete the journey in the more complex urban environment to deliver the goods to the customer. To this end,

Embark Trucks, Inc. has partnered with the commercial real estate firm of **Alterra Property Group** to identify and procure

AV-Ready transfer points across the U.S. sunbelt where Embark has its focus for future automated truck services. More information is at [this link](#).



Many vehicles in the United States have connectivity through the older 3G wireless networks. Certain vehicles made between 2010 and 2021 are equipped with 3G communication hardware for receiving *over-the-air* (OTA) updates as well as infotainment, navigation, SOS alerts and other functions. Major carriers such as **AT&T**, **Verizon** and **T-Mobile** have announced dates when they will discontinue their



3G service. AT&T switched off its 3G network on February 22, 2022. Other carriers will do the same on or before the end of 2022. This is bad news for owners of connected vehicles based on 3G technology. Various manufacturers are offering hardware/software upgrades for free or at a cost to the owners. More information is at [this link](#). **Consumer Reports** magazine has a list of the affected vehicles on its website. The list can be viewed at [this link](#).

Specialized autonomous vehicles are increasingly finding their way into airport operations. This includes autonomous towing vehicles for transporting the aircraft from the gate to the runway and vice versa. Other airport specialized vehicles include autonomous baggage carts, buses and security sentries for patrolling airport perimeter. Amsterdam's **Schiphol** airport and Dutch airline **KLM** have recently deployed two automated tow vehicles to try out the technology.

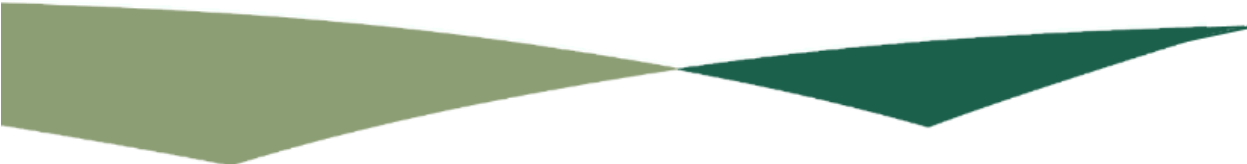


The motivation for this is significant reduction in fuel use and noise. Known as the *TaxiBot*, it is a semi-robotic hybrid towing vehicle made by **Smart Airport Systems** under license from **Israel Aircraft Industries** for taxiing airplanes with their power off. The company claims that its AV can reduce CO2 emissions by as much as 85%, noise pollution by 60%, and fuel by 65%. More information is at [this link](#).

Staying with aviation, **Google's** *Wing* drone delivery business unit claims to have made over 200,000 deliveries since September 2021. *Wing* is most active in Australia where 30,000 such deliveries have been made.

Wing has partnered with **Coles**, one of Australia's leading supermarket chains. Through this partnership, *Wing* is delivering 250 different items, from food stuffs to healthcare products and toiletries in Australia's capital, Canberra. Though the efficacy of drone delivery in urban areas is still unproven, *Wing* states that drone delivery works by making speedy deliveries while reducing traffic congestion, collisions, and greenhouse gas emissions. More information is at [this link](#).





Upcoming CAV-Related Events

May 25-26, 2022	Autonomous Vehicles USA 2022 , Huntington Beach, California
June 8-9, 2022	AutoTech: Detroit , Novi, Michigan
June 20-23, 2022	HxGN LIVE Global , Las Vegas, Nevada
June 21-23, 2021	Autonomous Vehicle Technology Expo , Stuttgart, Germany
Sept 7-8, 2022	ADAS & Autonomous Vehicle Technology Expo , San Jose, California (postponed from March 2022)
Nov 16-17, 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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