2020 CNNC: Round 3 Problem—ACVs

General Information for All Parties

The topic of this negotiation is **automated and connected vehicles** ("ACVs"), also called connected and autonomous (or automated) vehicles, self-driving vehicles, driverless cars, robo-cars, or robotic cars.[1] An *automated* vehicle uses sensors, controllers and computers, along with sophisticated artificial intelligence ("AI") software, to let the vehicle, rather than the driver, control at least some driving functions, such as steering, braking and acceleration; a *connected* vehicle uses wireless technology to communicate with its surroundings, such as roadways, traffic lights and stop signs.[2] While vehicles already use low-level automation to help with certain driving tasks, these features still require a driver's attention and involvement; in contrast, high-level automation, where the vehicle does most or all of the driving tasks, is a more recent development but is already being tested in Canada.[3] The Society of Automotive Engineers has promulgated an internationally recognized six-level standard of automation and, implicitly, of ACV safety:[4]

- SAE 0: The automated system issues warnings and may momentarily intervene but has no sustained vehicle control.
- SAE 1 ("hands on"): The driver and automated system share control of the vehicle. Examples are systems where the driver controls steering and the automated system controls engine power to maintain a set speed, as with cruise control. The driver must be ready to retake full control at any time.
- SAE 2 ("hands off"): The automated system takes full control: accelerating, braking, and steering. The driver must monitor the driving and be prepared to intervene immediately if the automated system fails to respond properly. The expression "hands off" is not meant literally—contact between hand and wheel is often mandatory during SAE 2 driving to confirm that the driver is ready to intervene.
- SAE 3 ("eyes off"): The driver can safely turn his or her attention away from driving tasks; e.g., the driver can text or watch a movie. The vehicle will handle situations that call for an immediate response, like emergency braking. The driver must still be prepared to intervene within some limited time, specified by the manufacturer, when called upon by the vehicle to do so.

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1 *Wikipedia*, https://en.wikipedia.org/wiki/Self-driving_car.

2 Transport Canada, https://www.tc.gc.ca/en/services/road/innovative-technologies/automated-connected-vehicles.html.

3 *Ibid.*

4 *Wikipedia*, https://en.wikipedia.org/wiki/Self-driving_car#Classification and SAE International: https://www.sae.org/standards/content/j3016_201806/

- SAE 4 ("mind off"): Like SAE 3, but no driver attention is required for safety; e.g., the driver may go to sleep or leave the driver's seat. Self-driving is supported only in limited spatial areas or under special circumstances.
- SAE 5 ("steering wheel optional"): No human intervention is required at all. An example would be a robotic taxi.

Vehicles in Canada are currently being sold with automation ranging from SAE levels 0 to 2; testing of ACVs at SAE levels 3 and 4 is underway in many countries, including Canada.[5] Not surprisingly, the technology and design needed to achieve these levels of automation presents both opportunities and risks.

The parties to the negotiation are:

- **Motorco Inc.**, an established automotive manufacturer wanting to enter the ACV market ("**Motorco**");
- **Teleos Ltd.**, a developer of AI driving systems for ACVs ("**Teleos**");
- **Citizens for Driverless Cars**, a non-profit organization devoted to advancing the adoption of ACVs ("**CDC**");
- **Centre for Ethics in Artificial Intelligence**, an influential group of intellectuals dedicated to ensuring that policy-makers consider ethical issues in the use of AI ("**CEAI**")

The negotiation arises under the following circumstances.

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5 Transport Canada, https://www.tc.gc.ca/en/services/road/innovative-technologies/automated-connected-vehicles/av-cv-101.html#Levels-automation.

Motorco is developing an ACV named **Flyt** (pronounced "flight") that uses an AI-based driving system developed by Teleos called **TeleoLogic**. Motorco holds all intellectual property rights relating to Flyt; Teleos holds all intellectual property rights relating to TeleoLogic. Motorco stands to make a large profit on Flyt—up to $10 million in the first year of production—if it can use TeleoLogic in a form appropriate to Flyt. The parties have thus entered into an agreement whereby Motorco has the rights to use TeleoLogic, including any customizations or adaptations of it made for Flyt. Considerable sums of money, including funding from Industry Canada, have already been spent on development costs in this regard.

A recent news story suggested that the agreement between Motorco and Teleos has been a matter of dispute between them, and that the dispute is responsible for Flyt being slow to reach market or testing, as the case may be. Nearly two years ago, Motorco had said that Flyt would be available in about a year. As of today, 10 months later than its predicted debut, the car still isn't ready. Potential users of Flyt have pressed Motorco to speed up testing, production and marketing. For example, some individuals and groups see safety benefits in ACVs, citing studies that estimate large reductions in accidents caused by human error.[6] These stakeholders are unimpressed that a monetary dispute between two companies would hold up production of something with such clear social benefits. Others are less sanguine, noting things like the difficulty of replacing human judgment in certain situations, the fatal and non-fatal incidents that have occurred to date,[7] and the ethical problems that might arise when an ACV is forced during an unavoidable crash to choose between two or more harmful courses of action.[8] These individuals and groups take a "go-slow" or even "no-go" stance towards ACVs. They welcome the breathing space that the dispute has given so that the policy issues of ACVs may be publicly and properly aired.

A key policy or design issue with ACVs relates to the difference between "top-down" and "bottom-up" approaches to AI. In a top-down approach, developers strive for pre-programmed rules that imitate cognitive responses; the idea is to go from the top down and add detail into each layer of abstraction. IBM's Deep Blue, which in 1997 successfully took on world chess champion Garry Kasparov, is an example of an AI system built with a top-down approach. In a bottom-up approach, developers start with simple methods and systems that grow and slowly become more complex, resembling a neural network that simulates human brain cells and learns as it goes. The idea is to see what aspects of cognition can be recreated in these artificial networks. Google's voice-recognition technology, which runs parallel neural networks to spot patterns in vast volumes of data streaming in from Google's users, is an example of an AI system built with a bottom-up approach.

For years, the top-down approach dominated, but over time, the bottom-up approach is proving more able to deal with the kinds of complexities inherent in ACVs. The main

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6 *Wikipedia*, https://en.wikipedia.org/wiki/Self-driving_car#Potential_advantages.

7 *Wikipedia*, https://en.wikipedia.org/wiki/Self-driving_car#Incidents.

8 *USA Today*, https://www.usatoday.com/story/money/cars/2017/11/23/self-driving-cars-programmed-decide-who-dies-crash/891493001/.

problem with the bottom-up approach is that it takes a long time for the AI system to learn appropriate responses to any given situation. With sufficient progress in both approaches, developers may eventually adopt a hybrid approach that relies on both forms of AI design.

One entity interested in these issues is the non-profit **International Ideation Institute/Institut international d'idéation** ("**III**" or "the **Institute**"). The Institute is a combined think tank, museum, gallery and innovation lab whose goal is to "turn ideas into futures." It has taken an interest in ACVs and has invited Motorco, Teleos and a number of other organizations to discuss the situation with a view to facilitating a resolution if possible. Both companies have accepted the invitation, as have CDC and CEAI. These two organizations have stated that they intend to file evidence, supply testimony, and make representations in a scheduled hearing of a Senate of Canada committee on ACVs. One of the issues to be considered at this hearing is the testing and approval of ACVs like Flyt. Thus, although CDC and CEAI are not parties to any agreement or dispute between Motorco and Teleos, they may influence the course of that dispute, how it is framed, and its outcome, whether at the hearing or in the context of any subsequent involvement with regulatory authorities.[9]

For the purposes of the negotiation, they have agreed to discuss the following issues, time permitting:

1. Financing or funding requirements to get Flyt to market or testing
2. Timing to market or testing
3. Level of automation for first generation of Flyt (SAE levels 2, 3 or 4)
4. Level of support for Flyt at Senate hearing and whether safety testing is government-controlled or industry-controlled
5. Level of exclusivity or access to the intellectual property rights for TeleoLogic
6. Nature of programming approach (e.g., top-down, bottom-up, hybrid)

The parties have authorized their representatives to negotiate on their behalves and to work out the details of any agreement or arrangement as best they can.

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[9] In Canada, jurisdictional responsibility for ACVs is shared among all three levels of government: federal, provincial/territorial, and municipal. For details, see *Automated and Connected Vehicles Policy Framework for Canada*, Appendix 1 (PPSC Working Group On Automated And Connected Vehicles, 21 January 2019), https://comt.ca/Reports/AVCV%20Policy%20Framework%202019.pdf.