

Truck Platoon Canadian On-Road Trial

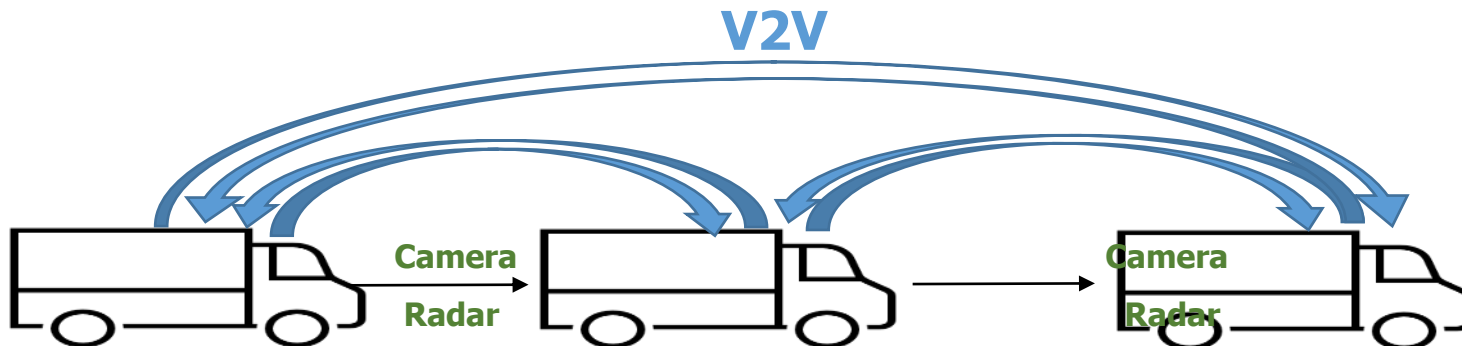
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➤ Truck Platoon Systems

- Truck platooning relies on Cooperative Adaptive Cruise Control (CACC) to enable two or more tractor-trailers to follow closely behind one another -- which reduces aerodynamic drag, fuel consumption, and emissions.
- CACC uses vehicle-to-vehicle (V2V) communication technology and forward looking sensors to automatically maintain a precise separation distance between vehicles.
- Potential platooning benefits:
 - Improved fuel economy
 - Reduced emissions
 - Improved road-use efficiency
 - Reduced driver workload



➤ Transport Canada's Interest in Truck Platooning

Following a regulatory review roadmap process, the Government of Canada's 2018 Fall Economic Statement recommended working with industry to develop new regulatory approaches in support of innovation, and further noted:

Implement a truck platooning system test bed (sandbox) to support the development and adoption of platooning technologies

The Truck Platoon Trial is complemented by other CAV-related activities in TC, including:

- [ADAS testing](#)
- [The Program to Advance Connectivity and Automation in the Transportation System \(ACATS\)](#)
- [Guidelines for testing automated driving systems in Canada Version 2.0](#)
- [Transport Canada's Vehicle Cyber Security Strategy](#)
- [Canada's Vehicle Cyber Security Assessment Tool \(VCAT\)](#)
- [National Policy Framework on Connected and Automated Vehicles](#)
- [Canada's Safety Framework for Connected and Automated Vehicles](#)
- [Safety Assessment for Automated Driving Systems in Canada](#)
- [Canadian Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles](#)

Transport Canada Platooning Activities 2014-Present

Review of Cooperative Truck Platoon Systems - Literature Survey
2014

3-Truck Track Testing with California PATH, Phase 1
Oct 2016



2-Truck Wind Tunnel Testing
Jan 2017



3-Truck Track Testing with PATH, Phase 2
Aug 2017



Next Steps

Platoon On-Road Trial (and track testing)
2021-2022

Test Methodology for Assessing Driver Fatigue Report
Sept 2020

Platoon Energy Savings Simulations
2021 (work in progress)

Report on Considerations for On-Road Trials
Sept 2020

2-Truck Track Testing with Auburn U.
Jun 2019



Platooning Workshop with Stakeholders
Oct 2018

Platoon Fuel Consumption Reports:
SAE Paper 2021-01-0941: Track-Based Aerodynamic Testing of a Two-Truck Platoon
SAE Paper 2020-01-0679: Impact of Mixed Traffic on the Energy Savings of a Truck Platoon
Fuel-Economy Testing of a Three-Vehicle Truck Platooning System

➤ TC's Truck Platoon Trial will Observe

- Driver experience - particularly task-induced fatigue
- Fuel consumption, GHG & CAC emissions
- Safety and dynamic performance
- Traffic flow interactions
- Key factors of influence on the operational design domain
- Regulatory and operational observations
- Offer experience in developing relevant training and safety plans for deployment of AV/CVs



Truck Platoon Canadian On-Road Trial Schedule

Phase I [COMPLETE] Planning & Preparation January – July 2021	Phase II & III [COMPLETE] Testing in Controlled Conditions August – October 2021	Phase IV On-road trial January 2021 – July 2022
<ul style="list-style-type: none"> • Contracted Alberta Motor Transport Association through BuyandSell.gc.ca • Finalizing Trial plan, this includes: <ul style="list-style-type: none"> • Overall Project plan – timeline & milestones • Driver Experience Methodology – assessing passive fatigue • On-Road Trial Methodology – Test equipment and logistics of on-road trial operation 	<ul style="list-style-type: none"> • Phase II: Track-based dynamic validation testing (TC-led) - braking, cut-in scenarios • Phase III: Supervised on-road driver fatigue assessment – calibrate/validate instruments 	<ul style="list-style-type: none"> • On-road trial (~6 months) • Followed by analysis and results reporting • Currently, a risk review process is underway to establish appropriate protocols for on-road trial operations, taking into account the experience from phases 2 and 3

➤ Truck Platoon Trial Partners



Transport
Canada

Transports
Canada



➤ Platoon Trial Partners

Lead Contractor selected to administer platoon trial is **Alberta Motor Transport Association (AMTA)**

- Platoon-capable trucks provided by **Pronto Ai**.
- Carrier partner **Bison Transport**, who will provide:
 - Goal to have 20 drivers participate
 - Operation, moving commercial goods on specific routes
 - Mechanic services
- Subject matter experts from University of Alberta Psychology and Engineering departments. The team includes experts in engine efficiency, vehicle automation and connectivity, and fatigue.
- Alberta's Transportation ministry is engaged in project governance.



➤ Platoon Trial – Pronto Ai CTPS

- Pronto Ai is supplying two 2019 Peterbilt 579 trucks retrofitted with their **Copilot** automated driving system.
 - TRL 7-8 – Ready for demonstration in an appropriate operational environment.
 - SAE Level 2 capable system with automated steering.
 - Pronto system uses LTE network communications (no DSRC), radar, forward cameras.
- Pronto will provide technical support for their hardware and software, and contribute to risk assessment, driver training, and systems mechanical training for the trial.



➤ Platoon Trial – Validation Testing

- Validation testing at Transport Canada's Motor Vehicle Test Centre in Blainville, QC. Testing executed by the contracted facility operator, PMG Technologies.
- Validation testing provides a safety verification function prior to on-road trials.
 - Single truck braking
 - Platoon braking
 - Traffic vehicle cut-in
 - Slower moving traffic reveal
 - Scenarios will include various conditions: straight vs curved road, various headways between trucks



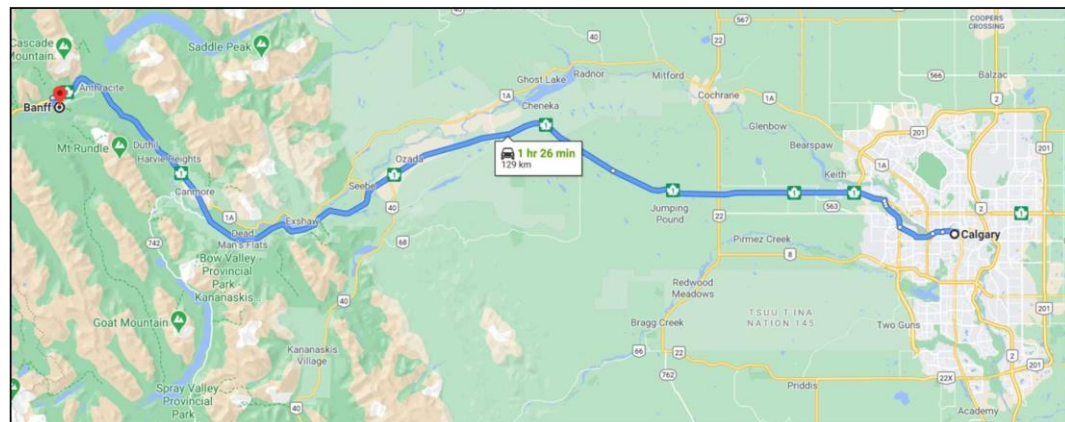
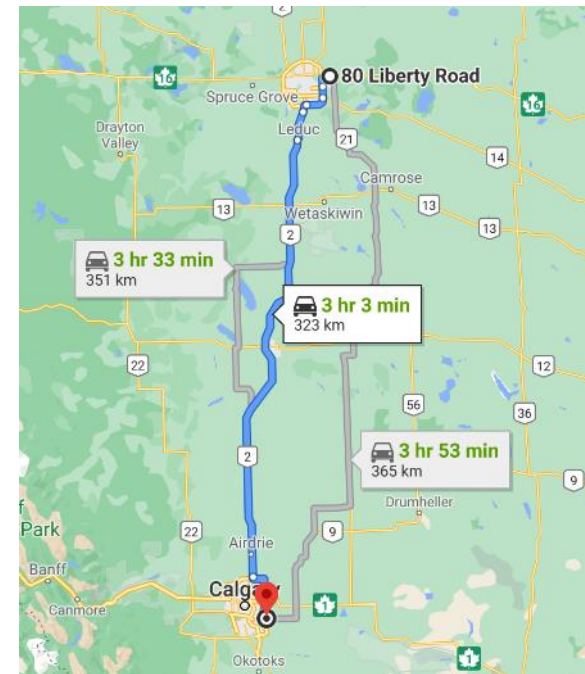
Transport Canada's Motor Vehicle Test Centre

Video from this testing can be seen here:

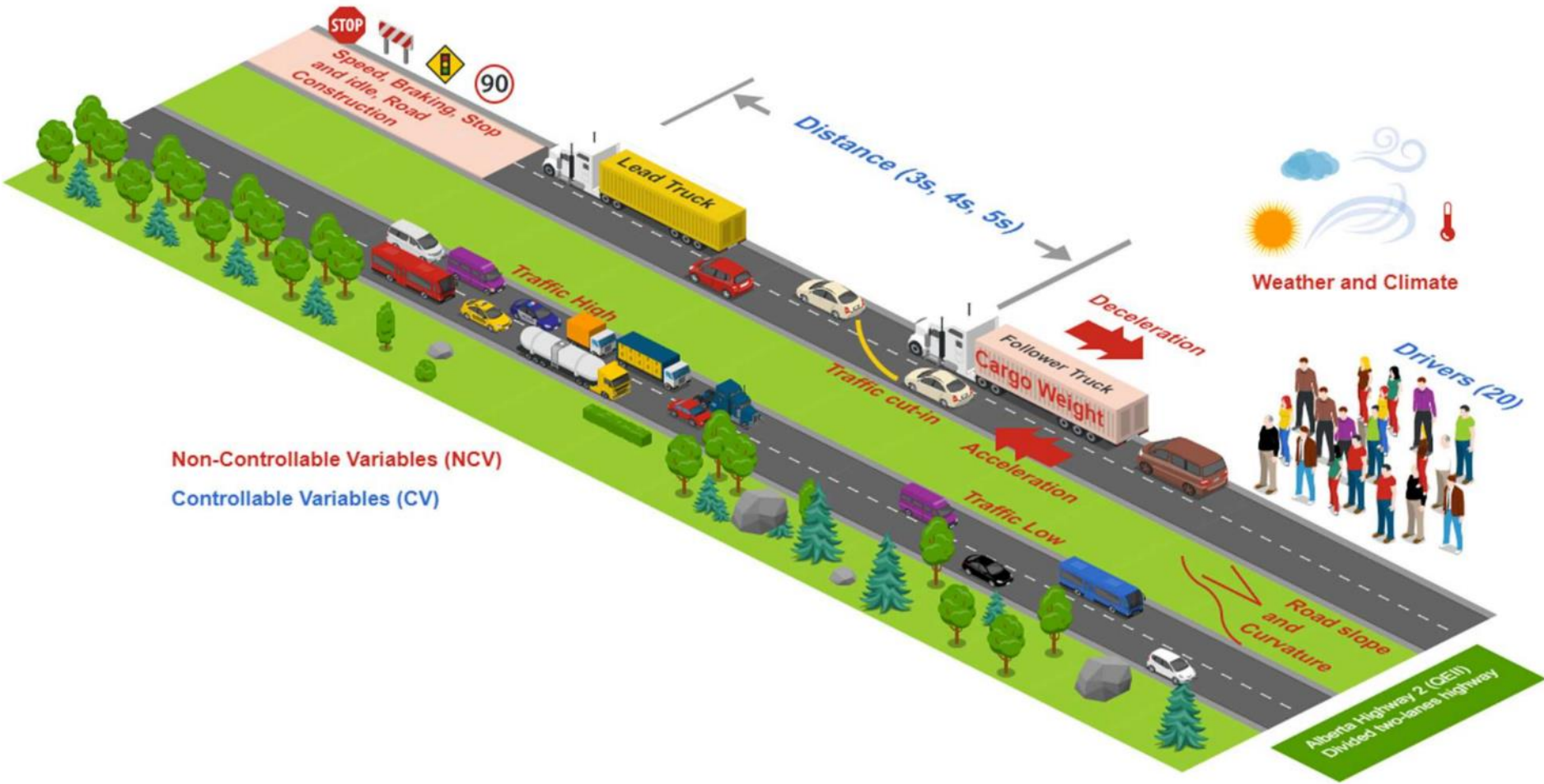
<https://www.youtube.com/watch?v=jAaeTyVvpLg&t>

➤ Platoon Trial – Operational Route

- **Highway 2, Calgary – Edmonton:** Platoon will operate on a route moving goods between. Route is ~700km with return trip (planned 50 roundtrip runs)
- Highway 2 (Queen Elizabeth II) is a divided four/six-lane highway
- Highway 1, Calgary – Banff: Greater variation in grade. Route is ~120 km (planned 10 roundtrip runs)



➤ Platoon Trial – Analytics



Non-Controllable Variables (NCV)

Controllable Variables (CV)

➤ Platoon Trial – Human Factors Assessment

Naturalistic Human Factors study focuses on monitoring task-induced fatigue, assessing the impacts on fatigue while driving due to various factors.

- Passive fatigue
- Vigilance
- Alertness
- Workload
- Driver trust

Physiological Assessment Data

Electroencephalogram (EEG)
Heart rate variation (HRV)
Electrodermal Activity (EDA)
Eye tracking

20 DRIVERS



EEG Headband



Eye-tracking cameras

➤ Platoon Trial – Next Steps

Transport Canada is undertaking a Gateway review, to confirm readiness to initiate the On-Road Trial.

Currently reviewing observations from controlled tests (track-based dynamics tests and supervised human factors assessment).

Trucks are equipped with instrumentation and data acquisition system. Shakedown runs are anticipated to take place through January 2022, and then the On-Road Trial can begin.



➤ Thank You

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