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Innovation Center - Exploring New Vehicle Technologies

Fleet Management Workshop

October 30, 2024

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Transport Canada's Innovation Centre

- In January 2018, Transport Canada launched the Innovation Centre (IC) …
- ***… a transportation innovation Research, Development & Deployment (RD&D) organization tasked with:***
- driving an integrated departmental approach to transportation innovation;
- partnering in new ways with government, industry and academia; and
- leveraging emerging technologies for the benefit of all Canadians.

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ecotechnology for Vehicle Program

Transport Canada's ecoTECHNOLOGY for Vehicles (eTV) Program tests the safety, environmental impact and driving performance of new technologies for passenger cars and heavy-duty trucks.

Testing results from the eTV Program help provide the information needed to create regulations and standards for these new products.

Some of the products for vehicles that are being tested include new technologies for advanced engines and transmissions and connected and automated vehicles

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Motor Vehicle Test Center

The MVTC is a Federal Laboratory owned by Transport Canada located in Blainville, Quebec.

- Established in 1978, the MVTC is located on 546 hectares of land and comprises numerous laboratories (such as for crash testing, structural integrity, pedestrian impacts), environmental chambers, and 25 km of multipurpose test tracks.
- The MVTC has multiple users, including:
- Transport Canada, Other Government Departments and private industry, to support research of new technologies including automated vehicles, truck platooning, alternative fuel vehicles, and child seats.

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What are we working on ?

Early 2024 we completed consultation for our 3-year workplan

Following these consultations, 24 projects across four technology areas were endorsed in Winter 2024

- Zero Emission Vehicles and Advanced Engine Technologies
- Vehicle Efficiency and Aerodynamics
- Tire Safety and Efficiency
- Automation, Cybersecurity and Connectivity

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ecoTECHNOLOGY for Vehicles 2024-27 Work-Plan Placemat

			Project Title and Description	Project Drivers (regulations, policy, programs etc.)			Federal Government Partners							
				Meeting Canada's 2030 and 2050 GHG Reduction Goals	Regulatory Modernization and Targeted Regulatory Reviews	Supporting Economic Recovery and Canadian Clean Technology Innovation	ECCC	TC	NRCan	ISED	NRC	INFC	HC	EXT.
A	Zero Emission Vehicles and Advanced Engine Technologies	1	**Energy Performance and Driving Range of Light and Heavy Duty ZEVs:** Testing the performance of emerging zero emission vehicle technologies (ie. emerging battery technology, hydrogen fuel cell, etc.) in a range of operating conditions, including Canadian climate and duty cycles, to inform approaches to support vehicle electrification in Canada.	LDV-GHG, HDV-GHG, HS, CAC-ER, CFS	UNECE-ZEV		ERMS, TD, CSED, OGAED	EP, ZETP	OERD, FDO	ATDT	EME		AHEAD	US-ZEV TF, HLSG
		2	**Emissions Performance of Advanced LDV and HDV Technologies and Fuels:** Testing the emissions and energy performance of advanced LDV and HDV engines (alternative fuels, hydrogen combustion, etc) by studying cold temperature effects, real-world duty cycles, and technology/fuel interactions.	LDV-GHG, CFS, CAC-ER, ANERP			ERMS, TD, OGAED	EP, ZETP	OERD				AHEAD	US-ZEV TF
		3	**Advanced Technology Vehicle Crashworthiness Testing:** Testing the crashworthiness of advanced vehicle technologies with a focus on emerging trends such as MHZEVs, alternative battery chemistry, and vehicles configured with structural battery technology.	LDV-GHG, HDV-GHG	SS-ECT, UNECE-ZEV			MRSP, MVTC						US-ZEV TF
		4	**Safety Testing of MHDZEVs:** Support development of safety assessment methods by validating test procedures from the In-vehicle Battery Durability for Electrified Vehicles and Hydrogen and Fuel Cell Vehicle UN Global Technical Regulations.	HS, ANERP	SS-ECT, UNECE-ZEV		ERMS	MRSP, MVTC, ZETP	OERD		AST			US-ZEV TF
		5	**Electric Vehicle Battery Cell Safety and Durability Testing:** Testing the impacts of duty cycle, charge profile and thermal management strategies on EV battery cell performance durability and safety.	LDV-GHG, HDV-GHG	SS-ECT, UNECE-ZEV, SEVC-HFCVF		TD, ERMS	MRSP, EP	OERD		EME, AST			
		6	**Electrification of Transit in Canadian Operating Environments:** Developing tools and reference information, based on real-world data from 60 electric buses operating in Toronto, that will inform transit authorities' transition to ZEV technology.	HDV-GHG, ANERP		ESM	TD, CSED		FDD, OERD	ATDT	AST	PR-EAR-DR		US-ZEV TF
		7	**Reliability and Accuracy of Hydrogen Refueling Stations:** Investigating the reliability, safety, and accuracy of dispensing from hydrogen refueling stations, as well as approaches to evaluate hydrogen refueling technology for LDVs and HDVs.	HS, CFS	SS-ECT, SEVC-HFCVF		ERMS, TD		FDD	MC	EME	PR-EAR-DR		US-ZEV TF, HLSG
		8	**Fast Charger Design and Installation:** The procurement and installation of a 350kW-rated Electric Vehicle Service Equipment (EVSE) that will allow for testing electric vehicles (EVs) under high charging to quantify the effects of high-powered charging battery safety and durability.	LDV-GHG, HDV-GHG, ANERP	SS-ECT, SEVC-HFCVF	ESM		ZETP			AST			US-ZEV TF
		9	**Impacts of DC Fast Charging on Electrical Metrology:** Investigating how DC fast charging, high-voltage charging protocols, and charging rates effects the reliability and measurement accuracy of Electric Vehicle Supply Equipment (EVSE).		UNECE-ZEV, SEVC-HFCVF	ESM	ERMS		OERD	MC	ET			US-ZEV TF
		10	**Life Cycle Analysis for ZEVs:** Assessing the lifecycle greenhouse gas and cost impacts of emerging zero emission vehicle technology (advanced battery chemistries, fuel cell, HDVs) in a variety of jurisdictions and usage scenarios.	LDV-GHG, HDV-GHG, ANERP			ERMS, TD, CSED, OGAED	EP	OERD, FDO		EME, AST			US-ZEV TF, HLSG
B	Vehicle Efficiency and Aerodynamics	1	**Development of an Improved Vehicle Aerodynamics Model:** Extensive on-road vehicle aerodynamic drag data will be consolidated into a model that will provide quantifiable impacts for whole traffic systems (urban and inter-city routes), accounting for environment, vehicle shapes, and traffic influences on energy use.	LDV-GHG, HDV-GHG, HDV-RP				EP	FDD		AERO			
		2	**Investigating Vehicle Design to Improve Aerodynamic Efficiency of ZEVs:** Identifying opportunities and testing concepts for improvements in aerodynamic performance of ZEV, focusing on MDVs and applying learnings from extensive eTV work on LDV and HDV aerodynamic concepts. Predicting applications and vehicle segments where transition to ZEV is feasible.	HDV-GHG, HDV-RP			ERMS, TD				AERO			US-ZEV TF
		3	**Aerodynamic Efficiency Impact of Road Vehicle Trailers and Accessories:** Assessing vehicle efficiency impacts of accessories for work or recreation that have significant energy use and range to inform Canadians, set realistic expectations for real-world vehicle performance and improve knowledge for informed procurement decisions.	LDV-GHG, HDV-GHG			ERMS, TD	ZETP			AERO			
		4	**Effects of Precipitation Drag on Vehicle Range:** Investigating the incremental energy use due to precipitation for national global predictions, leveraging academic partnerships. Improve range-prediction estimates and identify mitigation strategies and technologies to reduce GHG emissions and improve vehicle range.	LDV-GHG, HDV-GHG, HDV-RP	SS-ECT			MRSP			AERO			
		5	**Refining Methodology for Determining ZEV Road-Load Coefficients:** Improving methods to measure road-load of electric vehicles, which may not have a true 'neutral' setting required for coast-down test methods currently used under regulations. Inform SAE committee on test procedure development.	LDV-GHG, HDV-GHG			ERMS, TD,				AERO			US-ZEV TF, HLSG
C	Tire Safety and Efficiency	1	**Particulate Matter Emissions from Non-Combustion Transportation Sources:** Testing to evaluate PM mass, number, size, and composition from brake and tire wear; build Canadian testing capabilities; and inform emission standards and test procedure development.	LDV-GHG, ANERP, CAC-ER			ERMS, TD				AST		AHEAD	
		2	**Safety and Environmental Testing of Tires:** Evaluating the relationship between rolling resistance and wet-grip/snow-traction to inform the development of tire standards and test procedures.	EES-RT	SS-ECT			MRSP	FDD					
		3	**Real-World Testing of Automated Tire Inflation Systems (ATIS):** Testing the durability and reliability of Automated Tire Inflation Systems in the HDV sector.	HDV-GHG, ANERP, HDV-GHG			TD	MRSP			AST			
D	Automation, Cybersecurity, and Connectivity	1	**Advanced Driver Assistance System Testing** to evaluate new testing protocols and performance of commercially available ADAS technologies under a range of collision scenarios.		ACAVS, SS-ECT			MRSP						
		2	**Safety and Performance Testing of Cellular Vehicle Communication:** Evaluate performance and failure modes of V2X systems (vehicles, infrastructure, other road users).		ACAVS			MRSP, ACATS						
		3	**Modeling Vehicle Emission Reductions from Smart Traffic Simulations:** Evaluating the impacts of CAV adoption and vehicle-use patterns on fleet-wide emissions.	LDV-GHG, CAC-ER	CAV-T, ACAVS		TD	EP	CME, OERD		AST, AERO			
		4	**Performance and Efficiency Testing of ADAS-Equipped Vehicles:** Investigating and quantifying the impact that Advanced Driver Assistance Systems (ADAS) features have on vehicle emissions and traction battery state of charge in real world driving scenarios.	LDV-GHG, CAC-ER	CAV-T, ACAVS		ERMS	EP	CME		AST		AHEAD	
		5	**Development of a Cybersecurity Assessment Framework** to identify vehicle cybersecurity threats and mitigation strategies	HDV-GHG, HDV-RP	CAV-T, ACAVS			MRSP			AST, AERO			
		6	**Position-Navigation-Timing (PNT) Safety Testing:** To evaluate PNT technologies in the context of connected and automated vehicles.		CAV-T, ACAVS			MRSP, ACATS	CGS	PNTS	AST			

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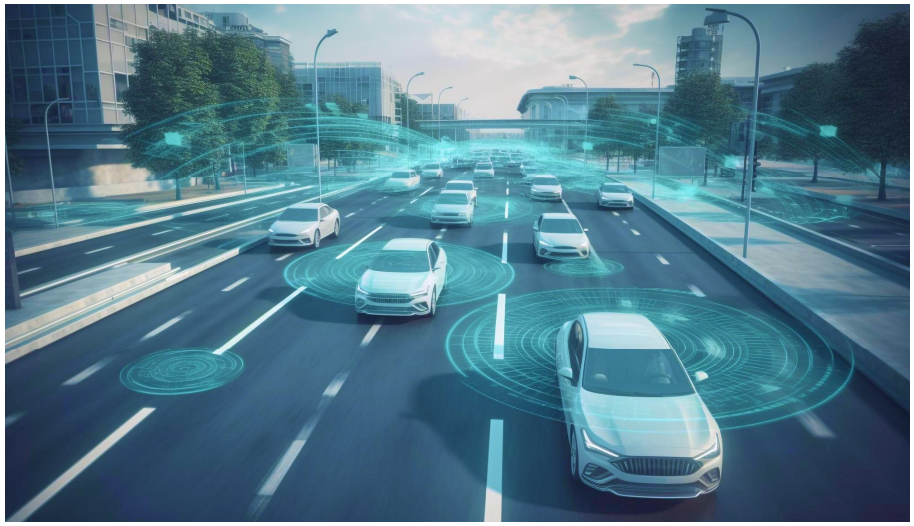
Detailed Projects

Zero Emission Vehicles and Advanced Engine Technologies



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Energy Performance and Driving Range of Light and Heavy Duty Zero Emission Vehicles

Evaluate the performance of zero emission vehicles in a range of operating conditions including Canadian climate and duty cycles.

Results will be used to inform approaches to support key government objectives related to the modernization of Canada's transportation sector.

Performance testing on zero emission vehicles incl. BEVs, FCEVs, PHEVs

A test plan will be developed for each vehicle with input from stakeholders.

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Advanced Technology Vehicle Crashworthiness Testing

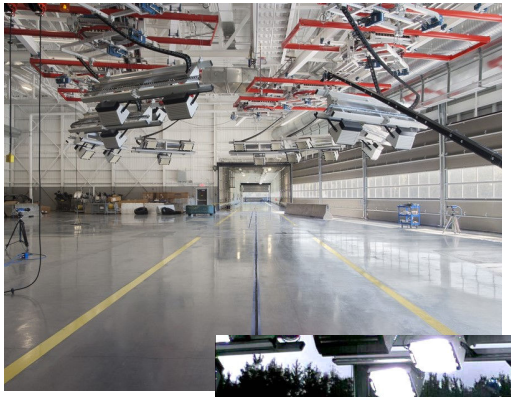
investigate the crashworthiness of advanced vehicle technologies, including plug-in hybrid and battery electric vehicles.

Conduct moving car-to-moving car frontal offset, side impact and rear impact crash tests.

The program will be carried out at the Motor Vehicle Test Centre

Examples of advanced vehicle technologies that will be studied are:

- Battery electric vehicles equipped w/ a structural battery
- Different battery configurations and chemistries



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Electrification of Transit in Canadian Operating Environments

Support transit authorities' transition to ZEV technology by utilizing Toronto Transit Commission's (TTC) efleet deployment

Evaluation of vehicle performance, develop and refine route selection criteria, and analyze vehicle reliability in a Canadian climate.

Results from this project will be used to support transit associations transition to ZEVs.

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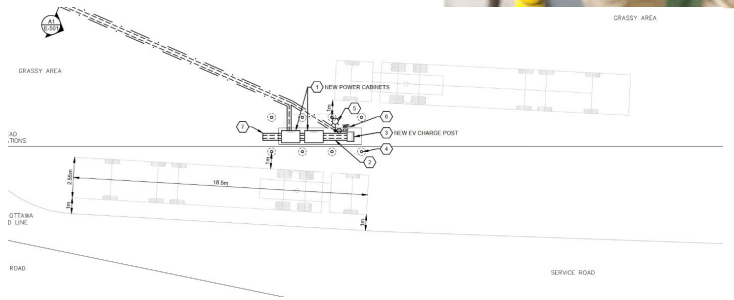
Fast Charger Design and Installation

Testing electric vehicles (EVs) under high charging to quantify the effects of high-powered charging battery safety and durability.

Data collected through testing at high loads will also support the development of EV battery models.

The procurement and installation of a 350kW-rated Electric Vehicle Service Equipment (EVSE) that would allow charging of nearly all currently available electric LDV and HDV models at their maximum charge rates.



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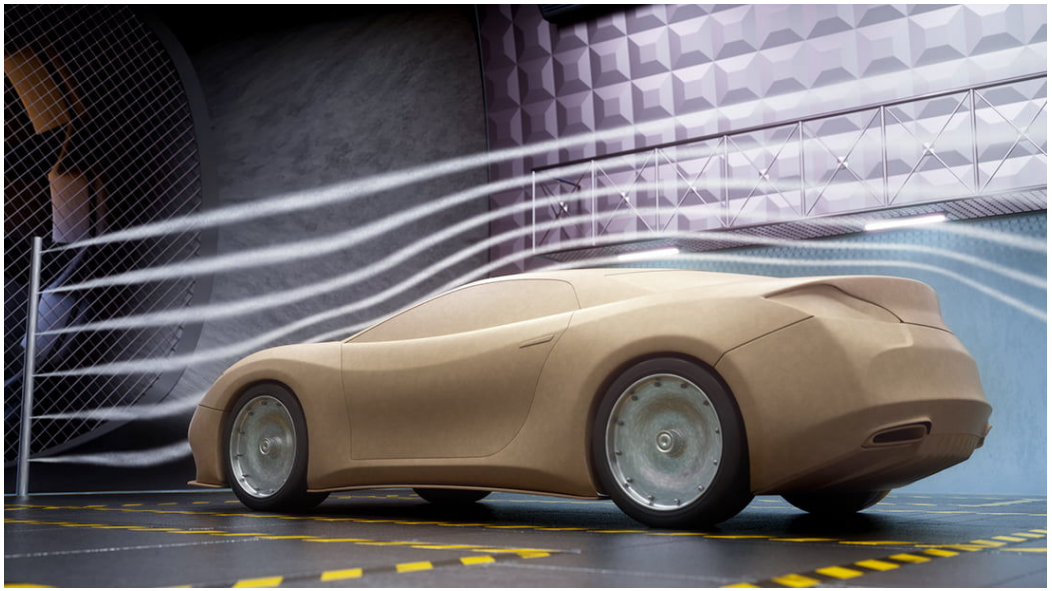
Vehicle Efficiency and Aerodynamics



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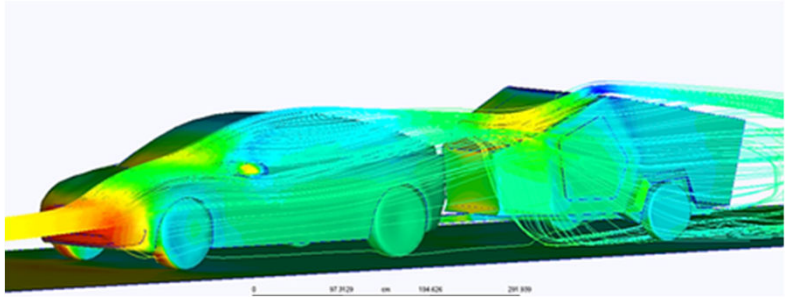
Aerodynamic Efficiency Impact of Road Vehicle Trailers and Accessories

Assess the vehicle efficiency impact of accessories for work or recreation that have significant energy use and range (ladder racks, bike/ski racks etc.).

Results can be used to inform Canadians, set realistic expectations for real-world vehicle performance and improve knowledge for informed procurement decisions.

Full-scale testing in 9m wind tunnel, using air-bearing system for trailers.



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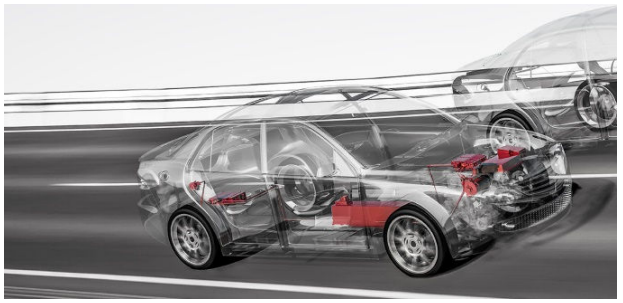
Investigating Vehicle Design to Improve Aerodynamic Efficiency of Zero Emission Vehicles

Identify opportunities and test concepts for improvements in the aerodynamic performance of zero-emission vehicles.

This work will focus on medium duty vehicles (MDVs), applying learnings from extensive eTV work on LDV and HDV aerodynamic concepts.

Some LDV and HDV considerations may be included to fill existing knowledge gaps.



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Tire Safety and Efficiency

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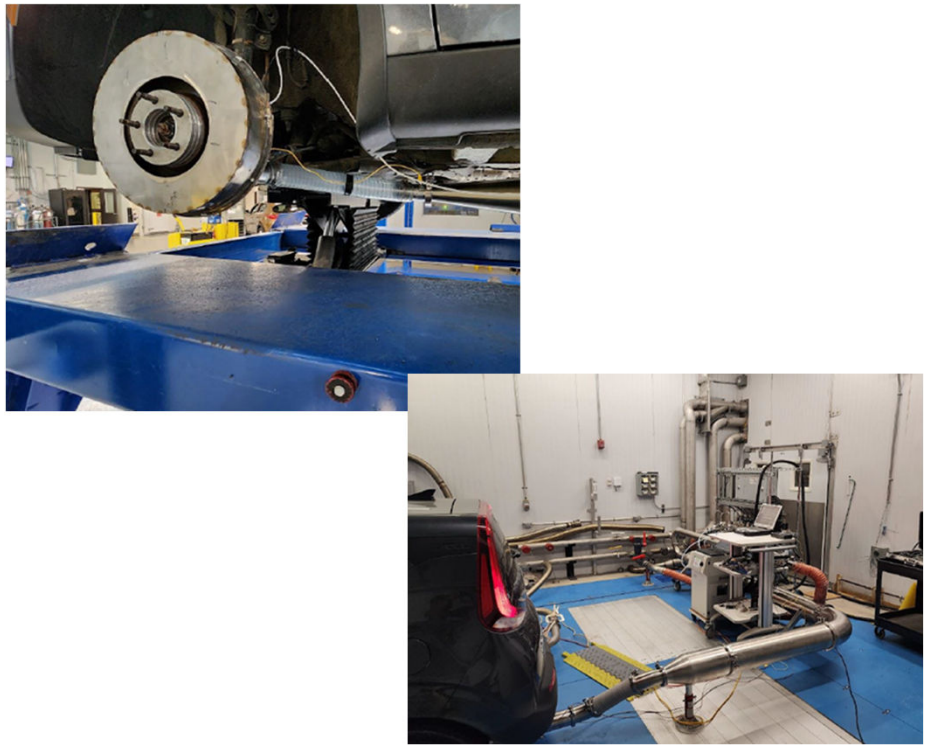
Particulate Matter Emissions from Non-Combustion Transportation Sources

Non-exhaust sources including brake wear, tire and road wear, clutch wear and road dust resuspension.

The non-exhaust sources have not been regulated because they are difficult to measure and control.

However, with increasingly stringent standards for exhaust emissions, the non-exhaust fraction has become increasingly important.



ERMS LAB Setup for brake PM

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Real-World Testing of Automated Tire Inflation Systems (ATIS)

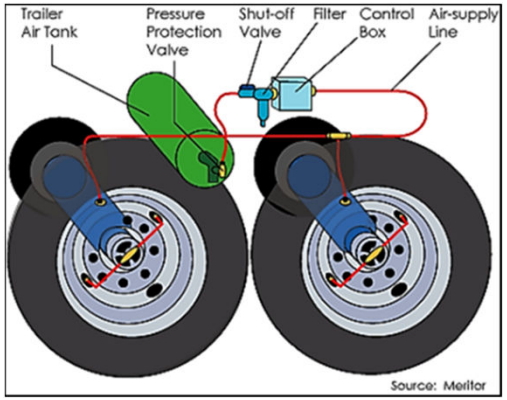
To further study the implementation of TPMS & ATIS in the HDV (Heavy-duty Vehicle) segment in terms of durability and reliability.

Project will be separated in 3 phases:

Phase I included a fleet survey of technologies,

Phase II will conclude in reporting on the real-world evaluation of a TPMS/Telematics combination.

Phase III has been flagged as further work to address knowledge gaps with ATIS.



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Automation, Cybersecurity and Connectivity

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Advanced Driver Assistance System Testing

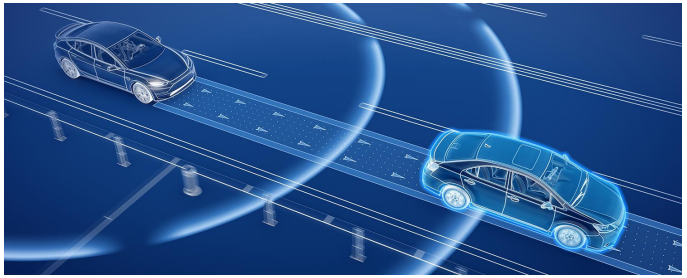
Evaluate testing protocols and performance of autonomous vehicles features

Test plan will be developed for each research topic involving different methodologies.

Monitor and evaluate the safety of emerging ADAS technologies as they become available to Canadians

Conduct ADAS procedures under various scenarios in order to capture Canadian road and visibility conditions

Canadian context includes winter road conditions and the effect of winter on advanced technologies' performance.



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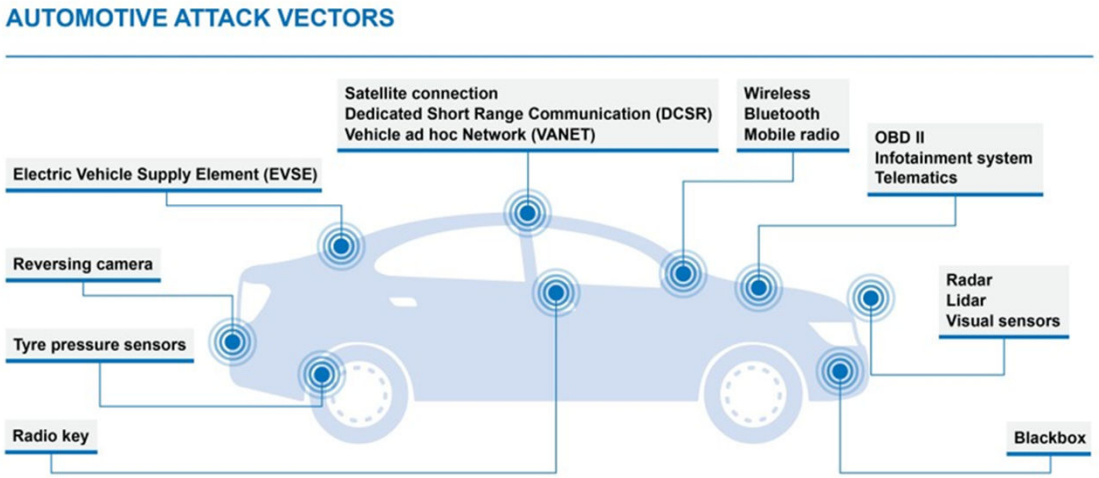
Development of a Cybersecurity Assessment Framework

identify vehicle cybersecurity threats and mitigation strategies

Work with stakeholders to identify key areas to explore

Testing of specific vehicle features or components, such as ADAS features or connectivity features

Testing of cyber vulnerability with respect to electric vehicle charging infrastructure



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Dominique-Pierre Dion, PMP
Manager, Compliance and Research Operations
Innovation Center
Transport Canada

dominique-pierre.dion@tc.gc.ca

613-218-4369