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**SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise
indicated, all other terms and conditions of the Solicitation
remain the same.

Ce document est par la présente révisé; sauf indication contraire,
les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

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Defence Science Projects Division/Division des projets
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Title - Sujet Cooperative Truck Platoon System Cooperative Truck Platooning System	
Solicitation No. - N° de l'invitation T8009-190376/A	Amendment No. - N° modif. 004
Client Reference No. - N° de référence du client T8009-190376	Date 2020-12-01
GETS Reference No. - N° de référence de SEAG PW-\$\$\$SL-009-38519	
File No. - N° de dossier 009sl.T8009-190376	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM Eastern Standard Time EST on - le 2020-12-09 Heure Normale du l'Est HNE	
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This amendment 004 is raised to answer questions from potential bidders and amend Annexes A, B, and C.

Question 13:

In Section 6.5.1 you refer to "sections 0 and 0". Could you please provide a paged number?

Answer 13:

As a result of the PDF conversion, some sub-section and task numbers show as "0". Errors are being corrected in the following:

Annex A: sub-sections 6.3.2, 6.4, 6.5.1; task numbers in tables under sections 8 and 9.

Annex B: Task numbers in the Basis of Payment table.

Annex C: Task numbers in the Pricing Schedule

Delete: existing Annexes A, B, and C; and

Insert: new Annexes A, B, and C attached.

Question 14:

The M4 and M5 requirements point to an academic profile which would typically request a right to publish some of the particular finding that person would be working on. Will this be allowed under this work? If not, what is offered to the researchers participating in the project?

Answer 14:

The justification for the Crown to retain intellectual property rights is that the purpose for the project is to generate knowledge and information for public dissemination, therefore we encourage participant researchers to publish findings based on this project work.

END

ANNEX A - STATEMENT OF WORK

PROJECT NAME:

Cooperative Truck Platooning Systems (CTPS) Trial

1. Terminology

A glossary of acronyms and definitions of frequently used words contained in the SOW.

AV	Automated Vehicle
AVSC	Automated Vehicle Safety Consortium
CTPS	Cooperative Truck Platoon System
CTP	Cooperative Truck Platoon
CV	Connected Vehicle
HMI	Human-Machine Interface
HDV	Heavy-Duty Vehicle
MVTC	Motor Vehicle Test Centre – Transport Canada test facility, located in Blainville, QC
ODD	Operational Design Domain
TC	Transport Canada
V2V	Vehicle-to-Vehicle

2. Background

Transport Canada's (TC) Innovation Centre undertakes testing and evaluation of current and emerging vehicle technologies to help inform various stakeholders that are engaged in the development of regulations, codes and standards for the next generation of advanced light and heavy-duty vehicles. Results help in the development of environmental and safety regulations, policies, and programs to ensure that new technologies can be introduced in Canada in a safe and timely manner.

In the 2018 Fall Economic Statement, the Government of Canada expressed interest in working with industry to develop new regulatory approaches in support of innovation. One approach includes the use of "a truck platooning system test bed (sandbox) to support the development and adoption of platooning technologies (the act of electronically hitching two or more heavy vehicles together to form a 'road train')."

The trucks use Vehicle-to-vehicle (V2V) communication in addition to forward sensors to help maintain constant following distance, allowing the potential for shorter gaps between the vehicles. These trucks are at least Level 1 automated vehicles according to SAE J3016 defined levels of vehicle automation. Cooperative truck platooning systems (CTPS) are in development and approaching commercialization. However, there is a knowledge gap in terms of the safety, reliability and resiliency of these systems. Further testing and evaluation is required to help qualify and quantify their overall operational safety and environmental performance.

Platooning technology has the potential to reduce greenhouse gas emissions and fuel consumption of long haul heavy-duty trucks, contributing to a more efficient transportation network. Despite comprising a small portion of Canada's on-road fleet, they emit almost 10% of the country's total annual greenhouse gas emissions. While greenhouse gas regulations are expected to help address this, platooning has the potential to accelerate Canada's efforts to meet its 2030 greenhouse reduction commitments, as presented in the 2017-2020 Departmental Sustainable Development Strategy, while increasing the trucking industry's competitiveness as the technology will decrease fuel costs. Platooning technology could also help address labour shortages as advanced technology could enhance the appeal of the trucking profession for new drivers.

3. Objective

The objective of this work is to support innovation, more specifically higher automation and connectivity of vehicles. The work will gather evidence to inform the potential development of regulations, policies, and programs that provide a modernized approach for addressing this technology.

This proposed truck platooning pilot project will also increase evidence to inform the potential policies and regulations on motor carrier operations and automated vehicle (AV) and connected vehicle (CV) technology of Canadian jurisdictions. Additionally, vehicle platooning could reduce greenhouse gas emissions, promote automated vehicle and connected vehicle technologies and inform Transport Canada's policies on automated vehicles and connected vehicles.

4. Scope

The Contractor is responsible for the development and organization of a Canadian on-road trial with supplemental on-track testing (for specific dynamic tests and a potential driver fatigue investigation). The trial will include at least 6 months of on-road operation on Canadian highways. The data collected from the operation of the CTPS equipped trucks during the trial will help better understand the operational impacts, benefits and limitations of platooning technology and higher levels of vehicle automation. The CTPS to be assessed must be a minimum Level 1 automated vehicle according to SAE J3016 defined levels of vehicle automation.

The Contractor must follow the most recent guidelines regarding automated and connected vehicle safety published by TC¹:

- Canada's Safety Framework for Automated and Connected Vehicles
- Testing Highly Automated Vehicles in Canada: Guidelines for Trial Organizations
- Canadian Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles
- Safety Assessment for Automated Driving Systems in Canada
- Canada's Vehicle Cyber Security Guidance

Although, these resources are intended for level 3 or higher AVs, the CTPS used for this project is likely to be a level 1 or 2 automated vehicle system. However truck platooning is a relatively challenging application for this rated AV level, as a high degree of system integrity is required to safely demonstrate shorter following distances and maximize benefits. The AV system used for this project and the on-road trial must follow these guidelines, accounting for the driver's intended role in operating the vehicle.

The on-road trial will be a duration of 6 months and is intended to operate through a variety of seasons, including summer and winter conditions. During this trial the Contractor will establish a collaboration with

¹ Documents are available at <https://www.tc.gc.ca/en/services/road/innovative-technologies/automated-connected-vehicles/what-you-need-to-know.html>

several parties: TC, CTPS supplier/integrator, carrier, representatives of jurisdictional authorities, and TC advisors, to coordinate track testing and an on-road trial.

The Contractor must have access to a CTPS that is developed to a technology-readiness level of at least 7², which represents a prototype ready for demonstration in an appropriate operational environment. Given the limited availability of CTPS, which is not yet commercially available, access to CTPS must be negotiated with platoon technology developers. TC prefers to use a CTPS that is developed with intent to be commercialized and operated on public roads.

TC will engage with Provincial and Territorial contacts to explore potential allowable location options for the trial, but the Contractor is responsible for ensuring appropriate permissions are attained to operate the trial (with TC's support). TC will also solicit candidate Canadian carriers through its contacts for the trial.

A key focus of the human factors component is the assessment of driver experience, and especially the potential for passive fatigue for the driver of following vehicles in the platoon. These drivers will become less involved in the driving task than in a normal conditions and will now assume more of a monitoring function. Driver fatigue and vigilance science suggest that the monotony associated with monitoring automated or partially automated systems can lead to fatigue-related inattention (hypovigilance) and potentially to drowsiness. Laboratory studies conducted on simulators tend to confirm this notion. There is however a need to gather data in naturalistic driving conditions to assess if and to what extent this issue materializes in platooning situations. This study therefore will need to satisfy the requirements of an experimental human factors investigation (clearly established independent and dependent variables, extra vs within-subject comparisons, number of experimental conditions, power analysis for sample size calculations, experimental control, etc.). An ideal strategy for this project would be to conduct the driver experience assessment in the highly controlled environment of Transport Canada's track testing facility as well as in the naturalistic environment of the on-road trial. This hybrid, complementary approach will benefit from the strength of both research strategies.

TC will develop a performance validation plan to assess safety-related performance of the CTPS on a test track prior to the trial, including assessment of platoon braking and interactions with vehicles cutting into the platoon. This testing will take place at Transport Canada's Motor Vehicle Test Centre (MVTC) in Blainville, QC. The Contractor will provide input for the test plan and coordinate the delivery and availability of CTPS-equipped trucks, trailers, and truck drivers for the tests. This testing must be performed in temperate weather conditions, so cannot be scheduled to occur when snow may be anticipated. TC will undertake the costs of this testing, including track rental, track services, instrumentation, data collection and analysis.

4.1 Project Participants

TC's Innovation Centre will engage other project partners, including but not limited to: TC's Motor Vehicle Safety group to guide safety aspects of project; and the National Research Council, to provide expert input on fuel consumption and aerodynamic assessment and CTPS technology. TC will be responsible for managing of project participants other than the CTPS supplier, jurisdictional authority (Province or Territory), and motor carrier operator. TC will be the point of contact for communications between the Contractor and any other parties participating in the project.

² Technology Readiness Levels defined here: <https://www.ic.gc.ca/eic/site/080.nsf/eng/00002.html>

TC will liaise with stakeholders such as other federal government departments, provincial and territorial governments, industry, and academia. In order to appropriately address concerns and capture valuable input from these stakeholders, the Contractor will be expected to provide presentation material to share information on the project plan prior to the on-road trial, and on the results at the conclusion of the trial. TC may propose modifications to the project plan based on stakeholder input.

TC and the project partners may, in coordination with the Contractor, perform tests supplemental to that of the Contractor during the on-road trial. The Contractor will make every reasonable effort to accommodate the supplemental testing requested by TC. Any additional effort, equipment and costs for this supplemental testing is not the responsibility of the Contractor.

4.2 Support Provided by Transport Canada

TC offers the following support for the successful implementation of the project:

- Technical expertise and guidance with planning, including: soliciting participation from provincial/territorial authorities or Canadian commercial vehicle operators.
- May provide advice on import/export process for vehicles.
- Help identify testing methods, equipment, or other resources to achieve optimal results.
- Engaging stakeholders for input and disseminating information regarding CTPS trial.

5. On-Road Trial Rationale (Areas of study)

5.1 Fuel Consumption of Platooning Trucks

During on-road trial operation of platooning trucks, the Contractor will take reliable measurements of fuel consumption and related factors (i.e., weather, average speed and speed variability, weight, etc.) for each trip. Specific factors to be investigated in relation to fuel consumption include:

- 5.1.1 Various separation times/distances of the platoon;
- 5.1.2 Investigating the effects of speed variations during a measurement run;
- 5.1.3 Investigating the effects of other-vehicle cut-ins and mixed traffic scenarios;
- 5.1.4 Investigating the effects of road grade and curvature;
- 5.1.5 Investigating the effects of vehicle configuration (cargo weight and, if feasible, trailer type).

5.2 Safety and Dynamic Performance of Platoons

The Contractor will provide input and support in Transport Canada's on-track dynamic test plan development and testing. This track testing will be intended to assess whether the CTPS is appropriate for operation on Canadian roads, and to determine certain operational design domain parameters (e.g.,

minimum following distance). During the on-road trial, data will be collected to observe platoon safety and dynamics performance. This will focus on the following:

5.2.1 Braking performance and reaction to vehicle cut-in of a platoon system:

- a. Platoon interactions with vehicles that enter the gap between platooning trucks (i.e. vehicle cut-ins, cut-offs and cut-outs); and
- b. Platoon responses to gradual and hard braking (during acceleration, deceleration, and same speed maneuvers).

5.2.2 Identify system limitations, faults, and abnormal or unintended system behavior, including system disengagement events or failure of system function or components.

5.3 Traffic Implications

The Contractor will analyse the effect of CTPS on traffic flow. This includes:

- 5.3.1 Estimated impact on roadway mobility (bandwidth, throughput, and latency); and
- 5.3.2 Impact on other road users' ability to pass, merge or access on/off ramps.

5.4 Human Factor Evaluation

The Contractor will gather data to assess human factors on the use of CTPS regarding the following:

5.4.1 Assessment of driver experience, including:

- a. Passive fatigue (related to task underload, monotony) for driver of following truck in platoon;
- b. Stress;
- c. Workload;
- d. Trust in the system/user acceptance;
- e. Risk perception.

5.4.2 Human Machine Interface (HMI) design and driver-vehicle interaction;

5.4.3 Behaviour of other road users in the vicinity of the platoon; and

5.4.4 Driver training and knowledge of system capabilities and limitations.

5.5 Operations

The Contractor will work with project partners, particularly the carrier who will operate the trucks, to observe operational impacts of using a CTPS, including the following:

- 5.5.1 Scheduling and logistic considerations;
- 5.5.2 Cargo weight;
- 5.5.3 Traffic congestion;
- 5.5.4 Positioning (leader vs follower trucks);
- 5.5.5 Lane changes (merging, off- and on-ramps); and
- 5.5.6 Speed variations.

5.6 Operational Design Domain (ODD) and Key Factors of Influence

Working with the CTPS supplier and Transport Canada, the Contractor will help assess the operational design domain of the CTPS for the operations of the on-road trial. The Contractor will also identify key factors of influence that determine limitations to the ODD for a particular CTPS. This will include determining restrictions on engaging the CTPS during the on-road trial based on parameters of the following conditions:

- 5.6.1 Weather;
- 5.6.2 Road types and road conditions (appropriate lanes, hills, grades, uneven terrain, curvatures, etc.);
- 5.6.3 Construction; and,
- 5.6.4 Times of day.

5.7 Regulatory/Operational Observations

The Contractor and project partners will identify and describe regulations, policies, and operational factors that relate to using CTPS, including the following:

- 5.7.1 Following distance;
- 5.7.2 Speed;
- 5.7.3 Hours of service;
- 5.7.4 Inspection or reporting requirements; and
- 5.7.5 Load on infrastructure.

6. Services to be Provided

Project Phases are described in the headings below. Phases will be executed sequentially, except Phase 3 – Driver Experience Assessment Track Testing may be executed before or after (or potentially during) Phase 4 - On-Road Trial. The identified tasks detailed in the headers within each phase are not necessarily dependent on each other and many will be performed in parallel.

6.1 Phase 1 - Trial Planning

The trial planning phase encompasses all the planning elements that must take place prior to the on-road trial, and prior to any track testing to verify the CTPS performance prior to the trial.

6.1.1 Identify a CTPS Supplier

The Contractor will identify a CTPS supplier to supply the cooperative truck platoon system to enable platooning of two or three trucks (preferably trucks are supplied with the CTPS already installed) for the trial. This task consists of the following requirements:

- a. The Contractor will provide a letter of engagement from the supplier demonstrating their commitment to provide the platooning system, preferably already installed on existing trucks. The supplier must also provide support related to training, diagnostics, calibration, troubleshooting, data collection or other technical procedures specific to the CTP system supplied.

6.1.2 Identify Trial Location Options

The Contractor must identify viable option(s) for the trial location and meet the following obligations:

- a. The trial location must be on Canadian multi-lane divided highways with a prolonged stretch road;
- b. The contract must engage regulators in a dialogue and demonstrate the jurisdiction's (Province or Territory) willingness to enter discussions for allowing a CTPS trial at the selected location (if the location is interprovincial, special authorization from all jurisdictions is required);
- c. The Contractor must also adhere to the rules and regulations put forth by said Province or Territory, including, but not limited to those regarding hours of service, weights and dimensions requirements, truck speed limiter requirement, vehicle safety inspection requirements, proper cargo securement, and any necessary permits for platoon operation.

6.1.3 Identify a Canadian Truck Operator Partner

The Contractor must identify a partnership with a Canadian motor carrier to participate in the project. It is anticipated this motor carrier will accommodate the platoon in its normal operation (commercial route) and meet the following requirements:

- a. The Contractor must provide a letter of engagement from the carrier identifying their commitment to providing payload (can consist of commercial goods), route, as well as carrier participation and support (e.g. training, logistics and scheduling) where needed.
- b. The platoon must not be carrying any dangerous goods as per Transport Canada's Transportation of Dangerous Goods Regulations³.
- c. The carrier must have a valid safety fitness certificate in good standing (i.e. satisfactory safety rating), and meet all National Safety Code safety standards. The carrier must meet

³ <https://www.tc.gc.ca/eng/tdg/clear-tofc-211.htm>

all legal operating requirements, including Motor Vehicle Fitness Certificate Regulations and Commercial Vehicle Drivers Hours of Service Regulations.

6.1.4 Provide Trucks, Trailers, Drivers and Equipment for Testing and Trial

The Contractor must provide the class 8 trucks, drivers, flatbed trailers for CTPS performance validation track tests, and trailers (type not prescribed) for the duration of the on-road CTPS trial. This includes two to three CTPS equipped class 8 trucks (may be supplied by CTPS supplier) as well as a comparable non-CTPS equipped truck to serve as a baseline vehicle for experimental control (this control truck may operate for only a portion of the trial period).

- a. The baseline control truck does not have to participate during the entire trial duration. This vehicle may only undergo the first two weeks of testing, subject to test plan.
- b. The platooning trucks must be equipped with disk brakes on the tractors.
- c. Demonstrate drivers' qualification for the trial according to criteria to be agreed upon with TC.

6.1.5 Trial Planning and Logistics Administration

The Contractor is responsible for planning the logistics and administration for the operational platooning trial which includes:

- a. Participating in regular project update meetings with TC and other project partners on a bi-weekly basis or as agreed;
- b. Providing a project plan which documents roles and responsibilities, resource requirements and a detailed schedule of milestones and deliverables.
- c. Vehicle maintenance and repairs, including identifying available mechanic services prior to the trial;
- d. Provision of Class-8 vehicle drivers with appropriate qualifications (experience, safe driving record).
- e. Provision of appropriate trailers (to fulfill the carrier's delivery needs).
- f. Ensuring compliance with rules and regulations for commercial vehicle operation.
- g. Importing and exporting of any equipment or vehicle (e.g. If the CTPS/Truck supplier is from outside Canada);
- h. Arranging for travel for themselves and the subcontractors;
- i. Acquiring an appropriate insurance for the trial and testing, as determined by the Contractor and agreed by TC, and considering the requirement of the jurisdiction in which they are operating.
- j. Providing an appropriate human factors expert as a project participant.

6.1.6 Develop Driver Experience Assessment Methodology

The Contractor must present a detailed methodology for the driver experience assessment for TC's approval. The methodology must detail the experimental approaches for both the on-track experiment and the on-road trial, including but not limited to:

- a. List of independent and dependent variables;
- b. List of experimental conditions;
- c. List of controlled variables and approaches to control them;
- d. Extra vs. within-subject comparisons;
- e. Power analysis for sample size calculation;
- f. Experimental protocol;
- g. List of psychometric tools to measure driver experience variables (subjective fatigue, stress, trust in the system, user acceptance, workload, risk perception, etc.);
- h. Technological approach to measure driver fatigue (ideally including both physiological and performance assessment); and
- i. A report format or template for presenting the results, to be approved by TC.

6.1.7 Develop On-Road Test Methodology

The Contractor must present an on-road test plan for TC's approval, presenting the methodology, including a list of measured values, methods and equipment used, and frequency of measurements (some anticipated measurements described in Appendix A). TC reserves the right to provide input to the testing plan.

- a. The test plan must address the subjects described in section 5.
- b. Include potential additional test methodology to be implemented as a "shakedown" testing period during the one or two weeks of on-road platoon trial. This may include additional test equipment (for correlation or calibration); and
- c. Propose a report format or template for presenting the results, to be approved by TC.

6.1.8 Perform Safety Assessment

The Contractor must provide safety assessment documentation for the trial according to TC-published "Safety Assessment for Automated Driving Systems in Canada" published January 2019 (where applicable, as this tool is intended for level 3 to 5 automated driving systems), referenced in section 4. This includes:

- a. Defining the operational design domain (ODD) of the CTPS and measures to ensure the CTPS is not operated outside of this ODD.
- b. Identifying potential hazards of operating the CTPS and the implementation of the trial and proposing mitigations.

- c. Assessing cybersecurity and data management of the CTPS, ensuring appropriate mitigation of risks are implemented.
- d. Establishing an effective process to orient or train new operators on the CTPS.

6.1.9 Develop Risk Management Plan

The Contractor must provide a risk management plan for the execution of phase 2 of the project, which will identify risks affecting the success of the project along with mitigation strategies.

6.1.10 Input into CTPS Performance Validation Plan

The Contractor must provide technical input into development of track-testing plan to evaluate platoon behavior in dynamic scenarios prior to the platoon trial, including braking events and vehicle cut-ins. The testing will take place at the MVTC facility in Blainville, QC. The Contractor will be responsible for coordinating delivery and availability of the CTPS-equipped trucks, trailers, and drivers for the testing. TC may propose modifications to the project plan based on stakeholder input.

6.1.11 Stakeholder Consultation

TC will hold at least one stakeholder consultation event to provide an opportunity for input to refine the trial plan. Stakeholders include federal government departments, provincial and territorial governments, industry, and academia. TC will administer this process, including determining invitees, venue, schedule, and agenda. In order to appropriately address concerns and capture valuable input from these stakeholders, the Contractor must brief TC and provide presentation material on the details of Phase 1 under their responsibility. TC may propose modifications to the project plan based on stakeholder input.

Decision Gate: prior to commencing Phase 2, a go/no-go decision will be made based on the acceptance of the deliverables and project participant commitments from Phase 1.

6.2 Phase 2 - CTPS Performance Validation

Performance validation of the supplied CTPS to ensure that the system operates in a manner suitable for executing the on-road trial. This process will complement the safety assessment with validation through physical testing of the platoon system's performance during braking and interactions with vehicles cutting into the platoon.

This testing will take place at Transport Canada's Motor Vehicle Test Centre (MVTC) in Blainville, QC. Transport Canada will conduct specific test scenarios simulating braking events and vehicle cut-in events to assess platoon behavior in highly-dynamic maneuvers. Anticipate that the CTPS-enabled trucks will be required for three weeks to complete this track-based testing. This testing must be performed in temperate weather conditions, so cannot be scheduled to occur when snow may be anticipated. TC will undertake the costs of this testing, including track rental, track services, instrumentation, data collection and analysis.

6.2.1 Support CTPS Performance Track Tests

The Contractor will be responsible for the delivery and availability of CTPS-equipped trucks, technical support, flatbed trailers, and truck drivers for the tests.

Decision Gate: prior to commencing Phase 3, a go/no-go decision will be made based on the acceptance of the CTPS performance and project participant commitments from Phase 2.

6.3 Phase 3 – Driver Experience Assessment Track Testing

This phase may be performed either before or after (or potentially during) Phase 4. Track testing will take place at TC's MVTC facility in Blainville, QC. The on-track component of the driver experience assessment plan is anticipated to require no more than three weeks of track testing (it may be necessary to work outside of normal business hours at the MVTC to accommodate scheduling). TC will undertake any costs of track rental and track services charged by the MVTC facility operator, PMG Technologies.

TC can assist in coordination of resources, helping to identify required test resources such as truck drivers, trailers, or track related equipment.

6.3.1 Coordination of Driver Experience Tests

The Contractor must coordinate the availability of all resources required for the testing, including CTPS-equipped trucks, trailers, truck drivers, technicians and testing equipment.

6.3.2 Implementation of Driver Experience Tests

The Contractor is responsible for the execution of the track testing according to the developed methodology in section 6.1.6.

6.3.3 Reporting of Driver Experience Track Test Results

The Contractor must provide TC with the raw data gathered from the track tests. Analysis and reporting of the results will be combined with results from the on-road trial. However, an interim report on observations from the track testing must be provided.

6.4 Phase 4 - On-Road Trial

The on-road trial will take place over a 6 month duration. The Contractor must implement the safety and risk mitigation measures established in Phase 1. The Contractor will be responsible for the functional implementation of the on-road trial test methodology developed in section 6.1.7.

6.4.1 On-Road Trial Setup

At the start of the on-road trial it is anticipated that additional technicians will be required during preparation for instrumentation, calibration and the testing of data acquisition equipment.

It is anticipated that during this trial setup period, approximately two weeks of more intensive monitoring and instrumentation will occur as a "shakedown" procedure to verify the proper calibration, function, and operational feasibility of the trial and data collection. TC and project partners may be present for the trial setup, and with advance notice and coordination, include additional instrumentation or data collection during this trial setup period.

- a. The Contractor will be responsible for coordinating resource availability for the trial, including transportation of equipment and vehicles to the testing location.
- b. The Contractor is responsible for instrumenting all vehicles and ensuring proper calibration and function of equipment according to the on-road trial test methodology developed in section 6.1.7.

6.4.2 Trial Implementation and Telemetry

During the implementation of the on-road trial, the Contractor must continue to participate in regular project update meetings with TC and other project partners on a bi-weekly basis or as agreed.

The Contractor must monitor the progress of the on-road trial, ensuring continued platoon mileage accumulation and data collection according to the on-road trial test methodology developed in section 6.1.7. The Contractor is responsible for resolving issues that hinder the progress of the on-road trial.

6.4.3 Dismantlement of trial

The Contractor is responsible for the process of dismantling all elements of the on-road trial, including:

- a. Any final data acquisition (e.g., surveys, retrieve data stored on-board vehicles);
- b. Removal of equipment; and
- c. Returning/exporting the trucks as necessary.

6.5 Data Analysis and Reporting

The Contractor must provide all data acquired during the trial to TC.

6.5.1 Results Reporting

The Contractor must produce a report according to the format approved in sections 6.1.6 and 6.1.7. The report will provide key observations on the subjects indicated in section 5.

The report will identify best practices and lessons learned at the end of the trial to help inform future pilots as well as fleet integration of platooning systems.

7. Constraints

The Contractor must:

- Follow applicable guidelines regarding automated and connected vehicle safety published by TC, described in section 4⁴;
- Comply with Automated Vehicle Safety Consortium (AVSC) Best Practice for in-vehicle fallback test drivers;
- Comply with applicable requirements for operating commercial vehicles for the on-road trial, including cabotage requirements in the case of trucks registered in another country;

⁴ Documents are available at <https://www.tc.gc.ca/en/services/road/innovative-technologies/automated-connected-vehicles/what-you-need-to-know.html>

- Follow applicable field operational test and data collection practices detailed in FESTA Handbook Version 7⁵;

The Contractor is responsible for following best practices in data management and cybersecurity, including protection of sensitive data that may contain personal information.

The on-road trial may impose additional restrictions beyond typical Canadian commercial vehicle operator requirements. The following truck/trailer configurations will not be allowed for this CTPS trial:

- Vehicles carrying hazardous materials;
- Vehicles carrying fluids (e.g., tankers, concrete trucks);
- Vehicles carrying pipes, lumber or similar types of loose loads;
- Automobile and boat transporter combinations (i.e., traditional, stinger-steered);
- Truck and pole combinations;
- B-Train combinations;
- Lowboy tractor and trailer combinations (loaded and unloaded).
- Saddle-mount or saddle-mount with full-mount combinations;
- Construction vehicles (e.g., mobile cranes, concrete mixers); and
- Recreational vehicles

8. Schedule of Deliverables

The timeline of deliverables below represents the anticipated latest acceptable delivery dates for each defined deliverable. It is TC's preference to find opportunities to advance the schedule to achieve earlier delivery dates where possible.

Item	Task	Description of deliverable	Date Completed
1	6.1.5a	Provide regular bi-weekly project status updates during project	Bi-weekly
2	6.1.5b	Project plan which documents roles and responsibilities, resource requirements and a detailed schedule of milestones and deliverables	One month after contract award

⁵ Available at this URL: <https://fot-net.eu/Documents/festa-handbook-version-7/>

3	6.1.6	Draft Driver Experience Methodology	Two months after contract award
4	6.1.7	Draft On-Road Trial Test Methodology	Two months after contract award
5	6.1.8	Safety Assessment documentation	Two months after contract award
6	6.1.9	Draft Risk Management Plan	Two months after contract award
7	6.1.11	Materials for stakeholder consultation describing project plan	Two months after contract award
8	6.1.6	Final Driver Experience Methodology	Three months after contract award
9	6.1.7	Final On-Road Trial Test Methodology	Three months after contract award
10	6.1.9	Final Risk Management Plan	Three months after contract award
11	6.2.1	Provide CTPS-equipped trucks, flatbed trailers, truck drivers, and technical support for CTPS system for CTPS performance validation track tests	2021-05-03
12	6.3.3	Implement Driver Experience Assessment track testing and provide raw data and interim report of results	2021-06-30
13	6.4.1	Provide CTPS-equipped trucks, trailers, truck drivers, and test equipment and setup for on-road trial.	2021-07-07
14	6.4.2	Implement on-road trial, monitoring execution and data collection according to test methodology.	2022-01-31

15	6.4.3	Provide data and briefing upon completion of on-road trial.	2022-01-31
16	6.5.1	Provide draft report for Driver Experience Assessment	2022-02-15
17	6.5.1	Provide draft report for On-Road Trial	2022-02-15
18	6.5.1	Following report review, provide final report for Driver Experience Assessment	2022-03-15
19	6.5.1	Following report review, provide final report for On-Road Trial	2022-03-15
20	6.1.11	Materials for stakeholder consultation summarizing project results	2022-02-28

9. Travel

The Contractor is responsible for arranging travel for its team members, and coordinating any travel with partners including the jurisdictional authority (Province or Territory), and motor carrier operator. Travel costs will be reimbursed by TC according to the National Joint Council Travel Directive⁶.

TC will be responsible for arranging the travel and costs of TC employees and additional project participants.

The table below presents anticipated travel required for the project under the responsibility of the Contractor. It is likely that some of the anticipated people will not need to be present for the entire duration of each event, and it is possible that some modification of this anticipated travel may be required. This estimate may not be comprehensive. For example it may not account for the potential travel required of commercial vehicle drivers for the Driver Experience Assessment testing, which may require numerous different drivers to participate.

⁶ <https://www.njc-cnrm.gc.ca/directive/d10/en>

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Associated Task (Referenced by section number)	Description	Number of days of travel (per person)	Number of People Anticipated
6.2.1	Travel to Blainville, QC, for CTPS performance validation testing	10	3
6.3.2	Implementation of Driver Experience track tests at Blainville, QC. Anticipated to last up to three weeks.	20	5
6.4.1	On-Road Trial Setup. Location TBD.	10	3
6.4.3	Dismantlement of Trial. Location TBD.	7	3

Appendix A to Annex A

Required test instrumentation

Instrumentation and data logging for the following measurements:

- Minimum data sampling rate of 1 Hz, preferably 10 Hz
- Acquire J1939 data from CAN bus (parameters to be confirmed at a later date, and depends on the data broadcast by the selected vehicle)
- Instantaneous fuel rate with an accuracy of ± 0.25 litres/hr (if using J1939 signals, will need to be verified and possibly calibrated against actual fuel use)
- Precision GPS with speed accuracy of ± 0.5 km/h and positional accuracy of ± 1 m horizontal and ± 2 m vertical.
- Forward-looking radar from all test vehicles, able to track multiple targets with positional accuracy of ± 1 m or better.
- CTPS performance (distance gap, system engagement, etc.)
- GPS-synchronized forward-looking video from all test vehicles
- Inertial measurement unit for recording linear and angular acceleration of test vehicles
- Local weather, within 1 km of the vehicle location (temperature, barometric pressure, humidity, wind speed, wind direction, precipitation conditions)
- OPTIONAL FOR AERODYNAMIC EVALUATIONS: on-board wind speed and direction (calibrated to freestream conditions), wheel torque (or driveshaft torque).
- Monitoring of human factors, fatigue: this would likely include a method of eye-tracking and/or steering input monitoring.

Appendix B to Annex A

Reference Material

Feasibility Study for the On-Track Testing of User Experience under Truck Platooning Conditions:

Transport Canada had a feasibility study to assess the driver experience while participating in a platoon. This document is intended to serve as a non-limitative reference document for potential bidders. The feasibility study includes relevant background material with regards to passive fatigue and automation as well as methodological considerations for a potential study (test track approach, naturalistic approach, various options for experimental plan, potential independent and dependent variables, sample size, power calculation, assessment tools, timeline, references, etc.).

<https://tcdocs.ingeniumcanada.org/sites/default/files/2020-09/Feasibility%20Study%20for%20the%20On-Track%20Testing%20of%20User%20Experience%20Under%20Truck%20Platooning%20Conditions.pdf>

Cooperative Truck Platooning (CTP): Considerations for On-Road Trials and Pilot Testing in Canada:

Transport Canada had a study conducted to review key considerations and approaches to the deployment of cooperative truck platooning systems (CTPS) in Canada. This report provides a foundational understanding of CTP operational concepts, safety, technical, legal and regulatory, operational and infrastructure considerations. It includes a summary of relevant on-road trials and pilot tests.

<https://tcdocs.ingeniumcanada.org/sites/default/files/2020-09/Cooperative%20Truck%20Platooning%20%28CTP%29-Considerations%20for%20On-Road%20Trials%20and%20Pilot%20Testing%20in%20Canada%20-%20Technical%20Report.pdf>

ANNEX B - BASIS OF PAYMENT

The schedule of milestones for which payments will be made in accordance with the Contract is as follows:

Item	Task	Description of Deliverable	Basis of Payment	Price (tax excluded)
1	6.1.5a	Provide regular bi-weekly project status updates during project	N/A	N/A
2	6.1.5b	Project plan which documents roles and responsibilities, resource requirements and a detailed schedule of milestones and deliverables	Firm Price	\$_____
3	6.1.6	Draft Driver Experience Methodology	Firm Price	\$_____
4	6.1.7	Draft On-Road Trial Test Methodology	Firm Price	\$_____
5	6.1.8	Safety Assessment documentation	Firm Price	\$_____
6	6.1.9	Draft Risk Management Plan	Firm Price	\$_____
7	6.1.11	Materials for stakeholder consultation describing project plan	Firm Price	\$_____
8	6.1.6	Final Driver Experience Methodology	Firm Price	\$_____
9	6.1.7	Final On-Road Trial Test Methodology	Firm Price	\$_____
10	6.1.9	Final Risk Management Plan	Firm Price	\$_____
11	6.2.1	Provide CTPS-equipped trucks, flatbed trailers, truck drivers, and technical support for CTPS system for CTPS performance validation track tests. Include transportation costs for equipment but not travel costs for personnel.	Firm Price	\$_____
12	6.3.3	Implement Driver Experience Assessment track testing and provide raw data and interim report of results.	Cost reimbursable at:	\$_____per hour

13	6.4.1	Provide CTPS-equipped trucks, trailers, truck drivers, and test equipment and setup for on-road trial. Include transportation costs for equipment but not travel costs for personnel.	Firm Price	\$_____
14	6.4.2	Implement on-road trial, monitoring execution and data collection according to test methodology.	Cost reimbursable at:	\$_____per kilometer
15	6.4.3	Provide data and briefing upon completion of on-road trial.	Firm Price	\$_____
16	6.5.1	Provide draft report for Driver Experience Assessment	Firm Price	\$_____
17	6.5.1	Provide draft report for On-Road Trial	Firm Price	\$_____
18	6.5.1	Following report review, provide final report for Driver Experience Assessment	Firm Price	\$_____
19	6.5.1	Following report review, provide final report for On-Road Trial	Firm Price	\$_____
20	6.1.11	Materials for stakeholder consultation summarizing project results	Firm Price	\$_____

Travel and Living Expenses - National Joint Council Travel Directive

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal, and private vehicle allowances specified in Appendices B, C and D of the [National Joint Council Travel Directive](#), and with the other provisions of the directive referring to "travellers", rather than those referring to "employees". Canada will not pay the Contractor any incidental expense allowance for authorized travel.

All travel must have the prior authorization of the Project Authority.

All payments are subject to government audit.

Estimated Cost: \$ 70,000.00

ANNEX C to PART 3 OF THE BID SOLICITATION – PRICING SCHEDULE

Item	Task	Description of Deliverable	Basis of Payment	Price (tax excluded)
1	6.1.5a	Provide regular bi-weekly project status updates during project	N/A	N/A
2	6.1.5b	Project plan which documents roles and responsibilities, resource requirements and a detailed schedule of milestones and deliverables	Firm Price	\$ _____
3	6.1.6	Draft Driver Experience Methodology	Firm Price	\$ _____
4	6.1.7	Draft On-Road Trial Test Methodology	Firm Price	\$ _____
5	6.1.8	Safety Assessment documentation	Firm Price	\$ _____
6	6.1.9	Draft Risk Management Plan	Firm Price	\$ _____
7	6.1.11	Materials for stakeholder consultation describing project plan	Firm Price	\$ _____
8	6.1.6	Final Driver Experience Methodology	Firm Price	\$ _____
9	6.1.7	Final On-Road Trial Test Methodology	Firm Price	\$ _____
10	6.1.9	Final Risk Management Plan	Firm Price	\$ _____
11	6.2.1	Provide CTPS-equipped trucks, flatbed trailers, truck drivers, and technical support for CTPS system for CTPS performance validation track tests. Include transportation costs for equipment but not travel costs for personnel.	Firm Price	\$ _____
12	6.3.3	Implement Driver Experience Assessment track testing and provide raw data and interim report of results. Hourly rate of \$ _____ multiplied by an estimated 150 hours.	Cost reimbursable at rate stated. Enter total estimate for evaluation.	\$ _____

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13	6.4.1	Provide CTPS-equipped trucks, trailers, truck drivers, and test equipment and setup for on-road trial. Include transportation costs for equipment but not travel costs for personnel.	Firm Price	\$_____
14	6.4.2	Implement on-road trial, monitoring execution and data collection according to test methodology. Price per kilometer \$____ multiplied by an estimated 30,000km for 1 truck.	Cost reimbursable at price stated. Enter total estimate for evaluation	\$_____
15	6.4.3	Provide data and briefing upon completion of on-road trial.	Firm Price	\$_____
16	6.5.1	Provide draft report for Driver Experience Assessment	Firm Price	\$_____
17	6.5.1	Provide draft report for On-Road Trial	Firm Price	\$_____
18	6.5.1	Following report review, provide final report for Driver Experience Assessment	Firm Price	\$_____
19	6.5.1	Following report review, provide final report for On-Road Trial	Firm Price	\$_____
20	6.1.11	Materials for stakeholder consultation summarizing project results	Firm Price	\$_____
Total price for evaluation purposes: (sum of all firm prices and estimated prices for items 12 and 14)				\$_____
Applicable Taxes:				\$_____

Travel and Living Expenses - National Joint Council Travel Directive

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal, and private vehicle allowances specified in Appendices B, C and D of the [National Joint Council Travel Directive](#), and with the other provisions of the directive referring to "travellers", rather than those referring to "employees". Canada will not pay the Contractor any incidental expense allowance for authorized travel.

All travel must have the prior authorization of the Project Authority.

All payments are subject to government audit.

Estimated Cost: \$ 70,000.00