

**- NOTICE OF INTENT STATEMENT OF WORK -
Task Authorization (TA) – 39**



National Défense
Defence nationale

1. NUMBER – TITLE OF TASK AUTHORIZATION

TA 39 – Thermal Comfort Testing of Canadian Armed Forces Operational Uniforms

2. VALIDATION OF SCOPE OF CONTRACT

The following task(s), as written in the SOW of the main contract (W7714-145967/001/SV) apply to this Task Authorization (TA):

- a. **Field Studies and Trials** - Design and conduct studies and trials, including clinical trials
- b. **Surveys** - Design and conduct surveys.
- c. **Data Analysis** - Perform state of the art analysis of data from experimental studies, clinical trials, field studies or trials, and existing databases.
- d. **Presentations to Government and Health Care System Stakeholders** - Prepare and deliver presentations to Government and Healthcare system stakeholders.

3. ACRONYMS

CADPAT	Canadian Pattern
CAF	Canadian Armed Forces
DSSPM	Directorate Soldier Systems Program Management
ECU	Enhanced Combat Uniform
HFSC	Human Factors Support Cell
SA	Scientific Authority

4. REQUIREMENT

The following services of the Sub Contractor are required: to perform thermal comfort testing on the Canadian Armed Forces (CAF) Operational uniforms including the Enhanced Combat Uniforms (ECUs) in order to assess thermal performance of the textile and the ability of participants to dissipate heat while wearing operational uniforms. It is felt that quantifying the textile in the lab for properties such as permeability and moisture management fails to address the actual thermal performance of the textile when integrated as a system with the human body. Therefore, the Human Factors Support Cell (HFSC) is requesting thermal comfort testing of users in a representative environment to close this gap.

Thermal comfort testing to include qualitative and quantitative evaluation of four different combat clothing configurations with up to four different types of material, as listed below:

- a) ECUs
- b) ECU Combat Pants + Hybrid Shirt + Fragmentation Vest
- c) Naval Operational Combats
- d) Trial Operational Combats

5. BACKGROUND

A project is standing up in The Directorate of Soldier Systems Program Management (DSSPM) to modernize the current CAF camouflage pattern; moving away from the CADPAT temperate and arid patterns.

The pursuit of a new camouflage pattern would entail the provision of new ECUs to the CAF. The DSSPM Human Factors Support Cell (HFSC) has identified this as a potential opportunity to improve upon the existing combat uniform. Among others, thermal performance has been identified as an area to investigate for product improvement. Recognizing the importance of thermal performance and the role textile design can play in mitigating heat stress, the HFSC is committed to enhancing the thermal comfort and performance of the next generation of ECUs.

Mounting evidence through operational experience shows that heat stress is a real threat in combat that has in extreme cases claimed the lives of Canadian soldiers. Heat stress is the result of elevated body temperature and is caused by a mix of excessive exposure to heat and physical exertion. It can lead to cramps, fatigue, exhaustion, disability and in severe cases, death (DAOD 5021-2). Left untreated, heat stress will cause degradation of mental and physical performance, in turn jeopardizing soldier safety and mission effectiveness. This poses a difficulty for military operations where mission requirements often demand severe physical exertion in hot climates while wearing Personal Protective Equipment (PPE) and combat load. Clothing and equipment configurations can influence the member's ability to effectively dissipate metabolic heat.

**- NOTICE OF INTENT STATEMENT OF WORK -
Task Authorization (TA) – 39**



National Défense
Defence nationale

There are many ways to manage and mitigate heat stress in military operations including training, reducing workload, reducing exposure to heat, ensuring adequate hydration and improving thermal management properties of the soldier system. As an acquisition body, this last mitigation effort is of particular interest to DSSPM. In order to enhance thermal management of the soldier system, DSSPM must first understand the capability of the current soldier system with regards to thermal comfort and performance and how it influences CAF member's health. Thus DSSPM would like to quantify the thermal performance capability of the ECU. The ECU is issued to all CAF members and as such can be considered as the operational 'base layer' and therefore a good starting point for thermal evaluation. The decision was made to also evaluate the hybrid shirt, as the hybrid shirt is currently being considered as an alternative to the ECU shirt for use under the Fragmentation Vest.

6. OBJECTIVES

The objective of this work is to assess thermal performance of current in-service combat clothing configurations a)-c) as listed in Section 4 above. This assessment is to include quantitative and qualitative data collection in the form of:

- a) Participant testing in controlled temperature environment as identified in the Scope section below;
- b) Complete thermal assessment of various testing configurations; and
- c) Development and administration of perceived thermal comfort surveys following testing for each participant.

The results of this work will aid to better inform acquisition personnel throughout the development of the next generation operational uniform with improved thermal performance capability. This will in turn help in mitigating occurrence of thermal fatigue, heat exhaustion and heat stroke for CAF members.

7. SCOPE

7.1 The Sub Contractor must develop and conduct a test plan in order to assess the thermal performance of the ECU in each of the configurations defined above in Section 4.

7.2 To achieve this aim, the Sub Contractor must enrol no more than 16 and no less than 8 participants aged 18-55. Female participation must be encouraged for a minimum of 25% and a maximum of 50% participation. Exclusion criteria to include participants with self-reported history of acute or chronic musculoskeletal injury or issues as well as participants with any self-reported history of diseases which may be negatively impacted by the testing.

7.3 All participants who meet inclusion criteria and agree to participate will be asked to complete various testing serials of a 13 km march at 5.6 km/h and 1% incline under controlled climatic conditions. Ambient environmental conditions throughout testing are adapted from MIL STD 810 G 'dry hot climate' and are to be held at 32 degrees C (+/-2 degrees C) with 20% relative humidity (+/-2%). Each participant will repeat the test for each of the four combat clothing configurations identified in Section 4 above. The following measurements are to be monitored throughout each of the four test serials as a quantitative measure of thermal comfort and response: core temperature, skin temperature, evaporative heat loss as well as additional measurements identified by the Sub Contractor. Following each test exposure participants will complete a subjective questionnaire as a measure of qualitative thermal comfort.

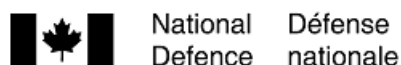
7.4 The scope of work will include the following:

- a. The Contactor must conduct all planning, coordination, training, execution, and implementation necessary to conduct the thermal comfort testing. The Sub Contractor must manage the recruitment, consent forms, safety briefings, and remuneration of participants.
- b. The Sub Contractor must ensure they have adequate resources for developing and executing the test plan and are staffed for the data collection, analysis and reporting of the results.
- c. The Sub Contractor must prepare a protocol and questionnaire for review and approval by Technical Authority prior to the execution of any testing; and
- d. The Sub Contractor must deliver a final study report summarizing the protocol and discussing the results of the testing and questionnaires.

8. APPLICABLE DOCUMENTS & REFERENCES

Department of Defense Test Method Standard: MIL-STD-810G, Environmental Engineering Considerations and Laboratory Tests, 31 Oct 2008

**- NOTICE OF INTENT STATEMENT OF WORK -
Task Authorization (TA) – 39**



9. TASKS TO BE PERFORMED

Phase 1 - Test Development and Planning

- 9.1 Prepare Human Research Ethics Protocol for submission to the participating institutional Research Ethics Boards for approval;
- 9.2 Develop a Draft Protocol including subjective questionnaires. Submit Draft Protocol for Technical Authority (TA) review. Develop Final Test Protocol based on TA feedback. Submit Final Protocol for DND approval. Final Protocol to be approved by TA prior to the execution of any testing.
- 9.3 All test clothing will be supplied to the Sub Contractor in various sizes based on anthropometric measurements of participants.
- 9.4 Purchase all necessary equipment and laboratory supplies (with the exception of test clothing).
- 9.5 Recruit Participants and conduct all testing in accordance with institutional and regulatory ethics guidelines.

Phase 2 – Subject Testing and Data Collection

- 9.7 For each participant, collect core temperature, skin temperature, evaporative heat loss, subjective questionnaires, and other variables deemed appropriate throughout each testing condition.

Phase 3 – Data Analysis and Reporting

- 9.8 Complete review, analysis and tabulation of all test and questionnaire data.
- 9.9 Prepare and submit a Draft Study Report and a Final Study Report detailing all evidence-based data captured during the conduct of the entire study; including executive summary, background, objectives, methods, results, conclusions, and recommendations for future research directions, appropriate modifications to the clothing material, configuration of the clothing worn, alternative clothing material options, or any other recommendations that may reduce the thermal stress burden of the wearer (if results reveal such a need to reduce thermal stress).

All material to be returned to the SA at completion of study.

10. DELIVERABLES (DESCRIPTION AND SCHEDULES)

All deliverables must be submitted and completed by 15 February 2020. The Sub Contractor must prepare and submit the following deliverables to CIMVHR:

Deliverable Number	Task reference	Description of Deliverables	Quantity and Format	Delivery Date
10.1	9.1	Human research ethics protocols for submission to each of the participating institutional Research Ethics Boards.	Electronic format, Microsoft Word.	Within 1 month of issuance of Task Authorization.
10.2	9.2	Research protocol.	Electronic format, Microsoft Word.	Within 2 months of issuance of Task Authorization.
10.3	9.2-9.7	Quarterly progress reports summarizing all results/findings to date.	Electronic format, Microsoft Word and/or Excel format.	Quarterly, as appropriate.
10.4	9.9	Draft study report. SA will provide feedback within 10 business days.	Electronic format, Microsoft Word.	No later than 30 days prior to the end of the Task Authorization.
10.5	9.9	Final study report addressing issues and feedback identified by the SA on the draft study report.	Electronic format, Microsoft Word.	To be submitted within 15 business days of receipt of feedback from the SA.
10.6		A copy of any presentation of the findings of this research must be submitted to CIMVHR 35 days prior to presentation or publication for a period of up to one year after the Task has ended.	Electronic format, Microsoft Word.	

**- NOTICE OF INTENT STATEMENT OF WORK -
Task Authorization (TA) – 39**



National Défense
Defence nationale

11. MANDATORY SELECTION CRITERIA

In order for the bidder to be considered compliant with this solicitation, the following mandatory criteria must be met:

- a. the lead investigator must be an expert in, and have extensive experience in thermal physiology research; and
- b. the proposed Sub Contractor must be a current Canadian academic investigator group with access to a climatic chamber to accommodate the prescribed thermal environment and testing equipment;

12. LANGUAGE OF WORK

Documentation and deliverables must be submitted in the English language.

13. LOCATION OF WORK

The work must be performed on the Sub Contractor's site.

14. TRAVEL

No travel requirements are anticipated for this SOW. If travel is deemed necessary, the Sub Contractor must have the prior written authorization of the Scientific Authority and the Technical Authority, and must be undertaken in accordance with the National Joint Council Travel Directive and with other provisions of the directive referring to "travellers", rather than those referring to "employees".

15. MEETINGS

An initial meeting must be held between the SA, the Sub Contractor, and the sub-Sub Contractor within the first three weeks of contract award. This meeting will serve as an introduction and provide an opportunity to review the Scope and Deliverables contained within the SOW to ensure a mutual understanding of the requirements. The meeting may be held in person or over the telephone at the SA's discretion.

16. GOVERNMENT SUPPLIED MATERIAL (GSM)

Combat clothing required for configurations outlined in paragraph 4. Cost of returning equipment to SA at completion of work to be included in total budget.

17. GOVERNMENT FURNISHED EQUIPMENT (GFE)

The Scientific Authority will provide combat clothing configurations as described in paragraph 4 for each of the participants. Sizing for clothing to be determined by SA via anthropometric survey of participants.

Any material or equipment loaned to the Sub Contractor for the purposes of conducting the work or purchased with Sub Contract funds must be returned to Canada by the completion date of the Sub Contract. Confirmation that the equipment has been returned must be submitted to CIMVHR.

18. SPECIAL CONSIDERATIONS OR CONSTRAINTS

See Section 11.

19. SECURITY

The Sub Contractor will not require access to PROTECTED and/or CLASSIFIED information or asset, nor to restricted access areas.

Not applicable RELIABILITY STATUS PROTECTED A PROTECTED B

20. INTELLECTUAL PROPERTY (IP) OWNERSHIP

The Sub Contractor will own any Foreground IP created by virtue of the main contract (W7714-145967/001/SV).

21. CONTROLLED GOODS

Not applicable

**- NOTICE OF INTENT STATEMENT OF WORK -
Task Authorization (TA) – 39**



National Défense
Defence nationale

Applicable

22. BASIS OF PAYMENT REQUESTED

- Firm price
- Ceiling price
- Limitation of expenditure

23. METHOD OF PAYMENT REQUESTED

- Single payment
- Milestone payments
- Progress payments (Quarterly)

24. BUDGET

24.1

The Sub Contractor will be paid by CIMVHR as per the terms of Contract # W7714-145967 between Defence Research and Development Canada and CIMVHR. The amount of funding available is allocated by Fiscal Year (April 1 - March 31st) and is approximately \$32,000, plus applicable overhead for FY 2019/2020. Further details TBD upon award.

A draft budget must be submitted with the proposal along with a budget justification. A detailed budget will be developed post award in consultation with CIMVHR. Interested parties should request budget documents and information on creating their budget from Jocelyne Halladay (Jocelyne.halladay@queensu.ca).