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K1A 0S5
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LETTER OF INTEREST
LETTRE D'INTÉRÊT

Comments - Commentaires

Vendor/Firm Name and Address
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Issuing Office - Bureau de distribution
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Gatineau
Québec
K1A 0S5

Title - Sujet STICK WHEELS , SPARES & COMPONENTS	
Solicitation No. - N° de l'invitation W8483-157127/A	Date 2015-06-09
Client Reference No. - N° de référence du client W8483-157127	GETS Ref. No. - N° de réf. de SEAG PW-\$\$ML-025-25193
File No. - N° de dossier 025ml.W8483-157127	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2015-07-10	
Time Zone Fuseau horaire Eastern Daylight Saving Time EDT	
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Girard, Luc	Buyer Id - Id de l'acheteur 025ml
Telephone No. - N° de téléphone (819) 956-0652 ()	FAX No. - N° de FAX (819) 956-0897
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: Specified Herein Précisé dans les présentes	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée See Herein	Delivery Offered - Livraison proposée
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Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

Solicitation No. - N° de l'invitation

W8483-157127/A

Client Ref. No. - N° de réf. du client

W8483-157127

Amd. No. - N° de la modif.

File No. - N° du dossier

025mlW8483-157127

Buyer ID - Id de l'acheteur

025ml

CCC No./N° CCC - FMS No/ N° VME

See attached

Please note that this is not a solicitation. No Contract will result from this Letter of Interest and Pre-Qualification.

**Letter of Interest (LOI) and Invitation to Qualify (ITQ)
For
Replacement of the Stick Wheels for the Victoria Class Submarines
for the Department of National Defence**

Purpose

The purpose of this LOI and ITQ is to qualify suppliers and determine Industry's interest to replace the Stick Wheels for the Victoria Class submarines. The attached Statement of Work (SOW) at Annex 'A' details the Stick Wheel replacement requirements which includes the replacement of all four (4) SW onboard the submarines, two (2) Shore Based Trainer SW, two (2) spare SW, spare parts, Special Purpose Test and Tools Equipment (SPTATE), all associated documentation and delivery to Halifax NS and Esquimalt BC. The SW replacement must be accomplished by customization of Commercial Off The Shelf (COTS) components and/or by design, system test, Factory Acceptance Test (FAT), Integrated Logistics Support (ILS), integration of qualification and testing instructions, and associated documentation.

Requested Information, Interested Supplier's Capability and Qualification

The Supplier must demonstrate to Canada's satisfaction that they meet the following mandatory evaluation criteria in order to qualify for Phase II, Request For Proposal:

1. Experience:

In a submarine environment, the Supplier must have been the prime contractor, have designed and delivered within the last five (5) years, at least one (1) electromechanical system in similar complexity and function to the existing Victoria Class Submarine Stick Wheel.

The Supplier must provide a detailed description and function of the project in a document which clearly outlines and demonstrates the functionalities of the electromechanical system delivered including but not limited to, a full description of the system, components supplied and interaction with other systems.

The Supplier must provide the project name, client name, contract value and date delivered.

2. Capability:

The Supplier must demonstrate to Canada's satisfaction that they have the capability in system design, manufacturing, system integration, installation and set-to-work for SW.

3. Proposed SW Replacement:

Interested Suppliers are to review the attached SOW in relation to their proposed SW and the following issues shall be addressed:

- System design;
- Proposed hardware;
- Compatibility and interface requirements with existing field devices and external systems.
- Deliverables as identified in Section 2 of the SOW

4. Quality Assurance:

In the performance of the Work described herein, interested Suppliers shall comply with the requirements of:

- ISO 9001-2000 – Quality Management Systems – Requirements, published by the International Organization for Standardization (ISO), current edition at date of submission of LOI-ITQ; and
- It is not the intent to require that the interested Supplier be registered to the applicable standard; however, interested Supplier's quality management system must address each requirement contained in the standard.

5. Rough Order of Magnitude (ROM) Cost:

- Provide a Rough Order of Magnitude cost estimate in Canadian currency; and
- Provide a breakdown of the cost structure per Stick Wheel as well as spare parts, special purpose tools and test equipment (SPTATE), Engineering Change (EC) development, FAT, etc.

6. Security Requirements:

The Supplier must meet the following security conditions: and demonstrate their compliance by providing the requested information.

- Facility Security Clearance (FSC) at **SECRET** level, with approved Document Safeguarding and Production Capabilities (DSC) at **SECRET** level, issued by Canadian Industrial Security Directorate (CISD) Public Works and Government Services Canada (PWGSC).

The Supplier must confirm their compliance to above security requirements and provide their Procurement Business Number (PBN), complete business name/address and complete contact information of their Company Security Officer (CSO) for verification purposes of the above requirement.

- Supplier's personnel requiring access to **CLASSIFIED** information, assets or sensitive work site(s) must EACH hold a valid personnel security screening at the level of **SECRET**, granted or approved by CISD, PWGSC.

The Supplier must provide the names and relevant information of the proposed individuals requiring access to classified or protected information, assets or sensitive work site(s) for verification purposes.

Note: All equivalent security clearances must be recognized and approved by CISD at PWGSC.

7. Controlled Goods Registration:

The Supplier must be registered with the Controlled Goods Program of PWGSC or if a foreign supplier, registered in an approved program recognized by Canada.

The Supplier must provide proof of registration.

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File No. - N° du dossier
025ml. W8483-157127

Buyer ID - Id de l'acheteur
025ml
CCC No./N° CCC - FMS No./N° VME

Communications

All communications during this requirement period shall be directed to Luc Girard Contracting Authority, via email at Luc.Girard@pwgsc.gc.ca to ensure fair and transparent treatment of all Interested Suppliers.

Submission of Responses

Companies must submit their written response to this LOI and ITQ directly to;

Public Works and Government Services Canada
Marine Systems, ML Division
Place du Portage, Phase III, 6C2
11 Laurier Street
Gatineau, Québec K1A 0S5
Attention: Luc Girard
Email: Luc.Girard@pwgsc.gc.ca
Phone: (819) 956-0652
Fax: (819) 956-0897

The written response shall be submitted in the quantities specified below:

Volume	Title	Hard Copy Quantity per Item
1	Technical: - Capability and Qualification: - Item 1: Experience - Item 2: Capability - Item 3: Proposed SW Replacement - Item 4: Quality Assurance	3
2	Financial, Security and Controlled Goods Registration: - Item 5: Rough Order of Magnitude Costing - Item 6: Security Requirements - Item 7: Controlled Goods Requirements	1

Evaluation of Interested Supplier's Deliverables

It is the sole responsibility of interested Suppliers to provide sufficient information to adequately assess its Deliverables. Only interested Suppliers who provided information to Canada's satisfaction will receive the Bid Package for Phase II (RFP).

Suppliers must comply with the requirements of this LOI - ITQ and meet all mandatory evaluation criteria to be declared responsive.

Following the response of the Supplier, Canada may request clarification and/or demonstration of the proposed systems.

Should an interested Supplier be of the opinion that some issues are not addressed above, that interested Supplier is encouraged to provide additional information. This information may be used during Phase II (RFP) of the project.

Any and all expenses incurred by a potential supplier in pursuing this opportunity including the provision of information, clarification, presentation to Canada and any visits are at the supplier's sole risk and expense.

This documentation has been reviewed by the technical authority and does not contain controlled goods.

Annex “A”

Invitation to Qualify (ITQ)

STATEMENT OF WORK (SOW)

OF THE

STICK WHEEL (SW)

FOR THE

VICTORIA CLASS SUBMARINES (VCS)

	NOTICE This documentation has been reviewed by the technical authority and does not contain controlled goods. Disclosure notices and handling instructions originally received with the document shall continue to apply.
	AVIS Cette documentation a été révisée par l'autorité technique et ne contient pas de marchandises contrôlées. Les avis de divulgation et les instructions de manutention reçues originalement doivent continuer de s'appliquer.

LIST OF EFFECTIVE PAGES

Page 1 of 36	Stick Wheel (SW)	SOW	Revision	Date
			1.0	20 May 2015

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Insert latest changed pages, dispose of superseded pages In Accordance With (IAW) applicable orders.

NOTE

On a changed page, the portion of the text affected by the latest change is indicated by a vertical line in the margin of the page.

Date of issue for original and changed pages are:

Change ...1.0... 20 October 2014

A zero in Change No. column indicates an original page. The Total number of pages in this SOW is 36 consisting of the following:

Page No.

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1 Scope

1.1 Purpose

This Letter of Intent (LOI) Statement of Work (SOW) defines the work requirements for the Stick Wheel (SW). The new Stick Wheels shall replace the legacy Stick Wheels on the VICTORIA Class Submarines (VCS), four in total, SSK 876 VICTORIA, SSK 877 WINDSOR, SSK 878 CORNER BROOK and SSK 879 CHICOUTIMI; and the two shore based trainers, the Submarine Control Trainer (SCT) and the Maintenance Trainer (MT). There is one submarine located in Halifax, three in Esquimalt and the shore based trainers are located at the Canadian Forces Base (CFB) in Halifax.

The SW consists of a single unit attached to the One Man Console (OMC). The SW replacement shall be accomplished by customization of Commercial Off The Shelf (COTS) components and or by design, system test, Factory Acceptance Test (FAT), Integrated Logistics Support (ILS) and documentation. The SW technical and performance requirements are an integral part of this SOW.

1.2 Background

The Victoria Class Submarine (VCS) is fitted with the Ferranti design based Stick Wheel (SW) that implements the manual control. Refer to a photograph of the Stick Wheel in Figure 1.

It is Canada's plan to replace the SW with a fully supportable system that provides the same core functionality of the existing SW. The complete mechanical and electrical assemblies shall be replaced with new components that shall interface with the existing mechanical and electrical interfaces and have the same or less weights of the legacy system. The installations and the Set To Work (STW) of the new SWs on all the submarines, the SCT and the MT shall be carried out under separate contracts.

1.3 Objectives of the SW Changes

1.3.1 Replacements of the Stick Wheels on all four Victoria Class Submarines and on the shore based trainers, SCT and the MT and only the SW installation kits are required.

1.4 Acronyms and Abbreviations

For acronyms and abbreviations, refer to section 7.

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Figure 1: An Existing Stick Wheel

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2 SW Delivery

2.1 General

The Contractor shall procure/design, customize, manufacture, test and Factory Acceptance Test and deliver SW kits required to satisfy the requirements of this SOW.

2.2 Deliverables

The Contractor shall produce and deliver SWs for the four (4) Victoria Class Submarines, Victoria, Windsor, Corner Brook and Chicoutimi and spare SWs to be kept in Canadian Forces Supply Stores (CFSS) IAW Table 1, SWs for the SBT trainers IAW Table 2, spares line replaceable components for the four (4) submarines and for the shore based trainers IAW Table 3, the Special Purpose Tools and Test equipment IAW Table 4 and documentation IAW Table 5.

Table 1: List of SWs for four Submarines and Spare SWs

Component	Qty	Locations and or Comments
Stick Wheel	4	Control Room, for four submarines
Stick Wheel	2	Spare SWs to be kept in Canadian Forces Supply Stores (CFSS)

Table 2: SWs for the Shore based Trainers

Components		Qty	Locations and or Comments
Submarine Control Trainer (SCT) and Maintenance Trainer (MT)	Stick Wheel	2	SCT and MT at CFNOS, Halifax

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Table 3: SW Spares Line Replaceable Components for all four Submarines and for the SCT and the MT Trainers

Title	Qty	Comments
<p>Submarine Spares for 1st and 2nd level maintenance support</p>	4	<p>Components types and quantities set for each submarine shall be proposed by the Contractor and approved by TA to support the 1st and 2nd level maintenance on board the submarine for five (5) years</p> <p>NOTE: The calculations for determining the quantity of spares of each type per submarine shall be: = (Number of components of each type used) * 1.0 (duty Cycle) * ((24*365*5) (number of hours for five years))/MTBF (Mean Time Between Failures)</p> <p>Canada shall decide what quantity of LRU spares shall be carried on board the submarine and what quantity shall be stored in CFSS (Canadian Forces Supply Stores)</p>

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<p>SCT and MT trainers spares for 1st and 2nd level maintenance support at the fleet training schools</p>	<p>2</p>	<p>Components types and quantities for each trainer shall be proposed by the Contractor and approved by TA to support the 1st and 2nd level maintenance for five (5) years</p> <p>NOTE: The calculations for determining the quantity of spares of each type per submarine shall be: = (Number of components of each type used) * 1.0 (duty Cycle) * ((24*365*5) (number of hours for five years))/MTBF (mean Time Between Failures).</p> <p>Canada shall decide what quantity of LRU spares shall be carried on board the submarine and what quantity shall be stored in CFSS (Canadian Forces Supply Stores)</p>
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Table 4: Special Purpose Tools and Test Equipment

Component	Qty	Comments
<p>Special Purpose Tools and Test Equipment (SPTATE)</p>	<p>3</p>	<p>To be designed/developed/tested and provided by the Contractor and approved by the TA. One set for the school (CFNOS), one set for FMFCS and one set for FMFCB.</p>

Table 5: Documentation

Title	Qty	Comments
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SW and SPTATE Documentation package	1	All documents shall include CTAT symbol and enhanced Title Blocks on all design documents, electrical schematics, mechanical assembly drawings, part lists and wiring diagrams
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2.3 System Requirements Document

The Contractor shall prepare the systems requirements document.

2.4 Preliminary Design Documents

The Contractor shall prepare the preliminary design documentation packages.

2.5 Critical design Documents

The Contractor shall prepare the critical design documentation package.

2.6 Failure Modes and Effects Analysis

The Contractor shall conduct the Failure Modes and Effects Analysis of the SW and prepare a report.

2.7 Engineering Change Specifications

The Contractor shall provide an Engineering Change (EC) specification for the four submarine installations, SCT and the MT.

2.8 SW Documentation

The contractor shall deliver the SW documentation IAW section 6.5.

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3 Project Management

3.1 Organization

The Contractor shall have a named Project Manager responsible to carry out the work required for the SW production program.

3.1.1 Project Manager

The Contractor's Project Manager shall have the authority to plan, direct, control and make decisions for the Contract.

3.1.1.1

The Contractor's Project Manager shall be the main point of contact with Canada.

3.2 Project Management Plan

The Contractor shall prepare and deliver a Project Management Plan (PMP) to identify how the Contractor intends to fulfill the project management requirements of this SOW.

3.2.1 Contents of PMP

The Contractor shall include in the PMP a Work Breakdown Structure (WBS), a Project Schedule (PS), a Risk Management Plan (RMP), a Configuration Management Plan (CMP), an Integrated Logistics Supports (ILS) plan, a Hardware Development Plan, Quality Assurance (QA) Plan and the Set To Work Plan (Factory Acceptance Plan).

3.2.2 Work Breakdown Structure (WBS)

The Contractor shall structure the WBS IAW MIL-HDBK-881A.

3.2.3 Risk Management Plan

The Contractor shall prepare a Risk Management Plan that establishes procedures for identification, assessment, management, reporting, tracking, reduction and elimination of risks arising from the performance of work.

3.2.4 Risk Management Program

The Contractor shall conduct its Risk Management Program IAW the approved Risk Management Plan.

3.2.5 Configuration Management Plan

The Contractor shall structure the configuration Management plan to show all the details of the hardware components of SW.

3.2.6 Integrated Logistic Support (ILS) Plan

The contractor shall establish, implement and control an Integrated Logistics Support (ILS) Program for the SW. The Contractor's ILS activities shall form an

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integral part of all SW planning, development, design, production, design qualification tests, installation and STW efforts associated with this LOI SOW.

3.2.7 Hardware Development Plan

The Contractor shall structure the hardware development plan to clearly show the SW hardware requirements analysis including the Special Purpose Test and Test Equipment (SPTATE) and the trainers design, development, test and integration activities.

3.2.8 Factory Acceptance (FAT) Plan

The Contractor shall structure the FAT plan to show how each SW shall be test at the factory.

3.2.9 Quality Assurance (QA) Plan

The Contractor shall structure the quality assurance plan in accordance with SAC clause D5402C (Quality Plan) dated 2010-01-11.

3.3 Security Management

Requirements for personnel and facilities security clearances are identified in the Security Requirements Check List.

3.3.1 Access to Canada's Facilities

The Contractor may be provided access to Canada's Facilities, on an as required basis and non-interference basis, to allow the Contractor to view systems and obtain relevant data. Site visits may also be used to interview Customer Subject Matter Experts (SMEs) to determine or confirm equipment functionality and operational parameters.

3.3.2 Visit Request Notice

The Contractor shall provide at least four (4) weeks' notice only for any submarine site visits.

3.4 Project Meetings

3.4.1 Project Kick Off Meeting

Within one two weeks of the Contract Award, the contractor shall conduct a project Kick Off Meeting at the contractor's facility. The discussion shall include but not limited to, the review of the:

1. The Project Management Plan
2. Technical Specification;
3. Critical path activities;
4. Plans for activities during the following period;

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5. Risk management concerns and mitigation actions: and
6. Any other contractual or programmatic issues associated with the project as manually agreed between the TA, PWGSC CA and the Contractor.

3.4.2 Project Review Meetings

The Contractor shall conduct and coordinate Progress Review Meetings (PRMs) once each month or as mutually agreed between Canada and the Contractor.

3.4.2.1

The Contractor shall hold the first PRM within one month following the Kick-Off Meeting.

3.4.2.2

PRMs shall encompass total project status as of the review date.

3.4.2.3 Final Project Meeting

A Final Project Review (FPR) meeting is required to provide a complete review of the deliverables.

3.4.2.4

The Contractor shall hold the FPR meeting at a time to be determined by Canada but this meeting shall take place no later than thirty (30) days after acceptance of the last deliverable.

3.4.2.5 Other Scheduled Meetings

The Contractor may identify through other requirements stipulated in this SOW, and the submission of his various plans the necessity to schedule other meetings.

3.4.2.5.1

The Contractor shall identify these meetings in the Project Schedule (PS).

3.4.2.5.2

Canada's approval of the PS will confirm Canada's intention to attend such meetings.

3.4.2.6 Meeting Arrangements

When the Contractor is tasked to arrange and coordinate a meeting, it shall be done IAW this section.

3.4.2.6.1 Supporting Documents

The Contractor shall prepare and submit supporting documents required (in source format and not in Portable Document Format (PDF) or equivalent format) for a meeting at least five (5) working days in advance of each review or meeting.

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3.4.2.6.2

The Contractor shall prepare and submit an agenda at least five (5) working days in advance of each review or meeting except in the case of unscheduled meetings in which case the Contractor shall submit an agenda prior to the meeting.

3.4.2.6.3

Canada and the Contractor shall mutually agree to the contents of the agenda.

3.4.2.7 Meeting support

3.4.2.7.1

The Contractor shall host and attend project reviews and meetings as required by this SOW, at the Contractor's facility or elsewhere as agreed to by Canada.

3.4.2.7.2

For all reviews and meetings hosted by the Contractor, the Contractor shall:

1. Arrange the venue;
2. Co-ordinate with Canada as appropriate;
3. Provide all administrative facilities and presentation equipment;
4. Ensure that qualified Contractor and subcontractor personnel attend the reviews or meetings;
5. Ensure and report that action items and decisions under the control of the Contractor as a result of the various meetings and reviews are implemented where applicable; and,
6. Maintain files, records, documents of all reviews and meetings.

3.4.2.8 Meeting Minutes

3.4.2.8.1

The Contractor shall record, produce, deliver and revise, as required, minutes for all meetings.

3.4.2.8.2

The Contractor shall prepare and distribute an electronic copy of the minutes to Canada's attendees.

3.4.2.8.3

Meeting minutes are accepted once signed by Canada. Canada will advise the Contractor of any issues within two working days of receiving the minutes.

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3.4.2.9 Meeting Cancellations

The TA and CA may cancel PRMs or any other review meetings at their discretion with a minimum of 5 working days' notice. Rescheduling of meetings by the Contractor shall be done only with the explicit agreement of Canada.

3.5 Reporting and Communications

3.5.1 Progress Reports

The Contractor shall monitor progress and deliver monthly Project Status Reports (PSRs).

3.5.2 Problem Reporting

3.5.2.1

The Contractor shall advise Canada by fax/email within three (3) working days of the date the Contractor determines that there is a schedule alteration or contractual issue.

3.5.2.2

Upon such notification Canada will advise whether an unscheduled meeting or other action is required.

3.5.3 Data Reviews and Revisions

The contractor shall submit all deliverable data in draft form for Canada's review IAW the applicable CDRL.

3.5.3.1

The Contractor shall ensure that the draft document consists of a complete document compliant with the requirements of the SOW and the applicable CDRL and DID (to be provided in the Request for Proposal phase).

3.5.3.2

Unless otherwise noted, the Canada's review process will take no more than ten (10) working days from receipt of the data.

3.5.3.3

The provision of comments by the Canada on draft deliverables shall not be construed as approval of the data deliverable.

3.5.3.4

Unless otherwise noted, the Contractor shall address Canada's comments and resubmit the document within ten (10) working days of reaching agreement on the comments.

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3.5.3.5

The Contractor shall ensure that final documents consist of the draft document modified to include changes as authorized by Canada.

3.5.3.6

When revisions and amendments have been made to data deliverables required under this SOW, the Contractor shall submit the revisions/amendments to Canada.

3.6 Action Item List (AIL)

3.6.1

The Contractor shall maintain a historical, chronological and up-to-date list of Action Items resulting from reviews, meetings, or correspondence between the TA and the Contractor in a format acceptable to the TA for the duration of the project.

3.6.2

In the list the Contractor shall record, as a minimum: identification number; title or description, date opened, action required, priority, organization responsible for taking action, brief statement of results in sufficient detail to clearly identify and track the action taken, date closed, and, status (open/closed).

3.6.3

The Contractor shall ensure that, once entered, no entry is deleted.

3.6.4

The Contractor shall include a subset of the list containing all open action items as an attachment to the monthly status reports.

3.6.5

The Contractor shall make a copy or reproduction of the most current AIL or any portion thereof available to Canada upon request at any time.

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4 Engineering Requirements

In addition to requirements listed in this section, the SW shall meet all the control functional requirements listed in reference documents provided during RFP phase.

4.1 Environmental

The SW shall meet the following environmental requirements. If any of the proposed COTS equipment does not fully comply with any of the following specifications, then the Contractor shall customize the equipment to meet the requirements.

All references to Government requirements and standards in the following MIL STD specifications shall be understood as Canadian Government / Organisations, in place of US Government.

Table 6: Environmental Requirements

Item	Environmental Condition	Requirements	Standard (reference) and Comments
1	Storage Temperature	All SW components - 40°C to + 80°C	MIL STD 810F Table 501.4-III: induced high, storage and transit Table 502-4-I Severe cold probability >1%
2	Operating Temperature	OMC mounted equipment: 1°C to + 55°C Continuous	Mil-STD-810F, method 501.5, Procedure II Duration of this temperature test can be minimum of 2 hours
3	Humidity	30 to 80% condensing (wet bulb) at 38°C	MIL STD 810F: 507.4 To meet prescribed tests, steady temperature.
4	Salt Fog	a) Relative Humidity 95% b) Temperature 35°C c) Salt concentration 5% b) PH level 6.2 to 7.2	MIL-STD-810F, Method 509.4
5	Rain	Spray	MIL-STD-810F Method 506.4, customize for spray

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Item	Environmental Condition	Requirements	Standard (reference) and Comments
6	Shock	Shock and Vibration	MIL STD 901 D
7	Vibration	Type I equipment	MIL-STD-167-1A
8	Compartment Pressure	Operational: 750-1310 mbar Abnormal: 713 mbar for 5 min with no detrimental effects Non Operational; 500 - 2300 mbar	
9	Submarine Motion	Submerged or surfaced: 30 deg in any direction (static or dynamic)	
9	EMI General		MIL STD 461E (DGS 250B) CE 101, CE 102, CS 101, CS 114, CS 116, RE 101, RE 102, RS 101 and RS 103.

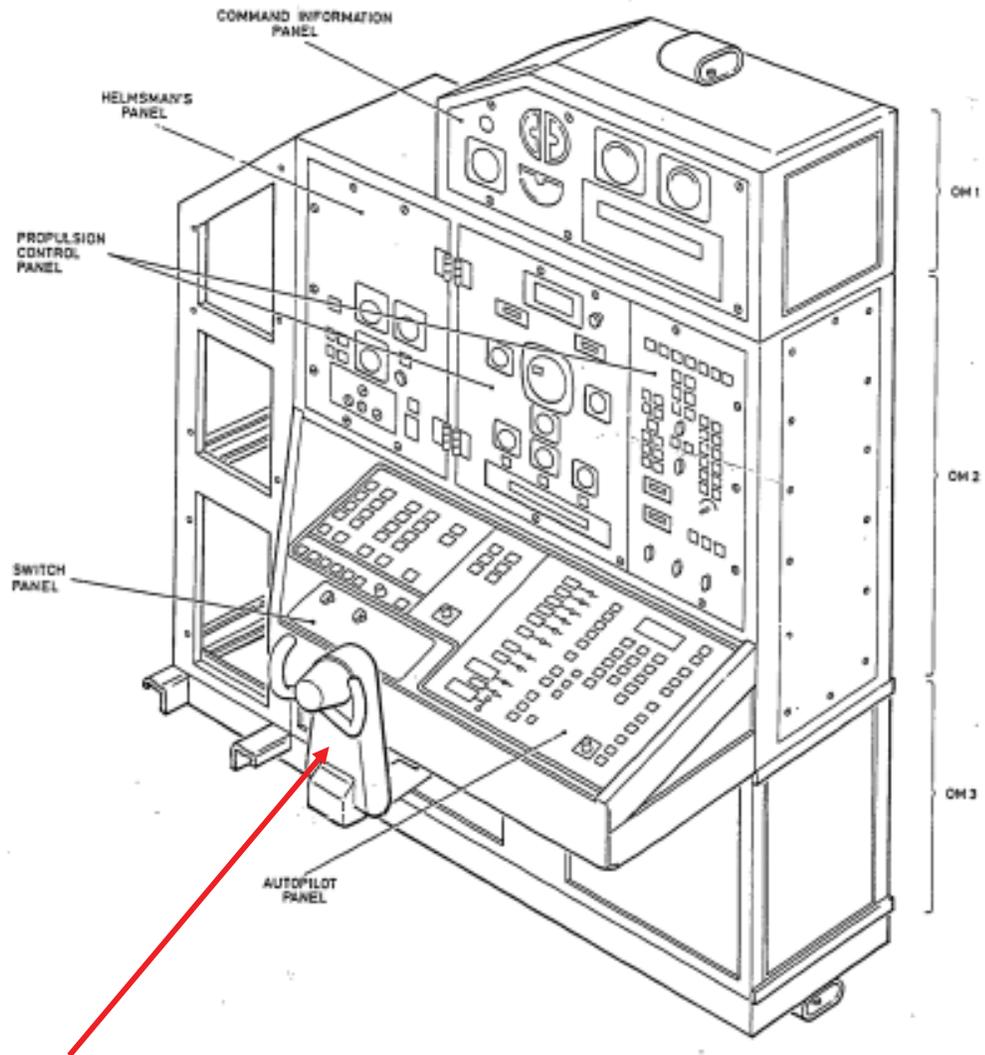
4.2 Mechanical

The existing SW equipment attaches to the front of the One Man Control (OMC) Console located in the submarine control room. Refer to OMC in Figure 2.

The mechanical design of the SW components enclosure shall be:

1. Form-fit-function of the existing SW;
2. Within the same total weight;
3. Accessible from either side or underneath of the SW enclosure to facilitate maintenance; and
4. Proven to meet the mechanical shock and vibration requirements as per Table and item 6.

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Stick Wheel

Figure 2: One Man Console (OMC)

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4.2.1 Weight and Dimensions

The SW assembly weight and dimensions shall be equal or less than as per the Table 7: Equipment, Function, Location, Weight, Width, Height and Depth. Minor increases in weight of these components if any must be submitted to TA for approval.

Table 7: Equipment, Function, Location, Weight, Width, Height and Depth

Item #	Equipment	Function	Location	Weight (Kg)	Dimensions Height, Width, Depth (mm)
1	Stick Wheel	Course and Depth control	OMC	16	588 X 250 X 404

4.2.2 Construction

The SW design shall meet the following construction requirements:

1. The SW shall not use any hazardous materials with the exception when no other acceptable, effective and less hazardous substitute is not available, to be reviewed and approved by TA;
2. The SW shall be fitted with an Equipment Identification Plate;
3. The SW shall use the same mounting hole pattern as per the legacy SW.
4. The SW shall be ergonomically compatible with the existing SW by not exceeding the dimensions of the legacy SW in any location where the helmsman's body could be located. Furthermore, the replacement SW shall not create any additional obstruction to the line of sight between operator and the OMC console instrumentation;
5. The same fastening pattern and fastening hardware shall be used to install the SW assembly to the OMC console.
6. The SW shall be suitably durable for use by military personnel who may operate the unit forcefully and under duress; and
7. The SW assembly colour shall be painted "Light Enamel grey".

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4.2.3 Robustness

The mechanical steering mechanism of the SW design shall be robust to withstand an excessive force put on by the submarine operators. In case of an extremely excessive force put on the steering mechanism, the SW steering mechanism shall fail safe and enable it to be repaired during 1st level maintenance onboard the submarine. One possible solution would be to include safety shear pins in the steering mechanism design, which are designed to break during an excessive force. If these pins do break, then they shall be replaceable during the 1st level maintenance onboard the submarine. The shear pins or equivalent safety devices shall be carried onboard the submarine as a spare Line Replaceable Units (LRUs) for maintenance support onboard each submarine and the Shore base trainers (SBTs). These devices shall be stored internally in a container which is an integral part of each SW. The access to this container shall use hand operated fasteners.

4.3 SW Packaging and Enclosure

All SW components shall be packaged in one self-contained enclosure, similar to the legacy SW.

4.4 Performance requirements

The SW shall meet or exceed the following performance requirements.

1. Rise/dive and turning of the steering mechanism shall palpable feedback such that the operator receives tactile sensation of the neutral position in azimuth and elevation orientations.
2. The palpable centre-point feedback shall not require significant force by operators such that fine adjustments during high speed maneuvers are easily made by hand.
3. The steering device shall be constructed so that the SW automatically returns to the neutral position when not in use by an operator.
4. All rotating parts shall be sufficiently dampened such that there shall be no oscillations about the neutral position when the SW is released from a full deflection in either the rise/dive or port/starboard directions.
5. The steering device shall be designed so that the SW range of motion displacement in any direction is same as per the legacy SW.
6. The new SW shall sustain the existing steering functionality with minimal impact upon user familiarity and ergonomics of the helmsman position.

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7. The steering device shall preserve all electrical interfaces of the legacy SW as per the complete list of electrical interfaces given in section 4.5.4.1 and Table 8.
8. The steering device shall interface to the existing legacy cables and connector plugs.

4.5 Electrical

The SW electrical design shall:

1. Be hardware based only, without any software;
2. Use a minimum number of different Line Replaceable Units (LRU);
3. Interface to existing systems with which the legacy SW currently interfaces;
4. Retain all the existing cables/wires between the new SW and the external systems with which the legacy SW interfaces and
5. Have built in self-diagnostics to isolate down to a single LRU.

4.5.1 Electrical Component Selection

When selecting components for the SW design preference shall be given to COTS industrial grade components. In the absence of suitable COTS industrial grade components, COTS commercial components shall be selected and customized if required to meet the environmental requirements in section 4.1 and Table 6.

4.5.1.1 Obsolescence

The Contractor shall ensure that the SW does not include parts that have become obsolete, or are expected to become obsolete within five (5) years after all the SWs have been delivered.

4.5.2 Redundancy

The Electronic Enclosures, parts of the Autopilot System that control the forward hydroplanes, after hydroplanes and the rudder are based on dual redundant circuits within each of these enclosures, called the port and the starboard. The SW shall provide dual sensors positions outputs to interface to the dedicated Port and Starboard electronics within each Electronic Enclosure. The SW shall have independent sensors processing circuits for each sensor to maintain modularity and redundancy in case of a failure in any of the dual sensors or its electronics to control the forward hydroplanes, after hydroplanes and rudder electronic enclosures.

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4.5.3 Sensors Life Expectancy

The selected steering mechanism sensors of the SW shall have a minimum actuation data in access of 10,000,000,000.

4.5.4 Electrical Interfaces

4.5.4.1 Field Sensor Input and Output Signals

The list of input and output signals between the SW and the other subsystems are identified in per Table 8.

NOTE: The signal list is incomplete. The Contractor is responsible for any additional I/Os that may be required based on the new design of the SW. If the information for the existing SW provided by Canada is not adequate for the new SW design, then, the Contractor is responsible for acquiring the necessary information by conducting submarine surveys.

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Table 8: SW Input and Output Signals

Input and Output Type	Qty	Signal Characteristic		Comments
		Voltage	Type	
Forward Hydroplane EE and SW				
Analog Outputs	1	+/- 5V	Forward Hydroplanes Demand	From SW to the Forward Hydroplanes Port
	1	+/- 5V	Forward Hydroplanes Demand	From SW to Forward Hydroplanes Stbd
	1	+/- 10 V	Voltage	From SW to Balance angle at the OMC Port
	1	+/- 10 V	Voltage	From SW Starboard to Balance angle at the OMC Stbd
Analog Inputs	1	24 V	Supply Voltage	From Forward EE Port to SW
	1	24 V	Supply Voltage	From Forward EE Stbd to the SW
After Hydroplane EE and SW				
Analog Outputs	1	+/- 5V	After Hydroplane demand	From SW to After Hydroplanes Port
	1	+/- 5V	After Hydroplane demand	From SW to After Hydroplanes Stbd
	1	+/- 10 VDC	Voltage	From SW Port to Ratio Changer/Changer/Balance angle at the OMC
	1	+/- 10 VDC	Voltage	From SW Stbd to Ratio Changer/Balance angle at OMC
Analog Inputs	1	24 VDC	Supply Voltage	From After Hydroplanes EE port to SW
	1	24 V	Supply Voltage	From After Hydroplanes EE Stbd to SW
Rudder EE and SW				
Analog Outputs	1	+/-5 V	Rudder Demand	From SW to Rudder EE Port
	1	+/-5 V	Rudder Demand	From SW to Rudder EE Stbd
Analog Inputs	1	24 V	Supply Voltage	From Rudder EE Port to SW
	1	24 V	Supply Voltage	From Rudder EE Stbd to SW
Miscellaneous Monitoring Signals at the SW				
All inputs and all Outputs to and from the SW	Contractor to define	Voltages	Various types	All SW inputs and outputs shall be brought to connector(s) to allow monitoring during maintenance

4.5.5 Power Consumption

The power consumption for the legacy SW is not available. The Contractor is responsible to conduct a submarine survey to measure the power consumption of the legacy SW and ensure that new SW does not exceed the measured power consumption.

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4.5.6 Maintenance

The SW shall provide two (2) levels of maintenance support for the SW equipment located:

1. On board the submarine;
2. At the Canadian Forces Naval Officers School (CFNOS); and
3. At the Fleet Maintenance Facility (FMF).

4.5.6.1 Maintenance Philosophy

The repair philosophy shall be to Repair by Replacement (R by R) down to a Line Replaceable Unit (LRU) level, i.e. Circuit Card Assemblies (CCAs), Power Supply Units (PSUs), etc.

4.5.6.2 Levels of Maintenance

The SW equipment maintenance philosophy consists of the following:

1. 1st level maintenance: to be provided on board the submarine using SW built in test diagnostics, its own personnel and materiel resources carried on board the submarine; and
2. 2nd level maintenance: to be provided by the Fleet Maintenance Facilities (FMF) personnel at each East and West coasts, if required by using the Contractor provided SPTATE.

4.5.6.3 First Level Maintenance Support Functions

The first level maintenance support functions include conducting all identified first level preventive maintenance as follows:

1. Isolate SW faults using built in test diagnostics, drawings, documentation, troubleshooting/fault finding guides (in any supplied format);
2. Remove and install replacement LRU;
3. Identify and document SW problems beyond first level capabilities for resolution by 2nd level support organizations.

4.5.6.4 Second Level Maintenance Support Functions

The second level maintenance support functions include conducting all identified second level preventive maintenance as follows:

1. Analyse and troubleshoot any automated or manual sequence within the SW using supplied built in diagnostics drawings, documentation, troubleshooting/fault finding guides (in any supplied format) and SPTATE;
2. Analyse and troubleshoot SW hardware using supplied drawings, documentation, troubleshooting and fault finding guides (in any supplied format and test equipment);
3. Repair SW components including wiring connectors, any SW wiring including associated interfaces;

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4. Repair/replace field sensors if required; and
5. Identify and document SW problems beyond 2nd level capabilities for resolution by 3rd level support organizations to repair/replace the SW.

4.5.6.5 Mean Time To Repair

Any component, which is subject to Repair-by-Replacement, shall have a maximum Mean Time To Repair (MTTR) of 30 minutes using specified procedures and resources. The MTTR shall include time to isolate, remove and replace the faulty component/module and bring the SW back on-line in service; it shall not include time taken to obtain the replacement component/module.

4.5.6.6 Hardware Diagnostics Test Tools and Test Equipment

The Contractor shall design, develop, test and deliver the Special Purpose Tools and Test Equipment (SPTATE) required for the 2nd level maintenance for both on board the submarine and alongside in harbour.

4.5.6.7 Built In Test Diagnostics for the 1st Level Maintenance

The SW shall provide Built In Test (BIT) hardware diagnostics to isolate all failed LRUs.

4.5.6.8 Special Purpose Tools and Test Equipment (SPTATE)

The FMF personnel is responsible for conducting the 2nd level maintenance on the SW by using SPTATE to isolate a failed LRU and repair it by replacing it with a functional spare LRU within each of the SW enclosure. If for some reason, this exercise fails to correctly identify the problem and the fault remains within the SW components, then, the SPTATE shall fully isolate the SW under test from the field signal connections and prove that in situ the standalone SW is fully functional. It will then be Canada's responsibility to correct the problem in the external connectors, cables/wires, external systems and the field sensors.

The SPTATE deliverable components may include but not limited to the following:

1. Circuit card extender boards;
2. Test Sets/Jigs, Breakout boxes, Special cables and or Plugs to isolate faults between the field sensors/wiring and SW. Further to completely verify the functionalities of the standalone SW, the SPTATE shall provide all necessary test hardware;
3. Special connector pin insertion, extraction and crimping tools for repairing connectors and plugs; and
4. Hardware procedures defining any special pins, fuses and/or visual indications that are required to be monitored during first and second level maintenance.

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5 Acceptance testing

5.1 SW Acceptance Testing

The purpose of the acceptance tests is to demonstrate that the SW performance and functional requirements have been satisfactorily met.

5.1.1 Factory Acceptance Testing (FAT)

The Contractor shall perform factory acceptance testing on each of the SW for the submarines and the Shore based Trainers. The FAT conduct shall be witnessed and accepted by TA/delegated representative.

5.1.2 Test Management

5.1.2.1 Factory Acceptance (FAT) Test Plan

The Contractor shall produce and deliver FAT plan that provides an overall outline of the entire spectrum of test activities of the SW production program.

5.1.3 Factory Acceptance Test (FAT) Procedures

The Contractor shall produce and deliver the SW FAT Procedures. The FAT procedures shall contain all conditions, precautions, adjustments, expected test results, tolerances, and a list of the tools and test equipment required to verify the correct operation of the entire SW and all the SW interfaces to the existing submarine systems where applicable.

5.1.3.1 Factory Acceptance Test (FAT) Reports

The Contractor shall prepare the SW FAT reports and submit them.

5.2 Letter or Certificate of Acceptance

Based on the successful reviews and acceptances of the SW for all the submarines, the SCT and the MT, Canada will for each of the SWs provide a Letter or Certificate of Acceptance to the contractor.

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6 Integrated Logistics Support

6.1 General

The Contractor shall establish, implement and control an Integrated Logistics Support (ILS) Program for the SW and its related logistics support elements IAW Mil-STD 1388 1A and 2B, and A-LM-505-001/AG-001. The Contractor ILS activities shall form an integral part of all SW planning, development, design, production, design qualification test, installation, set to work efforts associated with this SOW.

6.2 Logistic Support Analysis

The Contractor shall perform Logistics Support Analysis (LSA) activities IAW A-LM-505-001/AG-002 (Section **Error! Reference source not found.**, Table 1 and item **Error! Reference source not found.**).

6.2.1 Logistics Support Analysis Record

The Contractor shall develop and maintain a single storage point for all logistics data. This storage point shall be the Logistics Support Analysis Record (LSAR). The LSAR shall be created and maintained IAW A-LM-505-001/AG-001 and A-LM-505-001/AG-002 to allow LSAR data to be uploaded to Canada's current LSAR tool called "Omega PS".

6.3 Maintenance of SW

The contractor shall describe in the hardware design document the maintenance methodology to maintain the SW on board the submarine and at Fleet Maintenance Facility (FMF).

6.3.1 Special Purpose Tools and Test Equipment (SPTATE)

Based on the maintenance methodology, SPTATE may be required to support the SW on board the submarine and at the Fleet Maintenance Facility at the coats. The Contractor shall design and develop the SPTATE to provide the 2nd (second) level maintenance (to be carried out by Fleet Maintenance Facility personnel) support for SW.

6.4 Supply Support

6.4.1 Provisioning Parts Breakdown

The Contractor shall deliver a Provisioning Parts Breakdown in electronic format required for Canadian Forces Supply System (CFSS) IAW D-01-100-214/SF-000 and current industrial best practice.

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6.5 Documentation

The Contractor shall produce and provide the following documentation in Contractor's format as listed below:

1. Hardware requirements document;
2. Hardware design documents;
3. Users manuals;
4. Maintenance manuals (Test Form format reference document to be provided) including but not be limited to:
 - a. Hardware manual;
 - b. System troubleshooting documentation IAW Section 6.5.1; and
 - c. Repair instructions.
5. Illustrated parts breakdowns (IPBs) (as built part list); and
6. Circuit cards and all the internal wiring electrical schematics;

6.5.1 System Troubleshooting Documentation

The Contractor shall provide SW troubleshooting documentation that describes the SW Built In Test Equipment (BITE) and test results and also include the following:

1. SW signal interface list; and
2. SW circuit cards schematics and all the internal wiring schematics.

6.6 Technical Documentation

6.6.1 Engineering Data Access

The Contractor shall provide access to all engineering data during the contract.

6.6.2 Technical Publications

The Contractor shall prepare and deliver the Technical Publications in English and in Contractor's own format.

6.6.2.1 Equipment Reference Numbering

The Contractor shall use the Equipment Reference Number (ERN) as a basis for numbering and identifying all documentation for the corresponding piece of equipment. Part 5 of C-03-005-012/AM-001, provides guidance on using the ERN.

6.6.2.2 Original Equipment Manufacturer (OEM)

The Contractor shall make maximum use of existing OEM technical publications. The Contractor shall modify the existing OEM technical publications to reflect Canadian-specific equipment, nomenclature, part numbers, modifications, and maintenance procedures using current industrial best practices.

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6.7 Health and Safety

6.7.1 Dangerous/Hazardous Items and Material Safety Data Sheets

The hazardous materials shall be used only when no acceptable effective, less hazardous substitute is available, in accordance with the Treasury Board Hazmat policy & HFX Class G-1 spec, see paragraphs 33, 41 & 42.

6.7.1.1 Materiel Requirement Packages

The Materiel Requirement Packages delivered with the equipment shall include the following:

1. Equipment Identification Plate data: This document details the information that the Contractor proposes to incorporate on Equipment Identification Plates and is used to obtain Canada's approval prior to manufacturing Equipment Identification Plates for SW LRUs; and
2. The Material Safety Data Sheet (MSDS) and justification for each hazardous material used. The Material Safety Data Sheets (MSDS) provide information and instructions on the chemical and physical characteristics of a substance, its hazards and risks, the safe handling requirements, and actions to be taken in the event of fire, spill, overexposure, or other risk.

6.7.1.2

Note: Dangerous/Hazardous material shall be defined as any substance which is capable of posing a risk to health, safety, property or the environment when stored, handled or transported, and is so classified in regulations governing transportation. Hazardous materials include (but are not limited to) dangerous goods identified in the Canadian Transportation of Dangerous Goods Act.

6.8 Packaging, Handling, Storage & Transportability

6.8.1 General

The Contractor shall conduct Packaging, Handling, Storage and Transportability IAW A-LM-505-001/AG-001.

6.8.2 Packaging Methods and Levels

The Contractor shall ensure that packaging of provisioned items will provide adequate protection for a minimum of five (5) years, consistent with good economy, against damage, deterioration and loss of identification during storage, handling and shipment.

6.8.3 Marking of Packages

The Contractor shall mark all packages, shipping containers and consolidation containers IAW D-LM-008-002/SF-001, as applicable.

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6.8.4 Marking of Dangerous/Hazardous Items

The Contractor shall mark dangerous/hazardous items as follows:

1. Shipping Container: “In accordance with the Transportation of Dangerous Goods Act”; and
2. Immediate Product Container: “In accordance with the Hazardous Products Act, Controlled Products Regulation”.

6.8.5 Shelf Life Items

The Contractor shall mark the individual package for each shelf life item with:

1. The date of manufacture;
2. The shelf life expiry date; and
3. The storage environment restrictions (for example no freezing, no sunlight).

6.8.6 Contract End Items List

The Contractor shall provide a Contract End Items List (CEIL) for materials the Contractor developed or acquired in response to the SOW. The CEIL shall include all non-documentation items, e.g. SW Systems, parts list, that the Contractor shall be required to deliver as applicable.

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7 Engineering Change Specifications

7.1 General

The Engineering Change (EC) shall be detailed specification for changes to the Victoria Class Submarines to support the installation of the SW equipment as required by Canada and the trainers, SCT and MT. The EC specification shall be in Canada's EC format and these shall provide all the necessary detailed electrical and mechanical interfaces and component modifications. The EC Specifications shall be reviewed and approved for implementation by the TA. The EC work packages shall then be implemented under a separate contract on all four Victoria Class Submarines IAW the Submarine Modification Implementation Plan (SMIP), the SCT and the MT.

7.2 Engineering Changes Designs

The contractor shall:

1. Prepare the EC specification for the FoC submarine and the trainers SCT and MT IAW the requirements
2. Prepare the EC drawings
3. Prepare the EC package using metric units for the SW deliverables, unless the source of the original documentation is non-metric, and no changes to that original documentation is being made; and
4. Ensure that EC Specification meets the requirements of the Canadian Environmental Assessment Act (CEAA),

The EC Specification, including the preliminary and final version shall be reviewed by the TA. Following a successful review, the TA will approve the EC specifications for implementation.

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8 Acronyms and Abbreviations

AIL	Action Item List
AS	Autopilot System
CA	Contracting Authority
CCA	Circuit Card Assembly
CDRL	Contract Deliverable Requirement List
CEAA	Canadian Environmental Assessment Act
CFB	Canadian Forces Base
CFNOS	Canadian Forces Naval Officers School
CEIL	Contract End Items List
CMP	Configuration Management Plan
COTS	Commercial Off The Shelf
DC	Direct Current
DID	Data Item Description
DND	Department of National Defence
DOD	Department Of Defence
EC	Engineering Change
ERN	Equipment Reference Number
FAT	Factory Acceptance Test
FMF	Forces Maintenance Facility
FMFCB	Forces Maintenance Facility Cape Briton
FMFCS	Forces Maintenance Facility
FoC	First of Class
FPM	Final Project Meeting
IAW	In Accordance With
LRU	Line Replaceable Unit
OEM	Original Equipment manufacturer
OMC	One Man Control
PS	Project Schedule
PWGSC	Public Works Government Services Canada
MT	Maintenance Trainer
MTTR	Mean Time To Repair
QA	Quality Assurance
SBT	Shore Based Trainers
SCT	Submarine Control Trainer
SOW	Statement Of Work
SPTATE	Special Purpose Tools And Test equipment

This documentation has been reviewed by the technical authority and does not contain controlled goods.

SW	Stick Wheel
TA	Technical Authority
VCS	Victoria Class Submarines
WBS	Work Breakout Structure

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