



RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:
**Bid Receiving Public Works and Government
Services Canada/Réception des soumissions
Travaux publics et Services gouvernementaux
Canada**
Place Bonaventure, South-East
Portal, 7th Floor
800 de la Gauchetière Street West
Montréal
Québec
H5A 1L6

**REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION**

**Proposal To: Public Works and Government
Services Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

**Proposition aux: Travaux Publics et Services
Gouvernementaux Canada**

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Title - Sujet NeMO Concept Study	
Solicitation No. - N° de l'invitation 9F045-160638/A	Date 2016-12-06
Client Reference No. - N° de référence du client 9F045-16-0638	
GETS Reference No. - N° de référence de SEAG PW-\$MTD-100-14143	
File No. - N° de dossier MTD-6-39310 (100)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2017-01-09	
Time Zone Fuseau horaire Heure Normale du l'Est HNE	
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: Bergeron, Bruno	Buyer Id - Id de l'acheteur mtd100
Telephone No. - N° de téléphone (450) 926-4562 ()	FAX No. - N° de FAX () -
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: AGENCE SPATIALE CANADIENNE 6767 ROUTE DE L AEROPORT SPACE UTILIZATION DEVELOPMENT ST HUBERT Québec J3Y8Y9 Canada	

Instructions: See Herein

Instructions: Voir aux présentes

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

Space Program Directorate/Direction des programmes spatiaux
John H. chapman Space Centre
Centre spatial John H. Chapman
6767 Route de l'Aéroport
6767, route de l'Aéroport
Saint-Hubert
Quebec
J3Y 8Y9

Delivery Required - Livraison exigée	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
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

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PART 1 - GENERAL INFORMATION

1.1 Introduction

The bid solicitation is divided into seven parts plus attachments and annexes, as follows:

- Part 1 General Information: provides a general description of the requirement;
- Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;
- Part 3 Bid Preparation Instructions: provides Bidders with instructions on how to prepare their bid;
- Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;
- Part 5 Certifications and Additional Information: includes the certifications and additional information to be provided;
- Part 6 Security, Financial and Other Requirements: includes specific requirements that must be addressed by Bidders; and
- Part 7 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

1.2 Summary

- 1.2.1** With this Request for Proposals (RFP), the Canadian Space Agency's (CSA) plans to award a contract to determine the feasibility of a sub-surface ice sounder as a hosted payload on NASA's Next Mars Orbiter (NeMO).

The activity has the following objectives:

- Starting from the initial concept provided by CSA and JPL (Jet Propulsion Laboratory), define down to main sub-system level a NeMO-compatible payload meeting the observation requirements.
- Develop a science observation plan and operation concept compatible with NeMO capabilities.
- Develop a mission development plan for a launch in 2022, using as much as possible sub-systems with high Technology Readiness Level (TRL).
- Assess options for enhanced mission objectives and reuse of the payload for Earth Observation applications.
- The proposed contract is for a six (6) months period and may be extended by a period of up to seven (7) months to perform optional work.

This requirement is conditionally limited to Canadian services.

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1.2.2 Security Requirements

There are no security requirements

1.2.3 Trade Agreements

The requirement is not subject to the provision of any trade agreement

1.2.4 Canadian Content

The requirement is subject to a preference for Canadian goods and/or services.

1.3 Debriefings

Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority within 15 working days from receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

1.4 Communications

As a courtesy and in order to coordinate any public announcements pertaining to this contract, the Government of Canada requests that successful Bidders notify the Contracting Authority five (5) days in advance of their intention to make public an announcement related to the recommendation of a contract award, or any information related to the contract. The Government of Canada retains the right to make primary contract announcements

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PART 2 - BIDDER INSTRUCTIONS

2.1 Standard Instructions, Clauses and Conditions

All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the *Standard Acquisition Clauses and Conditions Manual* (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The 2003 (2016-04-04) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

Subsection 5.4 of 2003, Standard Instructions - Goods or Services - Competitive Requirements, is amended as follows:

Delete: 60 days
Insert: 180 days

2.1.1 SACC Manual Clauses

A7035T (207-05-25) List of Proposed Subcontractors

2.2 Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit at address below by the date and time indicated on page 1 of the bid solicitation. Bids are to be sent to the following address:

Bids Receiving Unit
Public Works and Government Services Canada
Quebec Region

Place Bonaventure, 7th Floor, South-East Portal
800 De la Gauchetiere Street West
Montreal, Quebec, Canada
H5A 1L6

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

2.3 Former Public Servant

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts awarded to FPSs, bidders must provide the information required below before contract award. If the answer to the questions and, as applicable the information required have not been received by the time the evaluation of bids is completed, Canada will inform the Bidder of a time frame within which to provide the information. Failure to comply with Canada's request and meet the requirement within the prescribed time frame will render the bid non-responsive.

Definitions

For the purposes of this clause, "former public servant" is any former member of a department as defined in the [Financial Administration Act](#), R.S., 1985, c. F-11, a former member of the Canadian Armed Forces or a former member of the Royal Canadian Mounted Police. A former public servant may be:

- a. an individual;
- b. an individual who has incorporated;
- c. a partnership made of former public servants; or
- d. a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

"lump sum payment period" means the period measured in weeks of salary, for which payment has been made to facilitate the transition to retirement or to other employment as a result of the implementation of various programs to reduce the size of the Public Service. The lump sum payment period does not include the period of severance pay, which is measured in a like manner.

"pension" means a pension or annual allowance paid under the [Public Service Superannuation Act](#) (PSSA), R.S., 1985, c. P-36, and any increases paid pursuant to the [Supplementary Retirement Benefits Act](#), R.S., 1985, c. S-24 as it affects the PSSA. It does not include pensions payable pursuant to the [Canadian Forces Superannuation Act](#), R.S., 1985, c. C-17, the [Defence Services Pension Continuation Act](#), 1970, c. D-3, the [Royal Canadian Mounted Police Pension Continuation Act](#), 1970, c. R-10, and the [Royal Canadian Mounted Police Superannuation Act](#), R.S., 1985, c. R-11, the [Members of Parliament Retiring Allowances Act](#), R.S. 1985, c. M-5, and that portion of pension payable to the [Canada Pension Plan Act](#), R.S., 1985, c. C-8.

Former Public Servant in Receipt of a Pension

As per the above definitions, is the Bidder a FPS in receipt of a pension? **Yes () No ()**

If so, the Bidder must provide the following information, for all FPSs in receipt of a pension, as applicable:

- a. name of former public servant;
- b. date of termination of employment or retirement from the Public Service.

By providing this information, Bidders agree that the successful Bidder's status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with [Contracting Policy Notice: 2012-2](#) and the [Guidelines on the Proactive Disclosure of Contracts](#).

Work Force Adjustment Directive

Is the Bidder a FPS who received a lump sum payment pursuant to the terms of the Work Force Adjustment Directive? **Yes () No ()**

If so, the Bidder must provide the following information:

- a. name of former public servant;
- b. conditions of the lump sum payment incentive;
- c. date of termination of employment;
- d. amount of lump sum payment;
- e. rate of pay on which lump sum payment is based;
- f. period of lump sum payment including start date, end date and number of weeks;
- g. number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is \$5,000, including Applicable Taxes.

2.4 Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than 5 (five) calendar days before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by Bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a proprietary nature must be clearly marked "proprietary" at each relevant item. Items identified as "proprietary" will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the question(s) or may request that the Bidder do so, so that the proprietary nature of the question(s) is eliminated, and the enquiry can be answered to all Bidders. Enquiries not submitted in a form that can be distributed to all Bidders may not be answered by Canada.

2.5 Applicable Laws

Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in **Québec**

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the Bidders.

2.6 Improvement of Requirement During Solicitation Period

Should bidders consider that the specifications or Statement of Work contained in the bid solicitation could be improved technically or technologically, bidders are invited to make suggestions, in writing, to the Contracting Authority named in the bid solicitation. Bidders must clearly outline the suggested improvement as well as the reason for the suggestion. Suggestions that do not restrict the level of competition nor favour a particular bidder will be given consideration provided they are submitted to the Contracting Authority at least 15 days before the bid closing date. Canada will have the right to accept or reject any or all suggestions.

2.7 Basis for Canada's Ownership of Intellectual Property

The Canadian Space Agency has determined that any intellectual property rights arising from the performance of the Work under the resulting contract will belong to Canada, for the following reasons, as set out in the [Policy on Title to Intellectual Property Arising Under Crown Procurement Contracts](#) : Where the main purpose of the Crown Procurement Contract, or the deliverables contracted for, is to deliver a not-yet fully developed component or subsystem that will be incorporated into a complete system at a later date, as a prerequisite to the planned transfer of the complete system to the private sector, through licensing or assignment of ownership, for the purposes of Commercial Exploitation.

PART 3 - BID PREPARATION INSTRUCTIONS

3.1 Bid Preparation Instructions

Canada requests that Bidders provide their bid in separately bound sections as follows:

Section I: Technical Bid (1 hard copies and 1 soft copies on optical disk or USB Drive)

Section II: Financial Bid (1 hard copy and 1 soft copy on a different optical disk or USB Drive)

Section III: Financial Bid (1 hard copy and 1 soft copy on a different optical disk or USB Drive)

If there is a discrepancy between the wording of the soft copy and the hard copy, the wording of the hard copy will have priority over the wording of the soft copy. The preferred electronic file format are MS Word, MS Excel and Adobe PDF.

*****Prices must appear in the financial bid only.***
No prices must be indicated in any other section of the bid.**

Canada requests that Bidders follow the format instructions described below in the preparation of their bid:

- (a) use 8.5 x 11 inch (216 mm x 279 mm) paper;
- (b) use a numbering system that corresponds to the bid solicitation.
- (c) the Bidder must use one set of Sections (Section I, II and III) for every single project proposed, meaning that every bid requires its own Section I, Section II and Section III documents.
- (d) all the required documentation for the soft copy of the Technical and Management Bid should be all-inclusive in one file (acceptable electronic formats are: MS Word and PDF). A separate electronic version of the Executive Summary should also be included which should not contain any proprietary markings or information as it will be treated as public domain material.
- (e) the hard copy of Section II and its electronic version as a stand-alone file should be submitted on a separate CD than the Section I.

In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process [Policy on Green Procurement](http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html>). To assist Canada in reaching its objectives, Bidders should:

- 1) use 8.5 x 11 inch (216 mm x 279 mm) paper containing fibre certified as originating from a sustainably-managed forest and containing minimum 30% recycled content; and
- 2) use an environmentally-preferable format including black and white printing instead of colour printing, printing double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

Section I: Technical and Management Bid

In their technical and management bid, Bidders should demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders should demonstrate their capability and describe their approach in a thorough, concise and clear manner for carrying out the work. The technical bid should address clearly and in sufficient depth the points that are subject to the evaluation criteria against which the bid will be evaluated. Simply repeating the statement contained in the bid solicitation is not sufficient. In order to facilitate the evaluation of the bid, Canada requests that Bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, Bidders may refer to different sections of their bids by identifying the specific paragraph and page number where the subject topic has already been addressed.

In their technical and management proposal, the bidders must describe their capacity and experience in addition to their project management team and point of contact of their client(s).

3.1.1 CSA's technical Additional Bid Preparation Instructions

Further to the generic bid preparations instructions mentioned above, the bidders are strongly encourage to follow the CSA's additional instructions found in Annex "E"

3.1.2 Preliminary Disclosure of Contractor's Background Intellectual Property brought into the study project by the Bidder:

If the Bidder intends to use any of its own Background Intellectual Property to develop the Foreground Information, the Bidder must complete the Table C1 – *"Disclosure of Background Intellectual Property (BIP) brought into the study project by the Contractor"* included in the Annex "C" of this bid solicitation document and include it into the Section I – (*Technical*) of its Bid. Such report will be reviewed by both the Contracting and Technical Authorities, but not evaluated.

If a contract is awarded following this bid solicitation process, the selected contractor will be required to provide Canada with a comprehensive update of such preliminary BIP disclosure report that was submitted as part of the contractor's Bid as part of the Contract closure process

3.1.3 Task Authorization Form

A portion of the Work to be performed under the resulting Contract maybe on an "as and when requested basis" using a Task Authorization (TA).

The Technical Authority will provide the Contractor with a description of the task using the "Task Authorization" form and process specified in Annex "D" of this bid solicitation document. Alternatively, the Bidder may propose, in its Technical and Management Bid, to use its own Task Authorization Form. Should Canada elect to use the Bidder's own Task Authorization Form, such decision will be evidenced in the resulting Contract.

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Section II: Financial Bid

3.1.4 Bidders must submit their financial bid in accordance with Basis of Payment in Annex "B".

Firm Fixed Prices are to be presented in Canadian funds, Canadian customs duties and excise taxes included (if applicable) and applicable sales taxes extra and shown separately (if applicable). Prices are to be FOB destination (Canadian Space Agency, St-Hubert, Quebec).

Blank prices: Bidders are requested to insert "0.00\$" for any item for which it does not intend to charge or for items that are already included in other prices in the basis of payment. If the bidder leaves any price blank, Canada will treat the price as "0.00\$".

All Costs to be included: The financial bid must include all costs for the requirement described in the bid solicitation for the entire Contract Period, including any option years. The identification of all necessary equipment, software, peripherals, cabling and components required to meet the requirements of the bid solicitation and the associated costs of these is the sole responsibility of the Bidder.

Per diems are to be based on seven and a half hours (7.5) of Work per day.

3.1.5 Exchange Rate Fluctuation

C3011T (2013-11-06), Exchange Rate Fluctuation

3.1.4 SACC Manual Clauses

Section III: Certifications

Bidders must submit the certifications and additional information required under Part 5.

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

4.1 Evaluation Procedures

- (a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical and financial evaluation criteria.
- (b) An evaluation team composed of representatives of Canada will evaluate the bids.
- (c) The evaluation team will determine first if there are two or more bids with a valid Canadian Content certification. In that event, the evaluation process will be limited to the bids with the certification; otherwise, all bids will be evaluated. If some of the bids with a valid certification are declared non-responsive, or are withdrawn, and less than two responsive bids with a valid certification remain, the evaluation will continue among those bids with a valid certification. If all bids with a valid certification are subsequently declared non-responsive, or are withdrawn, then all the other bids received will be evaluated.

4.1.1 Technical and Management Evaluation

4.1.1.1 Mandatory Technical Criteria

There are no mandatory technical criteria in the request for proposal.

4.1.1.2 Point Rated Technical Criteria

Point rated technical and management evaluation criteria are included in Annex "F".

4.1.1.3 Bidder Experience

Except where expressly provided otherwise, the experience described in the bid must be the experience of one or more of the following:

1. The Bidder itself (which includes the experience of any companies that formed the Bidder by way of a merger but does not include any experience acquired through a purchase of assets or an assignment of contract); or
2. The Bidder's affiliates (i.e. parent, subsidiary or sister corporations), provided the Bidder identifies and demonstrates the transfer of know-how, the use of toolsets and the use of key personnel from the affiliate for the applicable criterion; or
3. The Bidder's subcontractors provided the Bidder includes a copy of the teaming agreement and identifies the roles and responsibilities of all parties under the agreement and how their work will be integrated.

The experience of the Bidder's suppliers will not be considered.

4.1.2 Financial Evaluation

4.1.2.1 Mandatory Financial Criteria

The price of the bid must be proposed in Canadian dollars, Applicable Taxes excluded, FOB destination (Canadian Space Agency, Longueuil, Quebec), Canadian customs duties and excise taxes included.

The bidder financial proposal must not exceed the **individual item budget** identified below for its bid to be declared responsive. A bid that exceeds the maximum budget for one of the items listed below will be declared non responsive. The amounts listed below includes the Customs Duties and Applicable Taxes extra.

Item 1	Main requirement (3.3.3.1, 3.3.3.2, 3.3.3.3 and 3.3.3.4):	\$300,000.00
Item 2	Option 1 (3.3.5.1):	\$200,000.00
Item 3	Option 2 (3.3.5.2):	\$100,000.00
Item 4	Task authorisation maximum budget (Annex "G")	\$150,000.00

4.2 Basis of Selection

4.2.1 Basis of Selection - Highest Rated Within Budget

To be declared responsive, a bid must:

- (a) comply with all the requirements of the bid solicitation;
- (b) meet mandatory evaluation criteria; and
- (c) obtain the required minimum points for each criterion and each group of criteria with a pass mark; and
- (d) obtain the required minimum points overall for the technical evaluation criteria which are subject to point rating
- (e) obtain the required minimum points overall for the management evaluation criteria which are subject to point rating

Bids not meeting (a) or (b) or (c) or (d) or (e) will be declared non responsive. The responsive bid with the highest number of points will be recommended for award of a contract, provided that the items individual price does not exceed one of the budgets available for this requirement (see 4.1.2.1 for available budgets).

The overall score will be obtained by adding the scores for each of the following group of criteria: "Technical", "Management" and "Task Authorizations".

To establish the Tasks authorizations score, each responsive bid will be prorated against the bidder with the highest number of hours as per Annex "G" and multiply by 5. Maximum score achievable is thus 5 points.

In the event that more than one responsive bid has the same total points on the technical and management evaluation, the responsive bid with the highest number of points for criteria # 1 (Payload Analysis and Trade-off) will be recommended for award of a contract.

In the event that more than one responsive bid has the same total points on the technical and management evaluation, as well as for criteria # 1, the responsive bid with the highest score in the Technical Criteria (sum of Criteria 1 to 4) will be recommended for award of a contract.

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The table below illustrates an example where three bids were received and the selection of the contractor is determined by the highest score within a budget. The total available points equal 105 and the highest number of hours proposed within the point rated evaluation of the Task Authorizations (Annex "G") is 1616.75.

**Basis of Selection:
 Highest rated within budgets**

		Bidder 1	Bidder 2	Bidder 3
Main requirement (Max 300K)		\$300,000	\$295,000	\$300,000
Option 1 (Max 200K)		\$199,000	\$205,000	\$200,000
Option 2 (Max 100K)		\$100,000	\$100,000	\$99,000
Task Authorizations (Max 150K)		\$149,999.70	\$149,999.50	\$149,999.99
Calculations	Technical and Managerial Merit Score	82/100 (Meet all min. scores as per annex "F")	Did not meet mandatory budget for Option 1	80/100 (Meet all min. scores as per annex "F")
	Task Authorizations Score	1616.75/1616.75 x 5 =5	Did not meet mandatory budget for Option 1	1432.25/1616.75 x 5 =4.43
Combined Rating		87	-	84.43
Overall Rating		1 st	Exceeds mandatory budget on option 1	2 nd

PART 5 – CERTIFICATIONS AND ADDITIONAL INFORMATION

Bidders must provide the required certifications and additional information to be awarded a contract.

The certifications provided by Bidders to Canada are subject to verification by Canada at all times. Unless specified otherwise, Canada will declare a bid non-responsive, or will declare a contractor in default if any certification made by the Bidder is found to be untrue, whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply and to cooperate with any request or requirement imposed by the Contracting Authority will render the bid non-responsive or constitute a default under the Contract.

5.1 Certifications Required with the Bid

Bidders must submit the following duly completed certifications as part of their bid.

5.1.1 Integrity Provisions - Declaration of Convicted Offences

In accordance with the [Ineligibility and Suspension Policy](http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Bidder must provide with its bid the required documentation, as applicable, to be given further consideration in the procurement process.

5.1.2 Additional Certifications Required with the Bid

5.1.2.1 Canadian Content Certification

This procurement is conditionally limited to Canadian services.

Subject to the evaluation procedures contained in the bid solicitation, bidders acknowledge that only bids with a certification that the service(s) offered are Canadian services, as defined in clause A3050T, may be considered.

Failure to provide this certification completed with the bid will result in the good(s) offered being treated as non-Canadian services.

The Bidder certifies that:

() the service(s) offered are Canadian services as defined in paragraph 2 of clause A3050T.

For more information on how to determine the Canadian content for a mix of goods, a mix of services or a mix of goods and services, consult Annex 3.6.(9), Example 2, of the *Supply Manual*.

5.1.2.2 Canadian Content Definition

SACC Manual clause [A3050T](#) (2014-11-27) Canadian Content Definition

5.2 Certifications Precedent to Contract Award and Additional Information

The certifications and additional information listed below should be submitted with the bid but may be submitted afterwards. If any of these required certifications or additional information is not completed and submitted as requested, the Contracting Authority will inform the Bidder of a time frame within which to provide the information. Failure to provide the certifications or the additional information listed below within the time frame specified will render the bid non-responsive.

5.2.1 Integrity Provisions – Required Documentation

In accordance with the [Ineligibility and Suspension Policy](http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Bidder must provide the required documentation, as applicable, to be given further consideration in the procurement process.

5.2.2 Federal Contractors Program for Employment Equity - Bid Certification

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list available at the bottom of the page of the [Employment and Social Development Canada \(ESDC\) - Labour's](http://www.esdc.gc.ca/en/jobs/workplace/human_rights/employment_equity/federal_contractor_program.page?&_ga=1.229006812.1158694905.1413548969#afed) website (http://www.esdc.gc.ca/en/jobs/workplace/human_rights/employment_equity/federal_contractor_program.page?&_ga=1.229006812.1158694905.1413548969#afed).

Canada will have the right to declare a bid non-responsive if the Bidder, or any member of the Bidder if the Bidder is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list at the time of contract award.

5.2.3 Additional Certifications Precedent to Contract Award

5.2.3.1 Status and Availability of Resources

SACC Manual clause [A3005T](#) (2010-08-16) Status and Availability of Resources

5.2.3.2 Education and Experience

SACC Manual clause [A3010T](#) (2010-08-16) Education and Experience

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PART 6 - SECURITY, FINANCIAL AND OTHER REQUIREMENTS

6.1 Security Requirements

No requirement

6.2 Financial Capability

No requirement

6.3 Bid Financial Security

No requirement

6.4 Controlled Goods Requirement

No requirement

6.5 Insurance Requirements

No requirement

PART 7 - RESULTING CONTRACT CLAUSES

The following clauses and conditions apply to and form part of any contract resulting from the bid solicitation.

7.1 Statement of Work

The Contractor must perform the Work in accordance with the Statement of Work at Annex "A".

7.1.1 Task Authorization

The Work or a portion of the Work to be performed under the Contract will be on an "as and when requested basis" using a Task Authorization (TA). The Work described in the TA must be in accordance with the scope of the Contract.

7.1.1.1 Task Authorization Process

1. The Technical Authority will provide the Contractor with a description of the task using the "Task Authorization" form specified in Annex "D".
2. The Task Authorization (TA) will contain the details of the activities to be performed, a description of the deliverables, and a schedule indicating completion dates for the major activities or submission dates for the deliverables. The TA will also include the applicable basis(bases) and methods of payment as specified in the Contract.
3. The Contractor must provide the Technical Authority, within 10 calendar days of its receipt, the proposed total estimated cost for performing the task and a breakdown of that cost, established in accordance with the Basis of Payment specified in the Contract.
4. The Contractor must not commence work until a TA authorized by the Contracting Authority has been received by the Contractor. The Contractor acknowledges that any work performed before a TA has been received will be done at the Contractor's own risk.

7.1.1.2 Canada's Obligation - Portion of the Work - Task Authorizations

Canada's obligation with respect to the portion of the Work under the Contract that is performed through task authorizations is limited to the total amount of the actual tasks performed by the Contractor.

7.2 Standard Clauses and Conditions

All clauses and conditions identified in the Contract by number, date and title are set out in the [Standard Acquisition Clauses and Conditions Manual](https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual)(<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

7.2.1 General Conditions

[2040](#) (2016-04-04), General Conditions - Research & Development, apply to and form part of the Contract.

7.2.2 Supplemental General Conditions

The following Supplemental General Conditions apply to and form part of the Contract.

[K3410C](#) (2015-02-25), Canada to Own Intellectual Property Rights in Foreground Information

7.3 Security Requirements

7.3.1 There is no security requirement applicable to the Contract.

7.4 Term of Contract

7.4.1 Period of the Contract

The "Contract Period" is the entire period of time during which the Contractor is obliged to perform the Work, which includes:

- i. The "Initial Contract Period" which begins on the date the Contract is awarded and ends on July 31st, 2017;

7.4.3 Option to Extend the Contract

The Contractor grants to Canada the irrevocable option to acquire the goods, services or both described in Annex "A" Statement of Work Article 3.3.5.1 and 3.3.5.2 of the Contract under the same conditions and at the prices and/or rates stated in Annex "B". The option may only be exercised by the Contracting Authority and will be evidenced, for administrative purposes only, through a contract amendment.

The Contracting Authority may exercise the option within 180 days after contract award by sending a written notice to the Contractor.

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7.5 Authorities

7.5.1 Contracting Authority

The Contracting Authority for the Contract is:

Name: Bruno Bergeron
Title: A/Supply Manager
Public Works and Government Services Canada
Space Programs Directorate

Address: 6767, Route de l'Aéroport
St-Hubert, Quebec, Canada
J3Y 8Y9

Telephone: 450-926-4562
E-mail address: Bruno.Bergeron@canada.gc.ca

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

7.5.2 Technical Authority

The Technical Authority for the Contract is:

Name: _____
Title: _____

Organization: _____
Address: _____

Telephone: ____-____-_____
E-mail address: _____

The Technical Authority named above is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Technical Authority, however the Technical Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

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7.5.3 Contractor's Representative

Name: _____
Title: _____

Organization: _____
Address: _____

Telephone: ___-___-_____
E-mail address: _____

7.6 Proactive Disclosure of Contracts with Former Public Servants

By providing information on its status, with respect to being a former public servant in receipt of a [Public Service Superannuation Act](#) (PSSA) pension, the Contractor has agreed that this information will be reported on departmental websites as part of the published proactive disclosure reports, in accordance with [Contracting Policy Notice: 2012-2](#) of the Treasury Board Secretariat of Canada.

7.7 Payment

7.7.1 Basis of Payment

7.7.1.1 Work Performed under the Contract **NOT** Subject to Task Authorizations

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid a *firm price as specified* in **Annex "B"** for a total cost of \$CAD _____.
Customs duties are included and Applicable Taxes are extra.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

7.7.1.2 Work Performed under the Contract Subject to Task Authorizations

1. Canada's total liability to the Contractor under the Contract must not exceed \$CAD _____.
Customs duties are included and Applicable Taxes are extra.
2. No increase in the total liability of Canada will be authorized or paid to the Contractor unless an increase has been approved, in writing, by the Contracting Authority.

-
3. The Contractor must notify the Contracting Authority in writing as to the adequacy of this sum:
 - a. when it is 75 percent committed, or
 - b. four (4) months before the contract expiry date, or
 - c. as soon as the Contractor considers that the contract funds provided are inadequate for the completion of the Work,whichever comes first.
 4. If the notification is for inadequate contract funds, the Contractor must provide to the Contracting Authority a written estimate for the additional funds required. Provision of such information by the Contractor does not increase Canada's liability.

7.7.1.3 Milestones Payment

Canada will make milestone payments in accordance with the Schedule of Milestones detailed in the Contract and the payment provisions of the Contract if:

- a. an accurate and complete claim for payment using PWGSC-TPSGC 1111, Claim for Progress Payment, and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
- b. all the certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives;
- c. all work associated with the milestone and as applicable any deliverable required has been completed and accepted by Canada.

7.8 Invoicing Instructions

1. The Contractor must submit a claim for payment using form PWGSC-TPSGC 1111, Claim for Progress Payment.
Each claim must show:
 - a. all information required on form PWGSC-TPSGC 1111;
 - b. all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;
 - c. the description and value of the milestone claimed as detailed in the Contract.
2. Applicable Taxes, must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.

3. The Contractor must prepare and certify one original and two (2) copies of the claim on form PWGSC-TPSGC 1111, and forward it to the Technical Authority identified under the section entitled "Authorities" of the Contract for appropriate certification after inspection and acceptance of the Work takes place.
The Technical Authority will then forward the original and two (2) copies of the claim to the Contracting Authority for certification and onward submission to the Payment Office for the remaining certification and payment action.
4. The Contractor must not submit claims until all work identified in the claim is completed.

7.9 Certifications and Additional Information

7.9.1 Compliance

Unless specified otherwise, the continuous compliance with the certifications provided by the Contractor in its bid or precedent to contract award, and the ongoing cooperation in providing additional information are conditions of the Contract and failure to comply will constitute the Contractor in default. Certifications are subject to verification by Canada during the entire period of the Contract.

7.9.3 SACC Manual Clauses

- [A9117C](#) (2007-11-30) T1204 - Direct Request by Customer Department
- [A3025C](#) (2013-03-21) Proactive Disclosure of Contracts with Former Public Servants
- [A3060C](#) (2008-05-12) Canadian Content Certification

7.10 Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in _____. (*Insert the name of the province or territory as specified by the Bidder in its bid, if applicable.*)

7.11 Priority of Documents

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.

- (a) the Articles of Agreement;
- (b) the general conditions 2040 (2016-04-04) General Conditions – Research and Development;
- (c) Annex "A", Statement of Work;
- (d) Annex "B", Basis of Payment;
- (e) Annex "C", Disclosure of Contractor's Background Intellectual Property
- (f) Annex "D", Signed Task Authorization Forms (including all of their annexes, if any) (*if applicable*);
- (g) the Contractor's bid dated _____ .

7.12 Directive on Communications with the Media

1. Definitions

“Communication Activity(ies)” includes: public information and recognition, the planning, development, production and delivery or publication, and any other type or form of dissemination of marketing, promotional or information activities, initiatives, reports, summaries or other products or materials, whether in print or electronic format that pertain to the present agreement, all communications, public relations events, press releases, social media releases, or any other communication directed to the general public in whatever form or media it may be in, including but without limiting the generality of the preceding done through any company web site.

2. Communication Activities Format

The Contractor must early on coordinate with the Canadian Space Agency (CSA) all Communication Activities that pertain to the present contract.

Subject to review and approval by the CSA, the Contractor may mention and/or indicate visually, without any additional costs to the CSA, the CSA's participation in the contract through at least one of the following methods at the complete discretion of the CSA:

- a) By clearly and prominently labelling publications, advertising and promotional products and any form of material and products sponsored or funded by the CSA, as follows, in the appropriate official language:

“This program/project/activity is undertaken with the financial support of the Canadian Space Agency.”

“Ce programme/projet/activité est réalisé(e) avec l'appui financier de l'Agence spatiale canadienne.”

- b) By affixing CSA's corporate logo on print or electronic publications, advertising and promotional products and on any other form of material, products or displays sponsored or funded by the Canadian Space Agency.

Any and all mention or reference to the Canadian Space Agency in addition to those specified above in (a) and (b) must be specifically accepted by the CSA prior to publication.

The Contractor must obtain and use a high resolution printed or electronic copy of the CSA's corporate identity logo and seek advice on its application, by contacting the technical Authority mentioned in section 7.2 of this contract.

3. Communication Activity Coordination Process

The contractor must coordinate with the CSA's Directorate of Communications and Public Affairs all Communication Activities pertaining to the present contract. To this end, the contractor must:

- a) As soon as the Contractor intends to organize a Communication Activity, send a Notice to the CSA's Directorate of Communications and Public Affairs. The Communications Notice must include a complete description of the proposed Communication Activity. The Notice must be in writing in accordance with the clause Notice included in the general conditions applicable to the contract. The Communications Notice must include a copy or example of the proposed Communication Activity.
- b) The contractor must provide to the CSA any and all additional document in any appropriate format, example or information that the CSA deems necessary, at its entire discretion to correctly and efficiently coordinate the proposed Communication Activity. The Contractor agrees to only proceed with the proposed Communication Activity after receiving a written confirmation of coordination of the Communication Activity from the CSA's Directorate of Communications and Public Affairs.
- c) The Contractor must receive beforehand the authorization, approval and written confirmation from the CSA's Directorate of Communications and Public Affairs before organizing, proceeding or hosting a communication activity.

7.13 Insurance

G1005C (2008-05-12) Insurance – No specific requirement

7.14 Disclosure of background Intellectual Property

If applicable, on completion of the Work, the Contractor must submit to the Technical Authority and to the Contracting Authority, a copy of the Background Intellectual Property Disclosure as per the format prescribed in the Annex "C". Such disclosure will consist in a comprehensive update of the preliminary Background Intellectual Property (BIP) disclosure report that was submitted as part of the Contractor's bid (Annex "C", Table "C1").

Such Intellectual Property Disclosure report is a Contract deliverable that is subject to Canada's review and acceptance.

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ANNEX "A"

STATEMENT OF WORK

*****Available at the end of the RFP (following Page 45)*****

**Concept Study for a
Sub-Surface Ice Sounder
on the Next Mars Orbiter**

Statement of Work (SOW)

Date: November 2016

ANNEX "B"

BASIS OF PAYMENT

B.1 Work performed under the Contract NOT subject to Task Authorizations

This section applies to the Work described the Statement of Work (SOW) in Annex "A" to which this basis of payment applies.

MAIN REQUIREMENT (3.3.3.1, 3.3.3.2, 3.3.3.3 and 3.3.3.4)

Milestone ID	Milestone Description	To be Completed On or Before (Month After Contract Award)	Value of Milestone (Total maximum value of \$300,000.00)
1	Payload Trade-Off Review Meeting	2 MACA	25% of total value
2	NeMO SAR Concept Review Meeting	4 MACA	30% of total value
3	Final Review Meeting	6 MACA	45% of total value

OPTION 1 (WP 3.3.5.1)

Milestone ID	Milestone Description	To be Completed On or Before (Month After Option Award)	Value of Milestone (Total maximum value of \$200,000.00)
1	NeMO SAR Requirements Review	6 MAOA	100% of option total value

OPTION 2 (WP 3.3.5.2)

Milestone ID	Milestone Description	To be Completed On or Before (Month After Option Award)	Value of Milestone (Total maximum value of \$100,000.00)
1	TIM #1	2 MAOA	20% of option total value
2	EO Payload Trade-Off Review	4 MAOA	80% of option total value

B.2 Work performed under the Contract subject to Task Authorizations

This section applies to the performance of the Work primarily described in WP 3.3.5.3 of the Statement of Work (SOW) in Annex "A". Additional work within the scope of the project might also be subject to the Task Authorizations Process.

B.2.1 Basis of Payment – Work subject to Task Authorizations

Work performed under Task Authorizations will be performed on a Firm-Fixed Price Basis (FFP) as described and authorized by the Contracting Authority using the applicable "Support Task Authorization Form" (Annex "D"). Work performed under Task Authorizations will be paid in accordance with Section 7.7.1.2 of the Contract and subject to the all-inclusive labour rates defined below.

Labour Category (examples)	All-inclusive Firm Fixed Hourly Price
Principal Investigator/ Senior Scientists	____/Hour
Scientists	____/Hour
Senior engineer	____/Hour
Administrative Support	____/Hour

ANNEX "C"

CONTRACTOR'S DISCLOSURE OF BACKGROUND INTELLECTUAL PROPERTY

If applicable, and in accordance with Article 7.13 of the Contract (Disclosure of Intellectual Property), and with the *Article 28 – Records and Disclosure of Foreground Information* of the [2040](#) (2016-04-04) General Conditions for Research and Development, the Contractor must return to the Contracting Authority this completed Annex "C". Canada will not release any final payment owed to the Contractor unless it has received and accepted this completed Annex "C" as per the requirements below.

1. **Contractor's Legal Name:**
2. **Project Title supported by the Contract:** Concept Study for a Sub-Surface Ice Sounder on the Next Mars Orbiter for the Canadian Space Agency
3. **CSA Technical Authority:**
4. **Contract #:** 9F045-160638/001/MTD
5. **Date of disclosure:**
- 6.
- 7.
8. **Was there any Contractor's own Background Intellectual Property brought to the project?**

Yes → Complete Table C1 (Disclosure of Background Intellectual Property)

No

Definitions (from the [2040](#) (2016-04-04) General Conditions for Research and Development) which form part of this Contract):

1. **Intellectual Property (IP):** means any information or knowledge of an industrial, scientific, technical, commercial, literary, dramatic, artistic or otherwise creative nature relating to the Work, whether oral or recorded in any form or medium and whether or not subject to copyright; this includes but is not limited to any inventions, designs, methods, processes, techniques, know-how, show-how, models, prototypes, patterns, samples, schematics, experimental or test data, reports, drawings, plans, specifications, photographs, manuals and any other documents, Software, and Firmware.
2. **Background Information / Background Intellectual Property (BIP):** means all Intellectual Property that is not Foreground Information that is incorporated into the Work or necessary for the performance of the Work and that is proprietary to or the confidential information of the Contractor, its subcontractors or any other third party;
3. **Foreground Information / Foreground Intellectual Property (FIP):** means all Intellectual Property first conceived, developed, produced or reduced to practice as part of the Work under the Contract;

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ANNEX "C" – CONTRACTOR'S DISCLOSURE OF BACKGROUND INTELLECTUAL PROPERTY
(continued)

Instructions to the Contractor

BIP Disclosure:

If applicable, the Contractor is required to review and update the preliminary BIP disclosure report included in its Bid. At Contract closure, only the BIP elements that were actually used to develop the FIP must be listed in the final BIP disclosure report.

General Instructions for completing the C1 BIP table:

- Tables must be structured according to the CSA IP forms provided in this Annex "C".
- Each IP element must have a unique ID# in order to easily link the elements of the different tables.
- Titles of the IP elements must be descriptive enough for the project stakeholders to get a general idea of the nature of the IP.
- Numbers and complete titles of reference documents must be included.

The CSA Technical Authority is responsible to review and approve the Table C1 Canada before the closing of the Contract.

ANNEX "C" – CONTRACTOR'S DISCLOSURE OF BACKGROUND INTELLECTUAL PROPERTY
 (continued)

TABLE C1:
DISCLOSURE OF BACKGROUND INTELLECTUAL PROPERTY (BIP) BROUGHT TO THE PROJECT
BY THE CONTRACTOR (if applicable)

1 BIP ID#	2 Project Element	3 Title of the BIP	4 Type of IP	5 Type of access to the BIP required to use/improve the FIP	6 Description of the BIP	7 Reference Documentation	8 Origin of the BIP	9 Owner of the BIP
<p><i>Provide ID# specific to each BIP element brought to the project e.g. BIP-CON-99</i></p> <p><i>Where "CON" is the contract acronym</i></p>	<p><i>Describe the system or sub system in which BIP is integrated (e.g. camera, control unit, etc.).</i></p>	<p><i>Use a title that is descriptive of the BIP element integrated to the Work.</i></p>	<p><i>Is the BIP in the form of an invention, trade secret, copyright, design, patent?</i></p>	<p><i>Describe how the BIP will be available for Canada to use the FIP (e.g. BIP information will be incorporated in deliverables documents, software will be in object code, etc.).</i></p>	<p><i>Describe briefly the nature of the BIP (e.g. mechanical design, algorithm, software, method, etc.).</i></p>	<p><i>Provide the number and fill title of the reference documents where the BIP is fully described. The reference document must be available to Canada. Provide patent # for Canada if BIP is patented.</i></p>	<p><i>Describe circumstances of the creation of the BIP. Was it developed from internal research or through a contract with Canada? If so, provide contract number.</i></p>	<p><i>Name the organization that owns the BIP. Provide the name of the subcontractor if not owned by the prime contractor.</i></p>

ANNEX "D"

TASK AUTHORIZATION FORM AND PROCESS

D.1 Detailed Task Authorization Process

The Task Authorization Process is described under the Section 4.3 of the Contract. This Section E.1 provides additional details on how this process will be carried.

1. Canada will prepare a description of the required task using the Task Authorization Form presented in this Annex "D". Such form will include the following information:
 - A clear description of the Work to be performed with itemized tasks;
 - A schedule of the Work with major milestone completion dates;
 - A description of any Government Furnished Equipment (GFE) or Government Furnished Information (GFI) that will be provided to the Contractor (if applicable);
 - A list of deliverables (if applicable);
 - A list of reporting requirements (if applicable);
 - A description of any documentation required to release a payment (if applicable);
 - Any other relevant information.

Such form will then be submitted to the Contractor for review, costing and acceptance.

2. Following its review and costing, the Contractor will sign the Task Authorization Form and submit it for Canada's acceptance by sending it by e-mail to both the Contracting Authority and the Technical Authority (as identified under Sub-Sections 5.1 and 5.2 of the Contract).
3. If the Contractor's proposal is accepted by Canada, the Contracting Authority will counter-sign the Task Authorization Form and will send it by e-mail to the Contractor's Representative (as identified under Section 5.3 of the Contract).
4. Upon receipt of the Signed Task Authorization Form, the Contractor may begin the Work described in the Task Authorization Form.

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CONTRACT TASK AUTHORIZATION FORM
 Concept Study for a Sub-Surface Ice Sounder on the Next Mars Orbiter
 PWGSC File No. 9F045-160638

1	Task name:		2	Task number:	
---	------------	--	---	--------------	--

A	Description of the Work:
---	--------------------------

B	Schedule of Work / Milestone Completion Dates:
---	--

C	GFE or GFI to be provided to the Contractor (if applicable):
---	--

D	Deliverables (if applicable):
---	-------------------------------

E	Reporting Requirements (if applicable):
---	---

F	Documentation required to release a payment:
---	--

G	Other Information:
---	--------------------

3	Detailed Cost Breakdown
---	--------------------------------

Please provide information as to which personnel category will be assigned to the Task along with their respective level of effort (for information purposes only) and a description of any other cost items.

Labour Cost:
 Other Direct Costs (if applicable):
 Travel and Living (if applicable):

Total Firm Fixed Price: _____ (Specify unit applicable [pass, lot, etc..])

4	Authorizations
---	-----------------------

Contractor's Representative	CSA's Technical Authority	PWGSC's Contracting Authority
Name:	Name:	Name:
Title:	Title:	Title:
E-Mail:	E-Mail:	E-Mail:
Phone:	Phone:	Phone:
_____	_____	_____
Signature	Signature	Signature
_____	_____	_____
Date	Date	Date

5	For PWGSC Internal Use Only
---	------------------------------------

CSA Requisition Number:	Line #:
Date:	

ANNEX "E"

BID PREPARATION INSTRUCTIONS - OUTLINE AND CONTENT OF SECTION I

The suggested outline and content of the technical/scientific and management bid, is detailed herein. The information should be presented in the following order:

1. Title / Project Identification Page
2. Executive Summary
3. Table of Contents
4. Technical Section
5. Managerial Section
6. Bid Appendices

1. Title / Project Identification Page:

This is the first page of the Bid. It should clearly state:

- A. RFP file number;
- B. The company's name and address;
- C. The title of the proposed project (the use of acronyms in the title is discouraged, unless they are described);
- D. A short summary of the Bid summarizing the Bid in no more than 8 lines.

2. Executive Summary:

The Executive Summary of Section I of the Bid should be a stand-alone document suitable for public dissemination, for example, through the CSA web site, if the Bid is successful. It should not exceed one page in length (8.5" x 11") and should highlight the following elements:

- A. Project objectives;
- B. A description of the work to be done during the course of the project
- C. Key deliverables;
- D. Technical risks;
- E. Major milestones; and

3. Table of Contents:

The table of contents should be formatted such that its headings are linked to their respective location in the Bid for ease of reference when using the Bid's electronic version.

4. Technical Section:

The Technical Bid should describe the proposed project as outlined in the following sections and subsections.

4.1 Analysis and Trade-off (Evaluation Criterion 1)

This section should demonstrate the bidder's recent experience (less than 10 years) and capability to understand the science requirements for shallow ice mapping and to flow-down those high-level objectives to instrument specifications.

The bidder is requested to:

- A. demonstrate his understanding of the science requirements for planetary shallow ice mapping and Earth permafrost mapping and underlying technical/scientific principles;
- B. demonstrate capabilities for simulating and analyzing the high-level performance of a Synthetic Aperture Radar (SAR) in SAR imaging mode and sounding mode.

4.2 Mission Concept Design (Evaluation Criterion 2)

This section should demonstrate the bidder's recent experience (less than 10 years) and capability to perform space mission design analyses.

The bidder is requested to:

- A. provide examples of space mission design analysis completed by the bidder, such as payload accommodation analysis, coverage analysis, power and mass budgets, link analysis, etc.;
- B. describe simulators, tools, models, etc. that the bidder is currently using for space mission design activities and identify on which mission/instrument they have been used.

4.3 Mission Development Plan (Evaluation Criterion 3)

This section should demonstrate the bidder's recent experience (less than 10 years) and capability to perform a Technology Readiness and Risk Assessment (TRRA), identify technology development activities and assess costs, schedule and risks of the proposed mission.

The bidder is requested to:

- A. provide examples of mission development plans completed by the bidder for space missions;
- B. describe the methodology that the bidder is currently using for TRRA, estimating preliminary costs, schedule and perform risks assessment for a space mission;
- C. demonstrate the capability to identify technology development activities in the context of the Canadian space industry.

4.4 Science Objectives and Science Plan (Evaluation Criterion 4)

This section should describe the proposed science objectives, Canadian science team investigations, anticipated outcomes from investment in NeMO, and the methodology that will be used by the PI and science team to develop the science plan.

The bidder is requested to:

- A. describe the reference mission objectives proposed by the PI and science team for this study, and provide traceability to RD-4 of the statement of work, the requirements in Section 1.2.2 of the statement of work and to the proposed Canadian science team investigations;
- B. describe the science investigations that are proposed by the Canadian science team, demonstrating understanding of the objectives and proposed research methodologies and how these relate to the current state of the art, through reference to the published scientific literature; also describe how these relate to current capabilities and expertise in Canada;
- C. describe anticipated outcomes from investment in the NeMO mission in terms of advances to knowledge on Mars and Earth, public engagement, and training of HQP;
- D. describe the methodology that will be used to develop the science plan;
- E. Include short CV's for the PI and all Science Team members.

5. Management Section:

This section of the proposal should demonstrate the effectiveness of the bidder in delivering the project. In order to do this, the bidder should include as a minimum the following: key personnel qualifications, team organization and arrangements, previous project experience, and the Management Plan.

5.1 Team Experience (Evaluation Criterion 5)

The bidder is requested to:

- A. present the organizational chart and the project team that will be dedicated to the project;
- B. describe the roles and responsibilities of all key team members including partners or subcontractors who will form part of the team responsible for the work proposed;
- C. provide resumes of the bidder's key team personnel (including its partners and subcontractors) to illustrate the depth of experience related to similar projects;
- D. describe any teaming arrangements that would increase the depth of knowledge of the bidder's organization;
- E. provide the details of the arrangement that exists to respond to this request for proposal;
- F. demonstrate knowledge and previous experience in the technology domain applicable to the statement of work; and
- G. demonstrate previous Technical and Management experience in the work performed on similar projects (including the bidder, its partners and subcontractors).
- H. Identify within the proposed team one or several potential Canadian Principal Investigator (PI) for the proposed radar instrument on NeMO.

5.2 Project Management Approach (Evaluation Criterion 6)

The bidder is requested to:

- A. describe the management approach that will be taken to implement the project;
- B. provide a description of the main tasks of the project in sufficient detail to demonstrate a good understanding of the scope of the project;
- C. provide a resource allocation matrix identifying the time, manpower and resources allocated on each task.
- D. describe the overall project management system, methods of tracking and controlling the progress of the project necessary to ensure effective and efficient project management; and
- E. provide a project timetable that relates tasks, milestones and deliverables. For planning purposes, use a project start date of December 1st, 2016.
- F. Provide an analysis of project management risks with mitigation plans.

6. Bid Appendices

The following items should be addressed in individual appendices as part of the Bids.

- A. List of acronyms used in the Bid;
- B. Résumés: The Bid shall include résumés of all key personnel including those of subcontractors and these shall be appended to Volume I;
- C. List of Contacts: The list of contacts shall be appended to Volume I, in a format suitable for distribution and shall include all of the Bidder's points-of-contact involved in the Bid development and/or contract negotiations.

The following example format shall be used:

Table B 2: - Sample List of Contacts

Role	Name	Telephone	Fax	E-mail
Project Manager				
Project Engineers/ Principal Investigator				
Contracting Authority				
Claims officer				
Communications (for press release)				
Etc.				

- D. Signed Letters of Agreement with subcontractors: These include Memorandums of Understanding (MOUs), Memorandums of Agreement (MOAs), or other related documentation, that will confirm participation of identified subcontractors.;
- E. Statements of Work for subcontractors;
- F. CDRL compliance matrix;
- G. Key Background Intellectual Property;
- H. Corporate literature: Only literature that is relevant and will be useful to support the Bid;
- I. Any other Bid appendices deemed appropriate by the Bidder

ANNEX "F"

TECHNICAL AND MANAGEMENT POINT RATED EVALUATION CRITERIA

Each Technical Bid that meets the Mandatory Requirement, will be evaluated and scored in accordance with Table 1: List of Evaluation Criteria and Associated Scores. The criteria are grouped under the following divisions:

- Technical
- Management

Table 1: List of Evaluation Criteria and Associated Scores

Technical Criteria	Maximum Score	Minimum Pass Score
1) Payload Analysis and Trade-off	30	15
2) Mission Concept Design	20	10
3) Mission Development Plan	10	5
4) Science Objectives and Science Plan	10	7.5
<i>Minimum Pass Score for Technical Criteria</i> <i>Maximum Score for Technical Criteria</i>	40.5 70	
Management Criteria	Maximum Score	Minimum Pass Score
5) Team Experience	15	7.5
6) Project Management Approach	15	7.5
<i>Minimum Pass Score for Management Criteria</i> <i>Maximum Score for Management Criteria</i>	17.5 30	

The point rated evaluation criteria are supported by a set of 5 benchmark statements (0, A, B, C, D). Each of these statements has a corresponding relative value:

- 0 = 0% of the maximum point rating
- A = 25% of maximum point rating
- B = 50% of maximum point rating
- C = 75% of maximum point rating
- D = 100% of maximum point rating

As an example, the maximum point rating for the "Team Experience" criterion is 20 points. If a Bid receives a "C" for this criterion in the evaluation process, the score attributed will be: 75% of 20 points = 15 points (score)

Each of these criteria has a minimum passing score.

EVALUATION CRITERIA AND BENCHMARK STATEMENTS

TECHNICAL CRITERIA

1. Payload Analysis and Trade-off

Maximum Score: 30 points

This criterion assesses the degree to which the proposal demonstrates bidder's recent experience (less than 10 years) and capability to understand the science requirements for shallow ice mapping and to flow-down those high-level objectives to instrument specifications.

0) The Bid does not address experience or capabilities to understand the science requirements for planetary shallow ice mapping and to flow-down those high-level measurement objectives to instrument specifications.

A) Poor: The Bid provides only a limited discussion of the science requirements for planetary shallow ice mapping. The bidder's capabilities for simulating and analyzing the high-level instruments performance are not demonstrated.

B) Average: The Bid provides a discussion on the science requirements for planetary shallow ice mapping but the discussion exhibits no general understanding of underlying technical/scientific principles. The bidder's capabilities for simulating and analyzing the high-level instruments performance are addressed, but not specifically for a SAR.

C) Good: The Bid includes a discussion of the science requirements for planetary shallow ice mapping and Earth permafrost mapping and it exhibits a general understanding of the underlying technical/scientific principles. The bidder's capabilities for simulating and analyzing the high-level performance of a SAR instrument and radar sounder are clearly demonstrated.

D) Excellent: The Bid includes a discussion of the science requirements for planetary shallow ice mapping and Earth permafrost mapping and it provides an authoritative understanding of underlying technical/scientific principles. The bidder's capabilities for simulating and analyzing the high-level performance of a SAR instrument and radar sounder are clearly demonstrated.

2. Mission Concept Design

Maximum Score: 20 points

This criterion assesses the degree to which the proposal demonstrates the bidder's recent experience (less than 10 years) and capability to perform space mission design analyses, including payload accommodation analysis on a provided spacecraft.

0) The bid does not address experience in practical space mission design analysis activity to support the development of a mission.

A) Poor: The Bid provides one example of relevant space mission design analysis but lacks details. It does not enumerate the tools the bidder uses for space mission design activities.

B) Average: The Bid describes one relevant space mission design analysis activity in which the bidder has been involved, including performing payload accommodation analysis. It only enumerates some of the tools the bidder uses for space mission design activities.

C) Good: The Bid provides comprehensive and detailed example of one relevant space mission design analysis activity in which the bidder has played a significant role, including performing payload accommodation analysis. It describes the tools the bidder uses for space mission design activities.

D) Excellent: The Bid provides comprehensive and detailed examples of at least two relevant space mission design analysis activities in which the bidder has played a significant role, including performing payload accommodation analysis. It describes in detail the tools the bidder uses for space mission design activities and identifies on which mission/instrument they have been used.

3. Mission Development Plan

Maximum Score: 10 points

This criterion assesses the recent experience (less than 10 years) and capabilities of the bidder to perform a Technology Readiness and Risk Assessment (TRRA), identify technology development activities and assess costs, schedule and risks of the proposed mission.

- 0) The bid does not address experience in development plans for space missions.
- A) Poor: The Bid provides one example of relevant space mission development plan in which the bidder has been involved but lacks details. It mentions briefly the methodology the bidder uses for TRRA, estimating preliminary costs, schedule and perform risks assessment of a space mission.
- B) Average: The Bid provides a comprehensive and detailed example of one relevant space mission development plan in which the bidder has been involved. It mentions briefly the methodology the bidder uses for TRRA, estimating preliminary costs, schedule and perform risks assessment of a space mission.
- C) Good: The Bid provides comprehensive and detailed example of one relevant space mission development plan in which the bidder has played a significant role. It describes the methodology the bidder uses for TRRA, estimating preliminary costs, schedule and perform risks assessment of a space mission. The capability to identify technology development activities in the context of the Canadian space industry is demonstrated.
- D) Excellent: The Bid provides comprehensive and detailed examples of at least two relevant space mission development plans in which the bidder has played a significant role. It describes in detail the methodology the bidder uses for TRRA, estimating preliminary costs, schedule and perform risks assessment of a space mission. The capability to identify technology development activities in the context of the Canadian space industry is clearly demonstrated.

4. Science Objectives and Science Plan

Maximum Score: 10 points

This criterion assesses the appropriateness and merit of the proposed Canadian science investigations, relationship to Canadian scientific community interest, strengths and expertise, and understanding of science plan development.

- 0) The proposed reference mission objectives do not align with RD-4.
- A) Poor: The proposed reference mission objectives align with RD-4. Science investigations are missing information needed to assess their appropriateness or merit.
- B) Average: The proposed reference mission objectives align with RD-4 and correspond to requirements in Section 1.2.2 (from the statement of work). Science investigations are identified that relate to the mission objectives, and appear to have merit, but some details are missing. The Bid provides reasonable confidence that a science plan will be produced that demonstrates an understanding of mission and science development needs and costing. The science team includes key expertise needed to implement the science plan and has members from at least two Canadian universities.
- C) Good: The proposed reference mission objectives align with RD-4 and the requirements in Section 1.2.2 (from the statement of work) as shown by clear traceability. Science investigations are defined and have merit and address several areas of Canadian science community interest. The Bid provides confidence that a science plan will be produced that demonstrates a strong understanding of mission and science development needs and costing. The science team includes key expertise needed to implement the science plan and has members from at least two Canadian universities. Candidates are identified and a strategy is proposed to expand science team membership to at least five universities.

Solicitation No. - N° de l'invitation
9F045-160638/A
Client Ref. No. - N° de réf. du client
9F045-16-0638

Amd. No. - N° de la modif.
File No. - N° du dossier
MTD-6-39310

Buyer ID - Id de l'acheteur
MTD100
CCC No./N° CCC - FMS No./N° VME

- D) Excellent: The proposed reference mission objectives align with RD-4 and the requirements in Section 1.2.2 (from the statement of work) as shown by clear traceability. Science investigations are well-defined and address several areas of Canadian community interest and strength, and merit is demonstrated by a literature review. The Bid provides confidence that a science plan will be produced that demonstrates an excellent understanding of mission and science development needs and costing. The science team includes key expertise needed to implement the science plan and has members from at least five Canadian universities.

MANAGEMENT CRITERIA

5. Team Experience

Maximum Score: 15 points

This criterion assesses the capability (education, experience, expertise and complementarities) of the personnel assembled to carry out the Bid.

- 0) The proposed team (including bidder, partners and subcontractors) either has not been identified or has not successfully completed studies of similar scope and complexity.
- A) Poor: The proposed team (including bidder, partners and subcontractors), as described by the organizational chart, is incomplete or not balanced, and there is no evidence that it will be dedicated for the whole duration of the study. Roles and responsibilities of key team members are not defined. Resumes are not provided for key team personnel. The teaming arrangement is not described. The team composition demonstrates little or no experience in the domain relevant to the proposed work. The team has little experience of successfully completing studies of similar scope and complexity.
- B) Average: The proposed team (including bidder, partners and subcontractors), as described by the organizational chart, is complete and generally balanced, but there is evidenced that it may not be dedicated for the whole duration of the study. The roles and responsibilities of some key team members are not clearly defined. Resumes are provided for some key team personnel, but not all. The teaming arrangement is only generally described. The team composition is such that it only demonstrates partial experience in the domain relevant to the proposed work. The team has limited experience, in that it has successfully completing similar studies, albeit of a reduced scope and complexity. A potential Canadian Principal investigator (PI) for the proposed radar instrument on NeMO has been included in the proposed team.
- C) Good: The proposed team (including bidder, partners and subcontractors), as described by the organizational chart, is complete, balanced and are planned on being dedicated for the whole duration of the study. The roles and responsibilities of all key team members are clearly defined. Resumes are provided for all key team personnel. The teaming arrangement is described in detail. The team composition is such that it has recognizable experience in the domain relevant to the proposed work. The team has experience in successfully completing studies of similar scope and complexity. A potential Canadian Principal investigator (PI) for the proposed radar instrument on NeMO has been included in the proposed team.
- D) Excellent: The proposed team (including bidder, partners and subcontractors), as described by the organizational chart, is complete, balanced and will clearly be dedicated for the whole duration of the study. The roles and responsibilities of all key team members are clearly defined. Resumes are provided for all team personnel. The teaming arrangement is described in detail. The team composition is such that it has recognizable experience in the domain relevant to the proposed work. The team has experience and a proven, demonstrated track record in successfully completing studies of at least similar scope and complexity. A potential Canadian Principal investigator (PI) for the proposed radar instrument on NeMO has been included in the proposed team.

6. Project Management Approach**Maximum Score: 15 points**

This criterion assesses the suggested Project Management Approach.

- 0) No concrete management approach is provided.
- A) Poor: The project management plan as described in the Bid does not follow a methodical approach. The methods of tracking and controlling the progress are limited and are not correlated to the work. All phases are identified but there are no supporting details for the implementation of the work. The schedule is incomplete and does not contain details demonstrating that the complexity of the mission is understood.
- B) Average: The project management plan as described in the Bid follows a methodical approach, but lacks completeness. Overall, the methods of tracking and controlling the progress are provided, but are not fully correlated to the work. All phases are identified and compliant with the Statement of Work, but there are areas lacking details for the implementation of the work. The schedule is there but lacks details; the schedule includes the deliverables and is compliant with the deliverables schedule stipulated in the Statement of Work.
- C) Good: The project management plan as described in the Bid follows a methodical approach and is complete. The methods of tracking and controlling the progress are logical and clearly outlined, and are correlated to the work. All phases are identified and are compliant with the Statement of Work, including most details for the implementation of the work. The schedule is complete and detailed. The schedule includes the deliverables and is compliant with the deliverables schedule stipulated in the Statement of Work. Risks specific to this study are discussed.
- D) Excellent: The management plan as described in the Bid follows a methodical approach and is complete. The methods of tracking and controlling the progress are logical and clearly outlined, and are correlated to the work. A complete description of the implementation of the work is given and is compliant with the Statement of Work. The schedule is complete and very detailed. The schedule includes the deliverables and individual work packages and is compliant with the deliverables schedule stipulated in the Statement of Work. Risks specific to this study are identified with credible mitigation.

ANNEX "G"

POINT RATED EVALUATION FOR TASKS AUTHORIZATIONS

In order to evaluate the hourly rate provided by the bidder in response to the tasks authorizations part of the RFP, the bidder is required to calculate the maximum of hours (up to a maximum of 2 decimals) for each of the labour categories in accordance with a fixed ratio and a maximum budget.

The maximum budget of \$150,000.00 is only an approximation of requirements given in good faith and is provided for bid evaluation purposes only. It does not represent a commitment by Canada.

Labour Category	All-inclusive Firm Fixed Hourly Price	Fixed ratio of total hours	Hours	Total Price
Principal Investigator/ Senior Scientists	____/Hour	40%		Hourly price x Hours
Scientists	____/Hour	40%		Hourly price x Hours
Senior engineer	____/Hour	10%		Hourly price x Hours
Administrative Support	____/Hour	10%		Hourly price x Hours
			Total hours	Maximum budget \$150,000.00

Example:

Labour Category	All-inclusive Firm Fixed Hourly Price	Ratio of total hours	Hours	Total Price
Principal Investigator/ Senior Scientists	100.00/Hour	40%	727.27	\$72,727.00
Scientists	80.00/Hour	40%	727.27	\$58,181.60
Senior engineer	70.00/Hour	10%	181.82	\$12,727.40
Administrative Support	35.00/Hour	10%	181.82	\$6,363.70
			1818.18 hours	\$149,999.70

*******END OF THE RFP*******

Canadian Space Agency

ANNEX A

Concept Study for a Sub-Surface Ice Sounder on the Next Mars Orbiter

Statement of Work (SOW)

Date: November 2016

FOR CANADIAN SPACE AGENCY USE ONLY

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Agency

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1 INTRODUCTION

1.1 SCOPE

This Statement of Work (SOW) defines activities to determine the feasibility of a Synthetic Aperture Radar (SAR) instrument as a hosted payload on NASA's Next Mars Orbiter (NeMO) mission, based on cost, schedule, technical, and risk studies.

1.2 BACKGROUND

NASA is currently in Pre-Phase A for the NeMO mission. NeMO will be a communications satellite currently planned for launch in 2022 to replace the orbiters that have long-passed their design life. NASA is considering to use the extra power and mass available on NeMO to include additional payloads for scientific observation of Mars.

NASA chartered a Next Orbiter Science Analysis Group (NEX-SAG) to review and prioritize Mars observation payloads that could be accommodated on NeMO [RD-4]. The NEX-SAG performed a first assessment of the feasibility of instruments compatible with NeMO and identified six payloads of interest. Given the industrial and academic heritage in Canada, NASA and CSA mutually agreed to explore the potential contribution of a Canadian polarimetric SAR for sub-surface ice mapping.

NASA's Key Decision Point to undertake the NeMO mission project formulation is anticipated in 2017 [RD-11]. The CSA decision to contribute a SAR will depend on several factors including the eventual scope of NeMO if approved by NASA, the technical maturity of the proposed instrument, the interest of Canadian scientists and availability of a Canadian Principal Investigator (PI), and the availability of funding at NASA and CSA in the relatively short time frame leading to NeMO's nominal launch in summer 2022.

One of the purposes of this concept study is to determine if SAR technologies elements currently available in Canada could be easily adapted for a Mars application and what would be the cost. This concept study will also be used to select a provisional Canadian science team and develop a preliminary science plan to describe Canadian science team instrument support activities and research investigations and determine the cost associated with such Canadian science team participation. Should the mission go forward, the model for science team participation will be confirmed by NASA. This model could be a PI-led instrument model, where Canadian science team members fully participate to the international NeMO science team to plan scientific observations and have access to all mission data, or a model more similar to astronomical observatories where Canadian scientists are allocated observation time in proportion to national contributions, or some other model to be determined. A PI-led approach should be assumed for this study for the purpose of planning science team activities and costs for the mission lifecycle.

The 2022 launch date is very challenging. However, the activities planned in this study will serve to define a payload that CSA may be able to pursue under other opportunities. An optional work package is planned as part of this SOW to review how the proposed instrument for NeMO could be used for Earth Observation applications.

To help with the demanding NeMO schedule, a first estimate of possible instrument specifications and associated sub-systems is provided in the following sub-sections as a starting point for the activities. Section 1.2.1 provides a description of the NeMO spacecraft and the

available accommodation for a radar payload. Section 1.2.2 provides preliminary observation requirements, and a high-level reference instrument description is provided in Section 1.2.3.

1.2.1 NeMO Spacecraft Accommodation

The MARS 2022 orbiter is a communications satellite with high-resolution scientific observation payloads. The spacecraft will provide high data rate direct-to-Earth telecom link and relay to Mars-bound systems via X band and UHF systems. Figure 1.2.1 gives an overview of the current spacecraft concept. NeMO is baselining solar-electric propulsion using two NEXT-C ion thrusters. The electric power will be generated by advanced flexible solar arrays provided up to 20 kW of electric power at 1 AU.

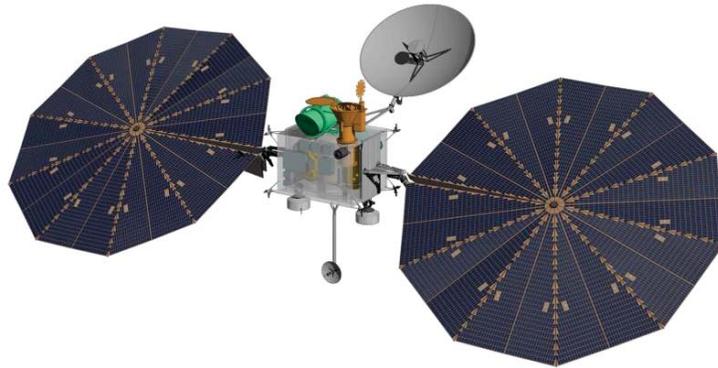


Figure 1.2.1-1 NeMO Spacecraft Overview

Some basic spacecraft characteristics are provided in Table 1.2.1-1

Table 1.2.1-1 NeMO Spacecraft Preliminary Specifications

Parameter	Value	Remarks
Mass	1250 kg bus	
Power	20 kW	@ 1 AU
Mars Orbit	320 km average, 75°-93°	
Attitude	Nadir and ±30° roll observing	
Launcher	Falcon-9 or Atlas V	
Thruster	Power: 7.3 kW Thrust: 235 mN Isp: 4150 sec	Thrusters will not be in function during SAR imaging.
Accommodation		Information will be provided during the study
Interfaces		Bus to Payload Command Interface: MIL-STD-1553 or RS-485
Data Allocation for the instrument	48 Gbits/day	Depend on the Mars/Earth geometry, max data rate is 130 Gbits/day and min data rate is 15 Gbits/day

Up to five different platforms are currently considered by NASA for this project. The accommodation information will be available at the beginning of the contract. The Contractor must review this information and determine one configuration that represents a nominal case and the worst case configuration. These two configurations will need to be considered in every aspect of the work related to the payload accommodation on the spacecraft.

1.2.2 Shallow Ice Mapping Requirements

If included on the spacecraft, one of the primary objective of the SAR instrument will be to identify promising ice deposits located a few meters under the Mars surface, as a primary resource which could eventually help sustain human presence on the planet.

Previous missions to Mars have provided evidence that there are significant quantities of water sequestered as ice near the surface and that water may flow on the surface [RD-4]

The science requirements for shallow ice mapping are discussed in [RD-4].

Two modes of operation are required: a sounding mode and an imaging mode. The sounding mode for the NeMO SAR will be similar to the SHallow subsurface RADar instrument’s (SHARAD) operating mode, but with requirements for better vertical resolution to improve the stratigraphic interpretations. The imaging mode is a polarimetric SAR at a frequency low enough to penetrate a few meters under the surface but no vertical resolution (sounding) is required. The

polarimetric signature will be used to reveal icy deposits [RD-5]. A high-level summary is provided in Table 1.2.2-1.

Table 1.2.2-1 Shallow Ice Mapping Preliminary Requirements

Parameters	Requirements	Notes
<i>Imaging mode</i>		
Horizontal Resolution	<15 m	Could be multi-look of higher resolution. 5m would be of interest to target high-interest sites (15m for survey).
Vertical Resolution	No specific requirement	No mention of a requirement for vertical resolution (i.e. tomographic SAR) in NEX-SAG recommendations. Possibility of tomographic processing to be examined in optional activities.
Penetration Depth	Few (<10) meters	To map shallow (<10 m), relatively pure ground ice. 5-8 m conservatively expected for P-band.
Polarization	At least dual circular (full polarimetry preferred)	Critical so that the coherent backscatter effect from pure ice can be observed.
Viewing geometry	Side-looking	To be optimized.
Coverage/revisit	No specific requirement	Imaging time should be first established as a function of the system parameters. Targeted areas will be provided by science team.
SNR	No specific requirements	To be established during the study.
Retrieval Accuracy	No specific requirements	To be established during the study.
<i>Sounding Mode</i>		
Horizontal Resolution	No specific requirement	Function of antenna footprint and pulse length.
Vertical Resolution	<1m (goal) 3m (threshold)	Will require high bandwidth to generate 1m data in a single pass; may be challenging to be compatible with depth requirements.
Penetration Depth	100 m	To map the thickness and volume of water ice in the north polar cap and CO2 deposits.
Polarization	Single-pol	To offset the higher data rate created by the enhanced bandwidth.
Viewing geometry	Nadir	Most likely require a roll of the spacecraft to bring the beam towards nadir.
Coverage/revisit	No specific requirement	Both polar and non-polar regions need to be covered.

1.2.3 High-Level SAR Instrument

This section presents a high-level reference SAR instrument resulting from preliminary work done by the CSA, based on previous concept studies, completed between 2003 and 2008. It is for information purpose only and the Contractor is expected to perform the required payload and trade-off analyses to investigate different concepts using the reference instrument as a starting point.

The reference instrument will use a low-mass deployable mesh reflector antenna of about 6 meters, illuminated by a dual circularly-polarized feed operated at 500 MHz. It is assumed that the spacecraft will perform a roll manoeuvre such that the payload can operate in the SAR imaging mode with an roll angle of approximately 30° or in the sounding mode with the antenna pointing towards nadir.

A receiver-exciter module will control the payload and will also generate and receive the required pulses. The nominal pulse will be a 30 μ s chirp with a bandwidth of 20 MHz to achieve a single-look ground range resolution of 15 m. The receiver-exciter module will allow generating a range of pulses both in terms of duration and bandwidth. Pulse duration between 10 μ s and 60 μ s should be possible with bandwidth of 10, 20, 40, 60, 80 and 160 MHz. This flexibility will allow optimizing the mode of operation to either provide higher resolution or reduce the data rate and improve the SNR. The 80 and 160 MHz bandwidth will only be used in the sounding mode and their implementation may present challenges due to the low center frequency. Their implementation should be considered as a goal, particularly the 160 MHz.

An HPA will amplify the RF signal to a peak power of approximately 2 kW with a duty cycle 3.75% resulting in an average peak RF power of 75 W.

A control and timing module will receive the imaging request from the spacecraft bus and will control the timing of the radar to generate and receive the pulses at the right time and generate a master LO signal used throughout the radar electronics.

In order to reduce the data rate to fit within an average mission data allocation of 48 Gbits/day, an on-board processor is considered. This on-board processor could provide lower resolution complex multi-looked products while surveying for interesting area at lower resolution while full resolution raw data could be collected over the high-interest sites.

Table 1.2.3-1 provides a summary of the SAR parameters while Table 1.2.3-2 and Table 1.2.3-3 provide an overview of the mass and power allocation for the proposed instrument. The power allocation is based on the assumption that the radar is operating 10% of the time. Determining the exact time available for imaging will be part of the study.

Table 3.3.5.1-1: Main Radar Parameters

Operating parameter	SAR Mode	Sounding Mode
Altitude	320 km	320 km
Antenna pointing angle	30°	Nadir
Antenna size	6m reflector	6m reflector
Polarization	Dual/Quad pol. circular	Single pol. circular
Bandwidth	10, 20, 40, 60 MHz	40, (80, 160 MHz as a goal)
Nominal Pulse length	30 μs	10 μs
Nominal PRF	1250 Hz	1250 Hz
Nominal Swath	30-40 km	N/A
RF Peak Power	2 kW	2 kW
Average RF Power	75 W (TBC)	25 W

Table 3.3.5.1-2: Preliminary Mass Allocation

Item	Allocation
Antenna subsystem including feed, reflector and deployment boom	40 kg
P-band HPA and DC/DC converter	15 kg
Rx/Tx module	15 kg
Payload Control and processing	10 kg
Sub total	80 kg
Margin	20 kg
Total	100 kg

Table 3.3.5.1-3: Preliminary Power Allocation

Item	Allocation
HPA DC Power	235 W
Rx/Tx Power	60 W
Payload Control (Always on)	20 W
Payload processing	20 W
Peak DC Power (Dual Pol.)	335 W
Average DC Power (Dual Pol.)	51 W
Peak DC Power (Quad Pol.)	665 W
Orbit Average DC Power (Quad Pol.)	85 W

1.2.4 Science investigations enabled by SAR

For the purpose of this concept study, instrument design will be driven by the primary objective of shallow ice mapping, and science support activities needed for instrument development must be included in science planning and costing.

However, additional science investigations may be proposed, according to science team interests. It is expected that these will demonstrate Global Science Excellence by advancing one or more science objectives proposed in [RD-4]

1.2.5 Proposed Requirements Tree

For the purpose of this study, the requirement tree in Figure 1.2.5-1 will be implemented. In the context of this document, NeMO SAR refers to a SAR payload hosted on the NeMO spacecraft. NeMO SAR Mission Objectives and NeMO SAR Payload Science Requirements represent the contribution of the SAR payload to the overall NeMO mission and will become input to the appropriate NeMO Mission document at a later time.

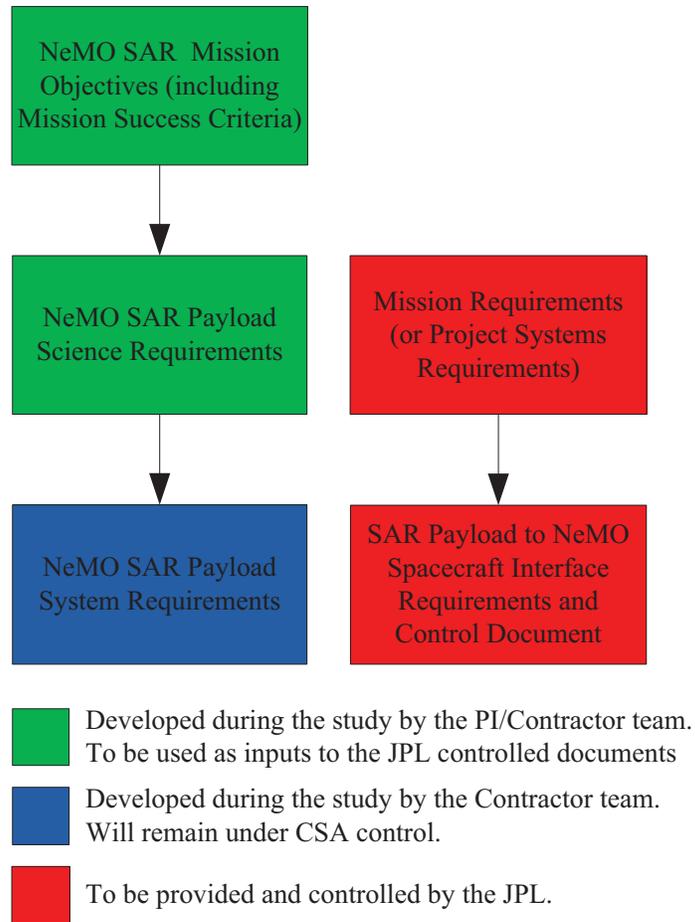


Figure 1.2.5-1 Hosted SAR payload on NeMO Requirements tree.

1.3 DOCUMENT CONVENTIONS

A number of the sections in this document describe controlled requirements and specifications and therefore the following verbs are used in the specific sense indicated below:

- a) “Shall” or “Must” is used to indicate a mandatory requirement;
- b) “Should” indicates a goal or preferred alternative. Such goals or alternatives must be treated as requirements on a best efforts basis, and verified as for other requirements. The actual performance achieved must be included in the appropriate verification report, whether or not the goal performance is achieved;
- c) “May” indicates an option;
- d) “Will” indicates a statement of intention or fact, as does the use of present indicative active verbs.

In the following, the term 'Contractor' is used to describe the team that will conduct the study, which could be a mixed team drawn from Canadian Industry, Universities or Research Institutes.

2 DOCUMENTS

2.1 APPLICABLE DOCUMENTS (AD)

There are no applicable documents to this contract.

2.2 REFERENCE DOCUMENTS (RD)

The following documents provide additional information or guidelines that either may clarify the contents or are pertinent to the history of this document.

Table2.2-1: Reference Documents

RD No.	Document Number	Document Title	Rev. No.	Date
RD-1.	PMBOK Guide	A Guide to the Project Management Body of Knowledge	5 th Ed.	2013
RD-2.	CSA-SE-STD-0001	CSA Systems Engineering Technical Reviews Standard ftp://ftp.asc-csa.gc.ca/users/TRP/pub/SE-STD/	A	2008-11-7
RD-3.	CSA-ST-GDL-0001	CSA Technology Readiness Levels and Assessment Guidelines ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/ This draft is the baseline for this concept study and will not be updated	Rev. C Draft	Nov. 2016
RD-4.		MEPAG NEX-SAG Report (2015), Report from the Next Orbiter Science Analysis Group (NEX-SAG), <i>Chaired by B. Campbell and R. Zurek</i> , 77 pages posted December, 2015 by the Mars Exploration Program Analysis Group (MEPAG) at: http://mepag.nasa.gov/reports.cfm		
RD-5.		Albert Frank Christian Haldemann (1997), <i>Interpreting Radar Scattering: Circular –polarization perspectives from three terrestrial planets</i> , Dissertation (Ph.D), Thesis, California Institute of Technology		

RD No.	Document Number	Document Title	Rev. No.	Date
RD-6.		Paillou, P. et al. <i>A study of P-band synthetic aperture radar applicability and performance for Mars exploration: Imaging subsurface geology and detecting shallow moisture</i> , Journal of Geophysical Research, Vol. 111, E06S11, 2006.		
RD-7.	NPR 7123.1B, Appendix E	NASA Systems Engineering Processes and Requirements Appendix E http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=NPR_7123_001B_&page_name=AppendixE :	B	Effective Date: April 18, 2013 Expiration Date: April 18, 2018
RD-8.	CSA-ST-FORM-0001	Technology Readiness and Risk Assessment (TRRA) Worksheet ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/Technology_and_Risk_Assessment_Worksheets%20and_Rollup_Tool/	E	Jul 29, 2013
RD-9.	CSA-ST-RPT-0002	Technology Readiness and Risk Assessment Rollup: TRRA - Data Rollup Tool.xlsm ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/Technology_and_Risk_Assessment_Worksheets%20and_Rollup_Tool/	E	Sept 11, 2013
RD-10.	CSA-ST-FORM-0003	Critical Technology Element (CTE) Identification Criteria Worksheet ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/Technology_and_Risk_Assessment_Worksheets%20and_Rollup_Tool/	A	Mar, 2014
RD-11.	NPR 7120.5E	NASA Space Flight Program and Project Management Requirements	E	Aug 14, 2012
RD-12.	NPR 7123.1B	NASA Systems Engineering Processes and Requirements	B	Apr 18, 2013
RD-13.	NASA/SP-2007-6105	NASA Systems Engineering Handbook http://igs.nigc.ir/STANDS/BOOK/HB-NASA.PDF	1	Dec 2007

3 REQUIREMENTS

3.1 GENERAL

The Contractor must manage the project to effectively achieve project performance, scope, quality, cost and schedule requirements of this SOW. The Contractor must provide the management, technical leadership and support necessary to ensure effective and efficient performance of all project efforts and activities.

The Contractor must report project costs, schedule, technical, performance and risks issues as defined herein.

3.2 OBJECTIVES

The main objectives of this study are to:

- Starting from the initial concept provided by CSA and JPL, and taking into consideration science investigations to be defined in the Contractor's bid, define initial NeMO SAR requirements and goals for a NeMO-compatible payload, and, down to main sub-system level, a NeMO-compatible payload meeting the observation requirements provided in Section 1.2.2.
- Develop a science observation plan and operation concept for a NeMO SAR payload compatible with NeMO capabilities.
- Develop a NeMO SAR development plan for a launch in 2022, using as much as possible sub-systems with high TRL.
- Assess options for enhanced mission objectives and reuse of the payload for Earth Observation applications.

3.3 DETAILED TASKS

3.3.1 *Payload Analysis and Trade-off*

The Contractor must first review the observation requirements provided in Section 1.2.2 and flag any inconsistency or missing information that may require clarification or change.

Starting from the proposed requirements provided in Section 1.2.2, and taking into consideration science investigations defined in the Contractor's Bid, the Contractor must establish basic system parameters (frequency(ies), power, bandwidth, antenna size, antennas scan, polarization, duty cycle, etc.) to provide the measurements with the required accuracy, resolution, SNR and perform necessary trade-off analysis to propose options compatible with the NeMO accommodation constraints. The contractor must investigate the possibility of sharing the reflector antenna with the telecommunication antenna. The contractor must support a meeting with the NeMO team to discuss the potential antenna sharing and the accommodation/interface constraints.

Models for surface reflectivity and attenuation shall be based on experimental data available in the open literature and must approved by the Technical Authority.

The performance model used in predicting the system performance analysis must be properly documented and the programs used to do the analysis be delivered with the Final Data Package.

The work accomplished in this task must be summarized in the Payload Analysis and Trade-off Document and the proposed options must be presented by the Contractor at the Payload Trade-off Review Meeting. The preferred payload option will be selected by CSA within a maximum period of two weeks after the meeting.

3.3.2 NeMO SAR Concept

After the payload selection, the Contractor must first update the payload analysis to take into account the inputs resulting from the Payload Trade-off Review Meeting and payload selection process.

For the selected payload, the Contractor must perform NeMO SAR design analysis to work out the main elements of the proposed concept in a draft NeMO SAR Conceptual Design Document. At a minimum, the following elements must be included in the concept design:

- Observation Objectives
- Payload Description
- Payload Accommodation on NeMO Spacecraft
- Coverage Analysis (including orbit description)
- Payload and Engineering Budgets, including: mass, power, data rates, on-board storage.
- Interface with Spacecraft (including need for manoeuvres)
- Payload Operations (assumed to be done in Canada)
- Data Processing
- Calibration and Validation
- Compliance to Measurement Objectives

The Contractor shall assume that the payload operations will be performed separately from the spacecraft operations. Interface between the spacecraft operations and payload operations centers are to be defined.

3.3.3 NeMO SAR Development Plan

The Contractor must first update the NeMO SAR concept design to take into account the inputs resulting from the NeMO SAR Concept Review.

For the confirmed NeMO SAR concept, the Contractor must perform a Technology Readiness and Risk Assessment (TRRA) and identify technologies that could be developed in Canada. This must be included in a NeMO SAR Development Plan Document, which must include, at a minimum, the following elements:

- Technology Readiness and Risk Assessment (TRRA)
- Technology development activities to be performed, detailing the urgency, criticality and the main risks and challenges of each activity
- Possible technology demonstrations
- Assessment of the heritage sub-systems for the current project
- Estimated NeMO SAR life cycle cost, including science team costs from the Science Plan
- Estimated NeMO SAR schedule including all major milestones
- Preliminary NeMO SAR risk assessment
- Preliminary concept of operation
- Potential collaborations
- Proposed Canadian technology capabilities development strategy
- Recommendations for follow-on technology development activities
- Preliminary prototyping approach
- Consideration for the Verification and Validation Plan, Integration Plan and Integrated Logistic Support Plan that might impact the project cost and schedule.

The Contractor must perform the TRRA in accordance with the requirements of the CSA Technology Readiness and Risk Assessment Guidelines (RD-3) and NASA Systems Engineering Processes and Requirements Appendix E (RD-7) to formally document the technology status.

The Contractor must produce the TRRA using Technology Readiness and Risks Assessment Worksheet (RD-8) and Critical Technology Element (CTE) Identification Criteria Worksheet (RD-10).

The NeMO SAR Development Plan shall include a cost estimate by sub-systems and project phases to deliver a complete payload to NASA by September 2021 as well as estimates for data processing and payload operations.

The NeMO SAR Development Plan may include options allowing to reduce the technical and schedule risk by procuring some of the sub-systems outside Canada.

A draft of the NeMO SAR Development Plan must be available 2 weeks prior to the Interim Review Meeting #2 to give the opportunity to CSA to review the proposed plan and provide feedback.

3.3.4 NeMO SAR Science Plan

The NeMO SAR Science Plan shall describe science team activities for the Mission lifecycle Phase A-E.

It shall include science support activities for instrument development and the proposed science investigations.

- The precise nature of instrument science support activities will be determined by the distribution of expertise in the science and industry teams but is anticipated to include mission requirements development, instrument performance modelling, calibration, characterization, validation, data product development and archiving, and science operations planning.
- Science investigations include science development in preparation for data analysis, data analysis and science dissemination activities.
- It should be assumed in costing that the instrument science support funding mechanism is contracts and the science investigation funding mechanism is science team grants.

The NeMO SAR Science plan should also include a description of the main development path for science activities, including the need for access to breadboard, EM and/or FM instruments for characterization and validation.

It should include the proposed Canadian science capabilities development strategy with recommendations for academic development activities.

A draft of the Science Plan must be available 2 weeks prior to the NeMO SAR Concept Review.

3.3.5 Optional Work Packages

After the IRM2, CSA will perform a first feasibility assessment with the latest information on the development schedule and available funding at CSA and NASA.

CSA will also conduct discussion with other potential partners that could provide some of the sub-systems identified in the NeMO SAR Development Plan.

Depending on the assessment, CSA may require the contractor to perform three additional work packages. The first work package is to update and expand some sections of the NeMO SAR Development Plan to produce the key documents for a NeMO SAR Requirements Review. The second set of activities is to investigate the applicability of the radar sounder for Earth Observation. The third option is a Science Maturation Study. The optional activities are described in the following sub-sections.

The optional activities may be executed in parallel or in sequence.

3.3.5.1 NeMO SAR Requirements Development

The objective of this work package is to produce the key deliverables and information required to meet the exit criteria of a Mission Requirements Review [RD-2] but tailored to the context of an hosted SAR payload on NeMO.

The CSA will inform the Contractor that they can proceed with work package and provide information on updated schedule, preferred options for the development, main approval milestones in Canada and US and a target for the lifecycle cost. CSA will also proceed with the appointment of the Principal Investigator (PI).

The PI must hold at least one meeting with the core science team to discuss the results of the NeMO SAR Concept Review, the feedback received from CSA and agree on the main mission objectives.

Starting from the section provided in the initial NeMO SAR Conceptual Design Document, the PI must prepare the NeMO SAR Mission Objectives Document, providing the fundamental reasons to develop a project and contribute to the overall mission. The NeMO SAR Mission Objectives Document must be prepared according to DID-0100. The PI shall include draft science requirements and show how these trace to Mission Objectives and anticipated data products. The science requirements section should clearly identify threshold (minimum), nominal and augmented (goals) science requirements.

The Contractor must develop the initial list of NeMO SAR Payload System Requirements. The list must provide a set of requirements defining a hosted payload mission on NeMO. Each requirement in the list must be traceable to a mission objective or if it cannot be traced directly, justified with respect to mission constraints, CSA objectives, regulations, etc. The list must be provided in Excel Format and sent to the Technical Authority for comments. A dedicated Technical Interchange Meeting shall be held to discuss the requirements list and provide feedback to the PI for reviewing and updating the NeMO SAR Mission Objectives.

The Contractor must take into account the feedback provided by CSA and the core science team and update the NeMO SAR concept and NeMO SAR development plan

The list of requirements and updated mission planning and development activities (including a revised cost estimate) shall be presented at the NeMO SAR Requirement Review. Activities leading to the NeMO SAR Requirements Review shall be completed within 4 months.

3.3.5.2 Earth Observation Applications

In parallel to the work on the NeMO radar, CSA will contact scientists active in the area of permafrost studies to define requirements for permafrost mapping relating to climate change. CSA will provide a list of requirements for permafrost mapping similar to NeMO SAR but targeted at the delineation and characterization of Active Layer Thickness. It is foreseen that the requirements will be more demanding and some of the system parameters may be limited by radio-frequency regulations.

The initial requirements will be made available to the Contractor about one month before the Final Review of the NeMO sub-surface mapping.

The Contractor shall produce a first assessment of the NeMO SAR payload for EO application and what are the modifications to the concept payload could be proposed for permafrost application.

If the assessment is deemed positive, CSA will exercise an option to initiate an activity to repeat the tasks described in Section 3.3.1. To execute the task, CSA may provide info on a representative bus for the accommodation analysis.

The work shall be done in two steps. The contractor shall first rework the payload and accommodation concept and present it at a Technical Interchange Meeting. Based on feedback received from CSA, the contractor shall update the concept and present it at the Final Review for the optional work.

3.3.5.3 Science Maturation Study

Upon CSA's acceptance of the Preliminary Science Plan, an additional Task Authorization could be issued to the Contractors to advance the maturity of selected topics and challenging aspects, as well as to support further planning with the NASA partners. Specific activities will be defined prior to issuing the Task Authorization, with some anticipated subjects described below.

The PI will update the NeMO SAR NeMO SAR Mission Objectives Document, mission success criteria clearly identifying threshold (minimum), nominal, and augmented (stretch goal) science objectives, associated Measures of Effectiveness (MOE), and Technical Performance Measures (TPMs). These science objectives, MOEs, and TPMs must consider anticipated NeMO SAR data products.

The PI and science team will conduct the necessary work to develop confidence in the science objectives and derived science requirements values and proposed verification and validation approach to the extent required to fully assess any impact on cost, schedule and risks.

The PI and science team will also further describe the data products to be developed including those that will be delivered for archive, and those that may be developed as research products for use by the NeMO science team.

The PI and science team shall correspondingly update the NeMO SAR Science Plan with results of the Science Maturation Study, including updated costing.

At least one technical meeting will be held with the Contractor, who must provide feedback to the PI and CSA Technical Authority on the status of trades on requirements values and impacts of meeting augmented science requirements.

The PI should also plan to participate in at least one NeMO science definition team meeting which may be organized by NASA in either the Washington DC or the Los Angeles area, and to present study results at one or more science conferences as agreed with Technical Authority.

3.4 DELIVERABLES

The deliverables for the activity are listed in Table 3.4-1.

Table 3.4-1 Deliverables

Reports and Documents	Due Date
Payload Analysis and Trade-off Document	Payload Trade-off Review Meeting – 2 weeks
NeMO SAR Conceptual Design Document	NeMO SAR Concept Review Meeting – 2 weeks (draft) Final Review – 2 weeks (final)
NeMO SAR Development Plan	Interim Review Meeting #2 – 2 weeks (draft) Final Review – 2 weeks (final)
NeMO SAR Science Plan	NeMO SAR Concept Review Meeting – 2 weeks (draft) Final Review – 2 weeks (final)
Minutes/ Presentations	
Kick-off Meeting Presentation	Meeting Date – 1 week
Payload Analysis and Trade-off Review Presentation	Meeting Date – 1 week
NeMO SAR Concept Review Presentation	Meeting Date – 1 week
Final Review Presentation	Meeting Date – 2 week
Minutes of Meetings	Meeting Date + 1 week
Action Item Log for Reviews and Teleconference	Meeting Date + 1 day
Final Data Package	
Final Version of all documents	2 weeks before Contract End Date
Executive Report	
BIP and FIP Disclosure Report	
Technical Notes	As required.
Software used for performance analysis	
OPTIONAL Work Packages 3.3.5.1: Reports and Documents	
NeMO SAR Mission Objectives Document	(OA is with respect to authorization of optional work) Draft OA + 1 month; IR 2 weeks after TIM #1. Final at NeMO SAR Requirements Review
NeMO SAR Payload System Requirements List	Draft TIM #1. Final at NeMO SAR Requirements Review
Updated NeMO SAR Concept Document	NeMO SAR Requirements Review
Updated NeMO SAR Development Plan (including revised cost estimates)	NeMO SAR Requirements Review
NeMO SAR Requirements Review Presentation	Meeting – 1 week
Minutes of Meetings	Meeting Date + 1 week
Action Item Log for Reviews and Teleconference	Meeting Date + 1 day

OPTIONAL Work Packages 3.3.5.2: Reports and Documents	(OA is with respect to authorization of optional work)
Payload Analysis and Trade-off Document for a sub-surface sounder for EO applications	Draft TIM #1 Final at EO Payload Trade-off Review Meeting
EO Payload Trade-off Review Meeting Presentation	Meeting – 1 week
Minutes of Meetings	Meeting Date + 1 week
Action Item Log for Reviews and Teleconference	Meeting Date + 1 day
OPTIONAL Work Packages 3.3.5.3: Reports and Documents	
Deliverable(s) to be defined as part of the task authorization	

3.5 SCHEDULE

The work described in this SOW must be completed within 6 months. An additional 4-month period is allowed for the optional 3.3.5.1 and/or 4-month period for work package 3.3.4.2 . The optional activities may be executed in parallel or in sequence.

3.6 MEETINGS

Table 3.6-1 lists the meetings planned for this activity.

TABLE 3.6-1 MEETINGS

Meeting	Date	Location
Kick-off Meeting	CA + 2 weeks	Contractor or Teleconference
Payload Trade-off Review Meeting	CA+ 2 months	CSA
Interim Review Meeting #1	CA + 3 months	Teleconference
NeMO SAR Concept Review Meeting	CA + 4 months	CSA
Interim Review Meeting #2	CA + 5 months	Teleconference
Final Review Meeting	CA + 6 months	CSA
OPTIONAL Meetings WP 3.3.5.1		
TIM #1	OA + 2 months	Teleconference
NeMO SAR Requirements Review	OA + 4 months	CSA
OPTIONAL Meetings WP 3.3.5.2		
TIM #1	OA + 2 months	Teleconference
EO Payload Trade-off Review Meeting	OA + 4 month	CSA
OPTIONAL Meetings WP 3.3.5.3		
Meetings to be defined in the task authorization.		

3.7 DOCUMENTATION AND NAMING CONVENTION

Documentation, reporting and other deliverables must be according to instructions provided in Appendix B of this SOW, which also provides naming convention. Presentation material must be in Power Point format. Documents provided in Adobe PDF format must not be protected against copy of text and figures.

Documents shall be delivered in the original software application format. One electronic copy of each deliverable document shall be transferred to the CSA to the address and in the format specified in DID-0000, Appendix B. No paper copy is to be delivered.

All simulation scenarios that have been considered (e.g. with STK) must be delivered in CD-ROM or DVD-ROM format.

All documents must be provided 10 working days prior to the specified Review/Meeting unless otherwise indicated.

3.8 PROJECT MANAGEMENT REQUIREMENTS

The Contractor is responsible for establishing and maintaining a project management control system necessary to meet the requirements provided in the next sub-sections.

3.8.1 Team Organization

The Contractor must set up and maintain a project organization specific to this project. The Contractor must provide and maintain a current Project Organizational Chart showing personnel assignments by name and function, and showing subcontractor-reporting relationships.

The Contractor must nominate a Project Manager, who will be responsible for all aspects of the work carried out by the Contractor and will act as single point of contact within its project organization for communications between the Contractor and the Technical Authority (TA). In the absence of the single point of contact, the Contractor must designate an alternate to maintain continuity of communication between the Contractor and the TA.

The Contractor must also identify other key personnel who are considered essential to the performance of the contract. Requirements for the Science Team are provided separately in the next section. The Contractor must assign personnel with appropriate qualifications and experience to all posts within the project organization.

The Contractor must include, within its program management structure, the necessary leadership to effectively manage the performance of subcontractors in keeping with the project objectives.

3.8.2 Science Team

The Contractor shall identify one or more candidates for the role of Principal Investigators (PI) at the proposal stage. The final selection must be approved by CSA's Program Authority.

The PI shall be a faculty member at a recognized Canadian university and should demonstrate research excellence in planetary science, significant experience in radar, previous experience in space missions, and team management capabilities. In addition, personal suitability for the PI role includes evidence of community building and ability to communicate science to the public.

The PI must assemble a core science team. The core science team shall include at least 4 additional scientists from Canadian universities. Scientists from non-CSA Canadian Government

Departments and industry, and international participants may be included. A CSA Mission Scientist will be appointed.

It is desired that the science team engages experts in terrestrial ice and SAR applications, as well as planetary scientists.

Each member of the science team must have a clearly defined role.

NASA has not yet defined its model for science team participation in NeMO: should the Canadian SAR contribution to NeMO go ahead, future Canadian science team involvement in NeMO will be subject to a selection mechanism agreed by CSA and NASA.

3.8.3 Communications and Access

The Contractor must establish and maintain a close management and technical interface with CSA technical and project authorities to assure a coordinated program effort and monitoring of the total program cost, schedule and performance.

The Contractor must provide access to its plant and personnel, at mutually agreeable dates, by representatives of CSA or other organizations nominated by the CSA, for review of program status.

The Contractor must provide temporary accommodation and other facilities for the use of the CSA representatives (and the nominated attendees) visiting the Contractor's premises for reviews, meetings, audits, liaison, etc.

The accommodation must be adequate for the purposes of the visit and the facilities provided must include telephone, faxing, photocopying and Internet access.

All documentation and data generated by the Contractor for the project must be accessible to the TA for review.

3.8.4 Project Meetings

The Contractor must hold the meetings described in section 3.6. Some or all of these meetings may be attended by representatives of the CSA, and/or other organizations nominated by the CSA. Canada reserves the right to invite additional knowledgeable people (Public Servants or others under NDA) to this meetings.

All meetings will be held between the Contractor and the TA at a mutually agreeable time. The Contractor must provide formal notification of the proposed meeting date to the TA no less than 10 working days before the meeting (with the exception of the KoM where the Contractor must provide formal notification no less than 5 working days before the meeting).

For meetings held at government venues, the Contractor must inform the TA of the names of Contractor and Subcontractor attendees no less than 10 working days before each meeting.

Additional teleconferences and face-to-face review meetings may be held if necessary when mutually agreed to by the Contractor and the CSA project manager.

Meetings can be alternatively replaced by videoconference or teleconferences for cost and/or time savings and when appropriate to support the scope of the meeting.

3.8.4.1 Kick-off Meeting

Within two weeks of the contract award (or at a date mutually agreeable to by the PA, the SA and the Contractor) a Kick-Off Meeting should be scheduled by the Contractor. The Contractor should provide the meeting agenda at least five working days before the meeting. The presentation should include the following content:

- Review of contract deliverables;
- Work requirements;
- Foreground Intellectual Property (FIP) and Background Intellectual Property (BIP);
- Licensing issues if any;
- Project's funding and expected cash-flow;
- Presentation to include the required copyrights and intellectual property disclosure;
- Other items as deemed appropriate.

This meeting will be held at Contractor Facilities or via teleconference.

All key participants under the contract, including at least one representative from each subcontractor, must attend this meeting.

3.8.4.2 Review Meetings (Payload Trade-off Review, Interim Reviews, NeMO SARConcept Review, NeMO SAR Requirements Review)

During the contract, various meetings will be necessary to evaluate progress of the work. The Meetings will be held according to the schedule in Table 3.6-1. The Meetings are intended to provide an opportunity for the Contractor, the PA, the SA, and other invited attendees to review and discuss the following in detail, as necessary:

- The contents of the contract deliverables;
- The technical work of each task;
- Foreground Intellectual Property (FIP) and Background Intellectual Property (BIP);
- Discuss project management issues;
- Presentation to include the required copyrights and intellectual property disclosure;
- Other items as deemed appropriate.

The Contractor's project manager, the systems engineer and all key Contractor participants, including at least one representative from each Subcontractor, must attend all Review meetings.

3.8.4.3 Final Review Meeting

The Final Review Meeting will be held at the Canadian Space Agency at the end of the contract. The specific intent of this meeting will be to discuss in detail the results obtained and the proposed follow-on activities. The Final Review Meeting is intended to provide an opportunity for the Contractor, the PA, the SA and other invited attendees to review and discuss the project.

- Contract deliverables;
- Foreground Intellectual Property (FIP) and Background Intellectual Property (BIP);

- Licensing issues if any;
- Final Funding and cash-flow;
- Discuss project management issues;
- Presentation to include the required copyrights and intellectual property disclosure;
- Other items as deemed appropriate

The Contractor must submit the Final Data Package 10 working days before Contract End Date; document versions must be as per the CDRL.

The Contractor's project manager, the systems engineer and all key Contractor participants, including at least one representative from each Subcontractor, must attend Final Review Meeting.

3.8.5 *Agendas, Minutes and Action Item Log*

The Contractor must provide a Meeting Agenda for all reviews and meetings including teleconferences and must deliver these to the TA no less than 5 working days before the meeting and must have it approved by the TA.

The Contractor must produce the minutes for all reviews and meetings including teleconferences and must deliver these to CSA no more than 5 working days after the meeting.

The Contractor must maintain a detailed Action Item Log (AIL) throughout the project to track actions resulting from all reviews and meetings including teleconferences using the following red-yellow-green stoplight method:

- 'Green' implying that the action item will be completed on-time.
- 'Yellow' implying that there exist an issue which will prevent meeting the deadline, and
- 'Red' implying that the action is past due.

Also, a chart indicating how many action items are open and how many are closed since the beginning of the project shall be produced at the meetings. The AIL must be delivered the next business day following the review or meeting (including teleconference).

3.8.6 *Project Reporting*

3.8.7 *Documents Deliverables*

The Contractor must deliver all documentation listed in the CDRL tables (Appendix A) as a minimum. The format and content of the deliverables must be in accordance with the requirements specified in the Data Item Descriptions (DIDs) (Appendix B), both the specific DID identified in the CDRL and the General Preparation Instructions, DID-0000.

Except for the documents that will remain CSA documents, the Contractor may propose documents in a contractor's format provided the purpose, scope and content equal or exceed the DID requirements. Subject to CSA approval, the content of the Contractor's document will replace the content of the document specified in the DID.

SI units must be used/supplied by the Contractor. Conversion factors must be supplied for all non-SI units used in the deliverable documents (including dates as YYYY-MM-DD).

The Contractor must obtain approval from the CSA for all CDRL Documents so indicated in the CDRL table (see Section 3.8.7.1).

3.8.7.1 Documents Delivered for Approval

The term “Approval” as used in this document and in other documents referred to herein, means written approval by CSA, of documents submitted by the Contractor. Once approved, the document is authorized for further use by CSA. The TA does not take responsibility for the validity of the data, or statements, and the Contractor is fully responsible for the content and secondary effects derived there from. The document may not be changed without the TA’s approval. No request or document for which approval is required must be acted upon or implemented by the Contractor until such approval is provided. Such requests and documents will be reviewed promptly by the TA and the necessary written approval or disapproval will be provided after their receipt by CSA. In the event of a failure by the TA to approve or disapprove the document within 15 calendar days, the documents may be deemed approved. In the event that a request or document is disapproved, the TA will advise the Contractor in writing as to the reasons for such disapproval and will define the additions, deletions or corrections that the TA deems necessary to render the request or document acceptable. Disapproved requests or documents that are subsequently amended by the Contractor and resubmitted for approval will be either approved or disapproved by the CSA.

3.8.7.2 Documents Delivered for Review

The term “Review” as used in this document and in all other documents referred to herein, means, unless specifically stated otherwise, a CSA review of the documents submitted for that purpose by the Contractor. The acceptance by the TA of a document for review shall imply that the document has been reviewed, commented on, revised as necessary, and has been determined to meet the requirements. The TA does not take responsibility for the validity of the data, or statements, and the Contractor is fully responsible for the content and secondary effects derived there from. In the event that the TA does not concur with a document submitted for review, the TA will so notify the Contractor. Such notification will include a full explanation of the reasons for the lack of concurrence and will recommend the additions, deletions or corrections that the TA deems beneficial to the needs of the project.

The Contractor is obligated to consider implementation of the changes suggested by CSA insofar as the changes are in accordance with the relevant DID in Appendix D and this SOW. If written notification of concurrence is not provided by CSA within 15 calendar days of the receipt of the document, the document will be deemed to have been reviewed by the TA without comment.

3.8.8 Subcontract Management

The Contractor must be fully responsible for implementation and execution of all tasks, including those subcontracted to others. Whenever this is the case, the Contractor must prepare and maintain subcontract Statements of Work, technical requirements documents, etc., necessary to effectively manage the subcontractors’ work. At the request of the TA, copies of subcontractor documentation must be delivered to the TA.

The Contractor must ensure that all of the relevant requirements of this Statement of Work are flowed down to the subcontract Statements of Work.

3.8.9 Product Assurance

There are no applicable product assurance requirements in this study.

3.9 INTELLECTUAL PROPERTY

The Contractor shall prepare Background and Foreground Intellectual Property (BIP and FIP) Report, identifying the BIP and FIP that will be generated in this study.

4 GOVERNMENT FURNISHED EQUIPMENT AND INFORMATION

No GFE.

APPENDICES



APPENDIX A CONTRACT DATA REQUIREMENTS LIST (CDRL)

This Appendix defines the documentation to be delivered by the Contractor.

LEGEND:

A = Approval (in the Approval Category)

CF = Contractor's format

X = Ad-hoc, as and when requested

TABLE A-1: CDRL

Title	DID No.	Approval Category
Meeting Agenda	0004	A
Minutes of Meetings	0005	A
Action Items Log (AIL)	0006	A
NeMO SAR Mission Objectives Document	0100	A
Payload Analysis and Trade-off Document	0200	A
NeMO SAR Conceptual Design Document	0210	A
NeMO SAR Development Plan	0220	A
NeMO SAR Science Plan	0230	A
NeMO SAR Payload System Requirements List	CF	A
BIP and FIP Disclosure Report	0240	A
Executive Report	0250	A
Technical Notes	CF	X

APPENDIX B DATA ITEMS DESCRIPTIONS (DIDs)

DID-0000 - GENERAL PREPARATION INSTRUCTIONS	33
DID-0004 – MEETING AGENDA	39
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DID-0220 – NEMO SAR DEVELOPMENT PLAN	44
DID-0230 – NEMO SAR SCIENCE PLAN	45
DID-0240 – FIP AND BIP DISCLOSURE REPORT	46
DID-0250 – EXECUTIVE REPORT	47
DID-0100 – NEMO SAR MISSION OBJECTIVES/SCIENCE REQUIREMENTS DOCUMENT	48

DID-0000 - General Preparation Instructions

PURPOSE:

This DID describes the standard format for the preparation of deliverable project documentation. All documentation must be written in English and must be delivered in electronic format. Documentation must be prepared in the Contractor's format, however it must meet the requirements of this DID.

PREPARATION INSTRUCTIONS:

1. GENERAL INSTRUCTIONS

1.1. Electronic Copies

Electronic documents must be prepared using the most appropriate tool (Microsoft Word, Excel, MS Project, etc.); released versions must be delivered in electronic format. Documents whose native format is not a common office program must be delivered in PDF (without security or pwd protection) in addition to the native format. . Schedules must be submitted in Microsoft Project format. Documents must be delivered via e-mail or direct transfer (FTP). For direct transfer, a notification of the document's readiness and location on a Contractor repository must be sent.

The electronic file name and the identification number written on the document itself must have the following format:

CDRL-NUM CIE Document Title (WXYZ) revA_sent2013-12-31 where:

CDRL-NUM:	The CDRL Identifier, for example: PM-100;
CIE:	Name of the Company originating the document (no space, no hyphen), for example: NDG;
Document Title:	Document title, for example: CAMS Optical Design Document;
(WXYZ)	Contractor's document number, in brackets, this is optional;
revA_sent 2013-12-31:	Revision number and Date Tracking Number with "sent" or "appd". For the initial release the contractor can use "rev0", "revNC", or "revIR".

Note the absence of underscores or hyphens, except at CDRL and dates. Failure to observe the filenaming convention will be cause for rejection of the deliverable and incur delays in the payment of the claim.

Electronic documents or notifications of their availability on Contractor repositories must be sent to the Project Manager.

Emails are to contain the project/program acronym or equivalent identifier in the "Subject" line and include the CDRL identifier under which deliverable documents are being submitted. Hard copy and media deliverables are to be addressed to:

Attention: (name of Project Manager)

Canadian Space Agency
 6767, Route de l'Aéroport
 Longueuil, QC, J3Y 8Y9
 CANADA

The optical storage device (CD, DVD, blu-ray) label must present the following information:

- a) Company Name
- b) Document Title
- c) Document Number and Revision Status
- d) CDRL Number
- e) Contract Number

1.2. Metadata on deliverables

In order for CSA to be able to properly managed deliverables and the configuration as well as to process Contractor's deliverables in an efficient manner, the Contractor shall, for each deliverable, provide the metadata as described in the following table.

Table B-1: Metadata Required

Provided by Supplier	Metadata Description	Comments
Yes	CSA Project Identifier	Project Acronym
Yes	Contract Identifier	PWGSC identifier
Yes	Contract Revision Identifier	PWGSC identifier
Yes	SOW Identifier	CSA Doc ID
Yes	SOW Revision Identifier	CSA Doc Revision ID
Yes	Document Type	Dwg, Doc, RFD, RFW, ECR, ECN, IP CR, IP CN/CD, QN, etc.
Yes	CDRL Identifier	Per CSA SOW (e.g. EN-006)
Yes	CDRL Sub-category Identifier	If multiple, separate subject documents per CDRL item (e.g. EN-006.03) (can be contractor defined)
Yes	Deliverable submission format	Electronic, Hard copy, On media (CD-ROM, etc.)
Yes	Deliverable Transmittal Identifier	e.g. CADM09-0123. Can also be a notification of delivery identifier
Yes	Deliverable Transmittal Date	
Yes	Originator's Organization Identifier	CAGE code, company name, short name, etc.
Yes	Deliverable Type	Dwg, Doc, RFD, RFW, ECR, ECN, NCR, Problem Report, IP CR, IP CN/CD, QN, etc.
Yes	Document Type	Specification, Design, Plan, Tech Note, Report, etc.
Yes	Originator's Document Identifier	

When applicable	Originator's Document Volume Identifier	
When applicable	Originator's Document Part Identifier	
When applicable	Originator's Document Issue Identifier	When both Issue and Revision are used concurrently to identify released documents
Yes	Originator's Document Revision Identifier	
Yes	Originator's Document Title	
Yes	Document Release Date	
Yes	Document Effective Date	Applicable to document changes, deviations, waivers,
Yes	Document Expiry Date	If applicable
When applicable	Originator's Authorizing ECN Identifier	Class 2 ECN approving document release and submission to customer
Yes	Document Maturity	Draft, Preliminary, Initial Release, Updated Revision, etc.
When applicable	Class	If deliverable is a change, deviation, waiver, etc. to a released item. (Class I, Class II)
Yes	Security Classification of Deliverable	Per Government of Canada definitions for Classified and Protected data (C,S,TS,PA,PB,PC)
Yes	Sensitivity of Document contents	Company Proprietary, Trade Secret, etc.
Yes	ITAR Content Indicator	Yes or No
Yes	Export Controlled Content Indicator	Yes or No
Yes	Affected Document Identifier	If deliverable is a change, deviation, waiver, etc. to a released document/drawing/model. Enables change-to-document, waiver-to-document relationships, etc.
Yes	Affected Document Revision Identifier	As above
Yes	Affected Document Title	As above
Yes	Product Breakdown Structure / Item Hierarchy Identifier	Critical for Item-to-Document Relationship
Yes	Associated Project/System Milestone Review	PDR, CDR, etc. When Reviews are at sub-system level, identify accordingly. e.g. Bus PDR
When applicable	Associated System Baseline	If different from Project Milestone
Yes	Filename of Deliverable	Filename and file type (for all representations submitted - .doc, .pdf, etc.). Original, revisable format to be delivered before contract completion.
Yes	Format of Deliverable / Application used to produce	MS WORD 2007, Project Scheduler 9, etc.
When applicable	Filename of Parent Deliverable Bundle	If part of a document Bill of Material
When applicable	Identification of Delivery Media	If physically delivered
When applicable	Originator's Repository Address of deliverable	To identify source location of document

1.3. Electronic Documents Format

Electronic copies of text documents must be formatted for printing on 8.5" x 11" paper.

1.3.1. Page Numbering

General format of documents should include page numbers and be formatted according to the Contractor's normal standard. If the document is divided into volumes, each such volume must restart the page numbering sequence.

1.3.2. Document Numbers

All pages must contain the Document Number at the top of the page. Document Numbers must include revision status and volume identification as applicable.

1.4. Updated Documents

When documents are sent to the CSA and are under a revision status, then they must be sent in tracking mode. In other words, the sidebars must appear in the revised document.

2. DOCUMENT STRUCTURE AND CONTENT

2.1. Overall

Except as otherwise specified, all documents must have the overall structure as follows:

- a) Cover/Title Page;
- b) Table of Contents;
- c) Scope;
- d) Applicable and Reference Documents;
- e) Body of Document; and
- f) Appendices
- g) The following property notice of all internal pages: *Use, duplication or disclosure of this document or any of the information contained herein is subject to the Proprietary Notice at the front of this document.*

2.2. Cover/Title Page

The title page must contain the following information:

- Document Number and date: Volume x of y (if multivolume)
- Rev. indicator / date of Rev.
- Document Title
- Project Name
- Contract No.
- CDRL Item No. or Nos., if one document responds to more than one CDRL, subject to prior approval from the TA.
- Prepared for: Canadian Space Agency

- Prepared by: Contractor name, CAGE Code, address, and phone number
- Product tree identifier, if applicable
- © HER MAJESTY THE QUEEN IN RIGHT OF CANADA [YEAR]
- The following proprietary notice: *This document is a deliverable under contract no. _____. It contains information proprietary to the Crown, or to a third party to which the Crown may have legal obligation to protect such information from unauthorized disclosure, use or duplication. Any disclosure, use or duplication of this document or of any of the information contained herein for other than the specific purpose for which it was disclosed is expressly prohibited outside the Government of Canada except as the Crown may otherwise agree to in writing.*

2.3. Table of Contents

The table of contents must list the title and page number of each titled paragraph and subparagraph, at least down to the third level inclusive. The table of contents must then list the title and page number of each figure, table, and appendix, in that order.

2.4. Scope

This section must be identified as section 1 and must, as a minimum, provide the following information:

- a) Identification (number, title) of the system, hardware, or software to which the document applies;
- b) A brief overview of the system to which the document applies; and
- c) A summary of the purpose and content of the document.

The requirements specified in the following DIDs are the minimum expected. The Contractor must include in all documents all additional information required in order to ensure that the document provided will achieve its purpose as stated in the DID.

2.5. Applicable and Reference Documents

This section must list by Document Number and title, all applicable and reference documents. This section must also identify the source of all applicable and reference documents and the revision indicator.

2.6. Body of Document

The body of the document must be prepared in accordance with the content and format requirements defined in the specific Data Item Description.

2.7. Appendices

Appendices may be used to provide information published separately for convenience of document maintenance.

3. DOCUMENT REVISIONS

Changes in revised documents must be identified by a sidebar.

4. SUBMISSION OF DATA

Data must be submitted via Letter of Transmittal (or an electronic equivalent as mutually agreed by the TA and the Contractor), and acknowledged. The Letter of Transmittal will contain as a minimum, the Contract Serial Number, the CDRL Number and the Title. The Letter of Transmittal must be forwarded by the Contractor in two copies; one copy of acknowledgement to be signed and returned to the Contractor by the recipient.

DID-0004 – Meeting Agenda

PURPOSE:

To clarify the purpose, content and timings of a meeting.

PREPARATION INSTRUCTIONS:

The meeting agendas must contain the following information, as a minimum.

1) DOCUMENT HEADER:

- a) Title;
- b) Type of meeting;
- c) Project title, project number, and contract number;
- d) Date, time, and place;
- e) Chairperson; and
- f) Expected duration.

2) DOCUMENT BODY:

- a) Introduction;
- b) Opening Remarks: CSA;
- c) Opening Remarks: Contractor;
- d) Review of previous minutes and all open action items;
- e) Project technical issues;
- f) Project management issues;
- g) Other topics;
- h) Review of any action items as a result of the current meeting and
- i) Set or confirm dates of future meetings.

DID-0005 – Minutes of Meetings

PURPOSE:

The minutes of reviews or meetings provide a record of decisions and agreements reached during reviews/meetings.

PREPARATION INSTRUCTIONS:

Minutes of meeting must be prepared for each formal review or meeting and must include the following information, as a minimum:

- 1) Title page containing the following:
 - a) Title, type of meeting and date,
 - b) Project title, project number, and contract number,
 - c) Space for signatures of the designated representatives of the Contractor and the CSA,
 - d) Name and address of the Contractor;
- 2) Purpose and objective of the meeting;
- 3) Location;
- 4) Agenda;
- 5) Summary of the discussions, assumptions, decisions and agreements reached;
- 6) List of the attendees by name, position, phone numbers and e-mail addresses as appropriate;
- 7) Listing of open action items and responsibility for each action to be implemented as a result of the review;
- 8) Other data and information as mutually agreed; and
- 9) The minutes must include the following statement:

“All parties involved in contractual obligations concerning the project acknowledge that minutes of a review/meeting do not modify, subtract from, or add to the obligations of the parties, as defined in the contract.”

The list of action items must include the following information:

- 1) the action item number;
- 2) a description of the action required;
- 3) the date the action item was opened;
- 4) the person responsible for ensuring that the action is carried out;
- 5) the due date for the action;
- 6) the status of the action (open or closed); and
- 7) any comments or remarks relevant to the action.

Once an action item is closed, the action item list should also indicate the date the action was complete.

DID-0006 – Action Items Log

PURPOSE:

The Action Item Log (AIL) lists, in chronological order, all items on which some action is required, allows tracking of the action, and in the end provides a permanent record of those Action Items (AI).

PREPARATION INSTRUCTIONS:

The AIL must be in a tabular form, with the following headings in this order:

- 1) Item Number;
- 2) Red, yellow, green stoplight
- 3) Item Title;
- 4) Open Date;
- 5) Source of AI (e.g. MCR meeting, RID, etc.);
- 6) Originator;
- 7) Office of Prime Interest;
- 8) Person responsible (for taking action);
- 9) Target/Actual Date of Resolution;
- 10) Status (Open or Closed);
- 11) Remarks; and
- 12) Chart of graphical representation of open, closed, and total action items.

The date in column 9 will be the target date as long as the item is open, and the actual date once the item is closed.

DID-0200 – Payload Analysis and Trade-off

PURPOSE:

To identify payload options to meet observation requirements, perform trade-off on those options and identify promising options.

PREPARATION INSTRUCTIONS:

The document must include as a minimum:

- 1) An introduction including the scope, the purpose and a list of assumptions (if any);
- 2) A summary of the mission objectives;
- 3) Description of available techniques to meet the observation requirements;
- 4) Description of the retrieval algorithms and performance model used for the analysis;
- 5) Description of basic system parameters (frequency(ies), power, bandwidth, antenna size, antennas scan, mass, polarization, duty cycle, etc.) for each possible payload;
- 6) Details of the trade-off analysis and resulting feasible payload options;
- 7) Comparative analyses of all candidates payload options with respect to feasibility/complexity and compliance to measurement objectives;
- 8) Summary of findings.

DID-0210 – NeMO SAR Conceptual Design Document

PURPOSE:

To develop a mission concept to meet observation requirements in the context of an hosted payload.

PREPARATION INSTRUCTIONS:

The document must include as a minimum:

- 1) An introduction including the scope, the purpose and a list of assumptions (if any);
- 2) Mission Objectives;
- 3) Payload Description;
- 4) Payload Accommodation on Spacecraft;
- 5) Coverage Analysis (including orbit description);
- 6) Payload Main Engineering Budgets, including as a minimum but not limited to: mass, power, data rates, on-board storage;
- 7) Interface with Spacecraft (including need for manoeuvres);
- 8) Payload Operations Concept;
- 9) Data Processing;
- 10) Calibration and Validation;
- 11) Compliance to observation requirements.

DID-0220 – NeMO SAR Development Plan

PURPOSE:

To define the programmatic activities required to initiate and develop the mission.

PREPARATION INSTRUCTIONS:

The plan must include the following:

- 1) An introduction including the scope, the purpose and a list of assumptions (if any);
- 2) A description of the mission including its science objectives;
- 3) Technology Readiness and Risk Assessment (TRRA);
- 4) Technology development activities to be performed, detailing the urgency, criticality and the main risks and challenges of each activity;
- 5) Possible technology demonstrations;
- 6) Assessment of the heritage sub-systems for the current project;
- 7) Estimated NeMO SAR life cycle cost including science team costs from the Science Plan and basis of estimate;
- 8) Estimated NeMO SAR schedule including all major milestones including basis of estimate;
- 9) Preliminary NeMO SAR risk assessment (Technical, Cost, Schedule and Safety Risk) with risk mitigation plan;
- 10) Preliminary concept of operation;
- 11) Potential collaborations;
- 12) Proposed Canadian industrial capabilities development strategy;
- 13) Recommendations for follow-on technology development activities;
- 14) Preliminary prototyping approach;
- 15) Consideration for the Verification and Validation Plan, Integration Plan, and Integrated Logistic Support Plan that might impact the project cost and schedule.

DID-0230 – NeMO SAR Science Plan

PURPOSE:

To define science team instrument support and science investigation activities for Phase A-E of the mission.

PREPARATION INSTRUCTIONS:

The plan must include the following:

- 1) An introduction including the scope, the purpose and a list of assumptions (if any);
- 2) Detailed science team roles and responsibilities
- 3) Description, methodology and plan for Instrument Support Activities phase A-E
- 4) Description, methodology and plan for development of science investigations phase A-E
- 5) Science plan schedule and milestones
- 6) Science Team cost phase A-E
 - a) Assuming contracts for instrument support activities and grants for science investigation development
- 7) Potential science collaborations;
- 8) Proposed Canadian science capabilities development strategy;
- 9) Recommendations for Science Research and Capabilities Development.

DID-0240 – FIP and BIP Disclosure Report

PURPOSE:

To fully disclose all FIP and BIP resulting from the study.

PREPARATION INSTRUCTIONS:

The report shall include the following:

- an introduction including the scope and the purpose;
- a list and description of all FIP resulting from the study; and
- a list and description of all BIP required by CSA for use of the FIP resulting from the study.

DID-0250 – Executive Report

PURPOSE:

To provide a summary of the work accomplished during the contract.

PREPARATION INSTRUCTIONS:

The Executive Report will be placed in the public domain (e.g. CSA's library, publication and/or website).

The report should not exceed ten (10) pages.

The Contractor should submit an electronic copy of the Executive Report in the Final Data Package. The structure for the Executive Report is as follows:

- 1) Introduction;
- 2) Project Objectives;
- 3) Approach / Project Tasks;
- 4) Accomplishments;
- 5) Science/Technology:
 - a) Innovative Aspects;
 - b) Application Fields;
- 6) Business Potential, Benefit and Impact on the organization;
- 7) Ownership of Intellectual Property; and
- 8) Publications / References.

The CSA and the Contractor, or others designated by them, have the right to unrestricted reproduction and distribution of the Executive Report. The report should include the following proprietary notice ("Owner of FIP" being either the CSA or the Contractor):

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DID-0100 – NeMO SAR Mission Objectives/Science Requirements Document

PURPOSE:

To capture the fundamental objectives of a mission, which can be either user driven, science driven, technology driven.

PREPARATION INSTRUCTIONS:

The document must include the following:

- 1) an introduction including the scope, the purpose and a list of assumptions (if any);
- 2) a list of applicable and reference documents (if any);
- 3) a discussion of NeMO SAR needs and justification, providing current status, need for measurement, technology demonstration, etc.;
- 4) a list of observation objectives stating the fundamental reasons to conduct the project;
- 5) Science requirements;
- 6) Traceability between the NeMO SAR mission objectives and the NeMO SAR science requirements;
- 7) anticipated data products;
- 8) mission success criteria and measure of effectiveness;
- 9) core team description.

APPENDIX C ACRONYMS AND ABBREVIATIONS

AU	Astronomical Unit
AD	Applicable Document
ADCS	Attitude Determination and Control Subsystem
AI	Action Items
AIL	Action Items Log
AU	Astronomical Unit
BIP	Background Intellectual Property
CA	Contract Award
CDRL	Contract Data Requirements List
CSA	Canadian Space Agency
DID	Data Item Description
ESA	European Space Agency
FIP	Foreground Intellectual Property
GFE	Government Furnished Equipment
IP	Intellectual Property
JPL	Jet Propulsion Laboratory
KoM	Kick-off Meeting
MCR	Mission Concept Review
NASA	National Aeronautics and Space Administration
NeMO	Next Mars Orbiter
NEX-SAG	Next Orbiter Science Analysis Group
OA	Option Award
OGD	Other Government Departments
PA	Product Assurance
PI	Principal Investigator
RD	Reference Document
RT	Review Team
SAR	Synthetic Aperture Radar
SOW	Statement Of Work
TA	Technical Authority
TBC	To Be Confirmed
TBD	To Be Determined
TN	Technical Note

TRA	Technology Readiness Assessment
TRL	Technology Readiness Level
TRRA	Technology Readiness & Risk Assessment
WBS	Work Breakdown Structure