

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:
Travaux publics et Services gouvernementaux
Canada
Place Bonaventure, portail Sud-Est
800, rue de La Gauchetière Ouest
7 ième étage
Montréal
Québec
H5A 1L6
FAX pour soumissions: (514) 496-3822

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 LPRNSS CONCEPT STUDY	
Solicitation No. - N° de l'invitation 9F052-140125/A	Date 2014-08-14
Client Reference No. - N° de référence du client 9F052-14-0125	
GETS Reference No. - N° de référence de SEAG PW-\$MTB-690-12859	
File No. - N° de dossier MTB-4-37070 (690)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2014-09-18	
Time Zone Fuseau horaire Heure Avancée de l'Est HAE	
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: Paquin, Esther	Buyer Id - Id de l'acheteur mtb690
Telephone No. - N° de téléphone (514) 496-3889 ()	FAX No. - N° de FAX (514) 496-3822
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: AGENCE SPATIALE CANADIENNE 6767 ROUTE DE L AEROPORT 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

Travaux publics et Services gouvernementaux Canada
Place Bonaventure, portail Sud-Est
800, rue de La Gauchetière Ouest
7 ième étage
Montréal
Québec
H5A 1L6

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


 Public Works and Government Services Canada		Travaux publics et Services gouvernementaux Canada		N° du document9F052-140125/A		Part - Partie 1 of - de 2		
				See Part 2 for Clauses and Conditions Voir Partie 2 pour Clauses et Conditions				
Item Article	Description	Dest. Code Dest.	Inv. Code Fact.	Qty Qté	U. of I. U. de D.	Unit Price/Prix unitaire FOB/FAM Destination Plant/Usine	Delivery Req. Livraison Req.	Del. Offered Liv. offerte
1	LPRNSS CONCEPT STUDY	9F052	9F052	1	EA	\$XXXXXXXXXXXX		

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PART 1 - GENERAL INFORMATION

1. Introduction

The bid solicitation is divided into seven parts, annexes and appendices 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: includes the certifications to be provided;
- Part 6 Financial Requirements: includes specific requirement that must be addressed by bidders; and
- Part 7 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting Contract.

The Annexes include the Statement of Work, the Basis of Payment, Bid Preparation Instructions and Point Rated

Annex "A"	Statement of Work
Annex "B"	Basis of Payment
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Appendix 1 to Annex A Lunar Polar Rover Night Survival Strategy (LPRNSS)

Appendix 2 to Annex A Document Naming Conventions

2. Summary

2.1 Project Title

Lunar Polar Rover Night Survival Strategy (LPRNSS) Concept Study

2.2 Description

With this Request for Proposals (RFP), Public Works and Government Services Canada (PWGSC) plans to award one (1) contract through the Canadian Space Agency's CSA's Exploration Core (ExCore) plans to develop concepts alternative to radioactive heat source for implementation on a lunar rover, with the intention of allowing it to survive a lunar night from a lunar polar region.

2.3 Period of Contract

The contract will be from the date of issue for a period of six (6) months.

2.4 Actual Available Budget

The budget available for the contract resulting from this bid solicitation is \$300,000.00, all applicable taxes extra. Annex A and Appendix 1 to Annex A (Statement of Work and Lunar Polar Rover Night Survival Strategy (LPRNSS)) includes a description of the work required. The maximum amount of funding available for the contract will not exceed \$300,000.00, (Applicable Taxes extra, as appropriate). Bids valued in excess of this amount will be considered non-responsive. This disclosure does not commit Canada to pay the maximum funding available.

2.5 Security Requirements

No security requirements apply to this project.

This requirement is not subject to the trade agreements.

2.6 Canadian Content

The requirement is limited to Canadian goods and services.

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 of receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

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 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.

5 Conflict of Interest

The Work described herein and the deliverable items under any resulting Contract specifically exclude the development of any statement of work, evaluation criteria or any document related to a bid solicitation. The Contractor, its subcontractor(s) or any of their agent(s) directly or indirectly involved in the performance of the Work and/or in the production of the deliverables under any resulting Contract will not be precluded from bidding on any potential future bid solicitation related to the production or exploitation of any concept or prototype developed or delivered under any resulting Contract.

PART 2 - BIDDER INSTRUCTIONS

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 (2014-03-01) 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: sixty (60) days

Insert: two hundred and forty (240) days

1.1 SACC Manual Clauses

A7035T (2007-05-25), List of Proposed Subcontractors

2 Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation.

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

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 FPS, 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 FPS 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.

4 Communications-Solicitation Period

All enquiries must be submitted in writing to the Contracting Authority no later than ten (10) 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 questions or may request that the Bidder do so, so that the proprietary nature of the question is eliminated, and the enquiry can be answered with copies to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

5 Applicable Laws

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

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.

6 Maximum Funding

The maximum available funding, applicable taxes extra, as appropriate, for the contract for the purposes of this bid solicitation is indicated under the heading Actual Available Budget in Part 1, Section 2.4 - Summary. Bids valued in excess of this amount will be considered non-responsive, pursuant to Part 4-Evaluation Procedures and Basis of Selection, Section 1.2 - Financial Evaluation. This disclosure does not commit Canada to pay the maximum funding available.

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, on the following grounds:

6.4.1 the main purpose of the contract, or of the deliverables contracted for, is to generate knowledge and information for public dissemination.

PART 3 - BID PREPARATION INSTRUCTIONS

1 Bid Preparation Instructions

Canada requests that bidders follow the format instructions described below in the preparation of each bid:

- (a) Each bid must contain the following sections:

Section I: Technical Bid as well as the Executive Summary (stand-alone document): **one (1) paper copy and two (2) electronic copies on CD.**

Section II: Financial Bid **one (1) paper copy and one (1) electronic copy on CD**

Section III: Certifications **one (1) paper copy**

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

- (b) For the paper copies, each section must be bound separately;
- (c) If there is a discrepancy between the wording of the electronic copy and the paper copy, the wording of the paper copy will have priority over the wording of the electronic copy;
- (d) For the electronic copies of Section I (Technical bid as well as the Executive Summary), all of the information must be contained in one file. The only acceptable formats are: MS Word, and PDF;
- (e) For the electronic copy of Section II (Financial Bid), all of the information must be contained in one file. The only acceptable formats are: MS Word and PDF;
- (f) The electronic copy of Section II must be submitted on a separate CD than the electronic copy submitted for Section I;
- (g) Prices must appear in Section II (financial bid) only. No prices must be indicated in any other section of the bid;
- (h) The total number of pages for Section I should not exceed 60 pages (8.5 X 11 inches) (216 mm X 279 mm) paper excluding bid appendices;
- (i) The bid should use a numbering system that corresponds to the bid solicitation;
- (j) the Bidder should ensure that the cover page in their bid (Section I, II and III) includes the following table duly filled out:

Company Name	Company address
Project Title	Title of the Request of Proposal: Lunar Polar Rover Night Survival Strategy (LPRNSS) Concept Study
Project summary: (8 lines)	

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>). 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 Bid and Executive Summary

In their technical bid and executive summary, 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 and executive summary 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.

Part 4 - Evaluation Procedures and Basis of Selection contains additional instructions as well as Annex C entitled "Bid Preparation Instructions" that contains furthermore the structure and content that bidders should take into account when preparing their technical bids.

Section II: Financial Bid

1 Bidders must submit their financial bid in accordance with the following:

- (a) A firm, all inclusive lot price for the Work, not exceeding the maximum funding available, as indicated under the heading Actual Available Budget in PART 1, Section 1.2- Summary. Applicable Taxes extra, as appropriate, must be indicated separately..
- (b) Prices in bids must be quoted in Canadian dollars. Applicable Taxes extra, as appropriate, must be indicated separately.

2 When preparing their Financial bid, bidders should review the Basis of payment in Annex B and Section 4.3, Financial Evaluation, Part 4 - Evaluation Procedures and Basis of Selection.

The prices included in the proposed pricing schedule include the estimated total cost of all items included in the price breakdown set out in Section II-1

3 For each submitted financial bid, Bidder must provide a price breakdown as follows for each firm lot price indicated, in accordance with the requirements set out in Section II- 1.

- (a) Labour: For each individual and (or) labour category to be assigned to the Work, Bidder must indicate:
 - i) the hourly rate, inclusive of overhead and profit; and
 - ii) the estimated number of hours corresponding to working hours.
- (b) Equipment: Bidder must specify each item required to purchase and complete the Work and provide the pricing basis of each one, Canadian customs duty and excise taxes included, as applicable. These items will be deliverable to Canada upon completion of the contract.
- (c) Materials and Supplies: Bidder must identify each category of materials and supplies required to purchase and provide the pricing basis of each one in order to complete the Work..
- (d) Travel and Living Expenses: Bidder must Indicate the number of trips and the number of days for each trip, the cost, destination and purpose of each journey, together with the basis of these costs which must not exceed the limits of the National Joint Council Office (NJC) Travel Directive. With respect to the TB Directive, only the meal, private vehicle and incidental allowances specified in Appendices B, C and D of the Directive <http://www.njc-cnm.gc.ca/directive/travel-voyage/index-eng.php>, and the other provisions of the Directive referring to "travellers", rather than those referring to "employees", are applicable.
- (e) Subcontracts: Bidder must identify all of the proposed subcontractor and provide in the Financial bid for each one a price breakdown as contained in paragraph 3 of Part 3 of the bid solicitation.
- (f) Other Direct Charges if applicable: Bidder must identify all other direct charges anticipated, such as long distance communications and rentals, and provide the pricing basis for each.
- (g) Applicable Taxes extra, as appropriate, must be identify separately.

Solicitation No. - N° de l'invitation

9F052-140125/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb690

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

9F052-14-0125

File No. - N° du dossier

MTB-4-37070

CCC No./N° CCC - FMS No/ N° VME

Section III: Certifications

Bidders must include the certifications and the documentation related if applicable under Part.5.

Section IV Exchange Rate Fluctuation

C3011T (2010-01-11), Exchange Rate Fluctuation

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

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.

1.1 Technical and Management Evaluation

1.1.2 Point Rated Technical and Management Criteria

Point rated Technical Evaluation Criteria are described in Annex D - Point Rated Criteria. Criteria not addressed will be given a score of zero.

1.2 Financial Evaluation

1.2.1 Mandatory Financial Criteria

Bids must meet the mandatory financial criterion. Bidder must respect the maximum funding available for each contract resulting from the bid solicitation as indicated under the heading Actual Available Budget in Part 1, Section 2.4 - Summary (Applicable Taxes extra, as appropriate).

Bids that fail to meet this mandatory financial criterion will be declared non-responsive. Bids valued in excess of this amount will be considered non-responsive.

This disclosure does not commit Canada to pay the maximum funding available.

1.2.2 Evaluation of Price

The price of the bid will be evaluated in Canadian dollars, applicable taxes extra, as appropriate, FOB destination, Canadian customs duties and excise taxes included.

2 Basis of Selection

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 the mandatory financial criterion;
- (c) obtain the required minimum points specified for criterion «Relevance and Merit of the Concept» for the technical evaluation; and

-
- (d) obtain the minimum overall score of 70 points in the evaluation of rated technical and management criteria. The rating scale contains 100 points.

Bids not meeting (a) or (b) or (c) or (d) will be declared non responsive.

Responsive bids received will be classified in order of decreasing overall score. Responsive bid obtaining the greatest number of points and submitted will be recommended for a contract award, provided that the assessed total price does not exceed the maximum budget available for this requirement.

The overall score will be obtained by calculating the total of the scores for the "Technical and Management " set of criteria.

If more than one responsive bid has the same overall score, the bid with highest score for rated Criterion No. 3 (Understanding the Requirements and Technical Principles) will be recommended for a contract award.

If more than one responsive bid has the same overall score and the same score for rated Criterion No. 3 (Understanding the Requirements and Technical Principles), the responsive bid with the highest number of points for rated Criterion No.6 (Team Capability) will be recommended for a contract award.

PART 5 - CERTIFICATIONS

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

The certifications provided by bidders to Canada are subject to verification by Canada at all times. 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 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 with this request will also render the bid non-responsive or will constitute a default under the Contract.

1 Certifications Required to Precedent to Contract Award

1.1 Integrity Provisions-Associated Information

By submitting a bid, the Bidder certifies that the Bidder and its Affiliates are in compliance with the provisions as stated in Section 01 Code of Conduct and Certifications - Bid of Standard Instructions 2003. The associated information required within the Integrity Provisions will assist Canada in confirming that the certifications are true.

1.2 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](http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml)" list (http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml) available from [Human Resources and Skills Development Canada \(HRSDC\)](#) - Labour's website

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.

Canada will also have the right to terminate the Contract for default if a Contractor, or any member of the Contractor if the Contractor is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list during the period of the Contract.

The Bidder must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification found at Attachment before contract award. If the Bidder is a Joint Venture, the Bidder must provide the Contracting Authority with a completed Federal Contractors Program for Employment Equity - Certification, for each member of the Joint Venture.

1.3 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 FPS, 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 FPS 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 Additional Certifications Precedent to Contract Award

The Additional Certifications Precedent to Contract Award, should be completed and submitted with the bid but may be submitted afterwards. If any of these required certifications 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 comply with the request of the Contracting Authority and to provide the certifications within that time frame provided will render the bid non-responsive

2.1 Canadian Content Certification

This procurement is limited to Canadian goods and services.

The Bidder certifies that:

() a minimum of 80 percent of the total price of the bid consists of Canadian goods and Canadian services as defined in paragraph 5 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 (<https://content.buyandsell.gc.ca/policy-and-guidelines/supply-manual/annex/3/6>).

Canadian Content Definition

SACC Manual clause A3050T (2010-01-11) Canadian Content Definition

2.2 Status and Availability of Resources

The Bidder certifies that, should it be awarded a contract as a result of the bid solicitation, every individual proposed in its bid will be available to perform the Work as required by Canada's representatives and at the time specified in the bid solicitation or agreed to with Canada's representatives. If for reasons beyond its control, the Bidder is unable to provide the services of an individual named in its bid, the Bidder may propose a substitute with similar qualifications and experience. The Bidder must advise the Contracting Authority of the reason for the substitution and provide the name, qualifications and experience of the proposed replacement. For the purposes of this clause, only the following reasons will be considered as beyond the control of the Bidder: death, sickness, maternity and parental leave, retirement, resignation, dismissal for cause or termination of an agreement for default.

If the Bidder has proposed any individual who is not an employee of the Bidder, the Bidder certifies that it has the permission from that individual to propose his/her services in relation to the Work to be performed and to submit his/her résumé to Canada. The Bidder must, upon request from the Contracting Authority, provide a written confirmation, signed by the individual, of the permission given to the Bidder and of his/her availability.

2.3 Education and Experience

The Bidder certifies that all the information provided in the résumés and supporting material submitted with its bid, particularly the information pertaining to education, achievements, experience and work history, has been verified by the Bidder to be true and accurate. Furthermore, the Bidder warrants that every individual proposed by the Bidder for the requirement is capable of performing the Work described in the resulting contract.

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PART 6 - FINANCIAL REQUIREMENTS

1 Financial Capability

Manual SACC clause A9033T (2012-07-16) Financial Capability

PART 7 - RESULTING CONTRACT CLAUSES

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

1 Statement of Work and Requirements Documents

The Contractor must perform the Work in accordance with the Annex A- Statement of Work, Appendix 1 to Annex A -Lunar Polar Rover Night Survival Strategy (LPRNSS) and the Contractor's technical Bid entitled _____, dated _____.

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>) issued by Public Works and Government Services Canada.

2.1 General Conditions

2040 (2014-03-01), General Conditions - Research & Development, apply to and form part of the Contract.

2.2 Supplemental General Conditions

The following supplemental general conditions apply to and form part of the Contract:

4001 (2013-01-28), Hardware Purchase, Lease and Maintenance
4002 (2010-08-16), Software Development or Modification Services
4003 (2010-08-16), Licensed Software

3 Term of Contract

3.1 Period of the Contract

The Contract will be from the date of issue for a period of six (6) months.

4 Authorities

4.1 Contracting Authority

The Contracting Authority for the Contract is:

Name: Esther Paquin
Title: Supply Specialist
Public Works and Government Services Canada
Quebec Region,
7th Floor,
Place Bonaventure, South East Portal,

800 de La Gauchetiere Street West,
Montreal, Quebec, H5A 1L6
Telephone: 514-496-3889
Facsimile: 514-496-3822
E-mail address: esther.paquin@pwgsc.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.

4.2 Project Authority (*will be identified in the contract*)

The Project Authority for the Contract is:

Name: _____
Title: _____
Organization: _____
Address: _____

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

The Project Authority 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 Project Authority; however, the Project 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.

4.3 Technical Authority (*will be identified in the contract*)

The Technical Authority for the Contract is:

Name: _____
Title: _____
Organization: _____
Address: _____
Telephone: ____-____-_____
Facsimile: ____-____-_____
E-mail: _____.

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 recommendations to the Project Authority 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 capacity 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.

4.4 Contractor's Representative

The Contractor's Representative for the Contract is:

Name: _____

Title: _____

Organization: _____

Address: _____

Telephone: ____-____-____

Facsimile: ____-____-____

E-mail address: _____

5 Payment

5.1 Basis of Payment

5.1.1 Firm Lot Price

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid a firm lot price of \$_____ Customs duties are included and all applicable Taxes extra, as appropriate.

5.2 Limitation of Price

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.

5.3 Method of Payment

5.3.1 Milestone Payment- Firm Price

Canada will make milestone payments in accordance with the Schedule of Milestones detailed in Annex B - Basis of Payment and the payment provisions of the Contract if:

- (a) an accurate and complete claim for payment using form PWGSC-TPSGC 1111 (<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/1111.pdf>) 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.

5.3.1.1 Schedule of Milestones

The schedule of milestones for which payments will be made in accordance with the Contract is included in Annex B.

5.4 SACC Manual Clauses

A9117C (2007-11-30), T1204-Direct Request by Customer Department

6 Invoicing Instructions

6.1 Invoicing Instructions-Progress Claim-Firm Price

1. The Contractor must submit a claim for payment using form PWGSC-TPSGC 1111, Claim for Progress Payment. (<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/formulaires-forms-eng.html>).

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 extra, as appropriate, 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 GST/HST payable as it was claimed and payable under the previous claims for progress payments.
 3. The Contractor must prepare and certify one (1) original and two (2) copies of the claim on form PWGSC-TPSGC 1111, forward:
 - a) the original and one (1) copy to the Canadian Space Agency at the address shown on Page 1 of the contract (CSA Finance – Services Section) for appropriate certification by the Project Authority identified herein for appropriate certification after inspection and acceptance of the Work takes place;

and,

 - b) one (1) copy of the original progress claim to the Contracting Authority identified under the section entitled «Authorities» of the Contract.

4. CSA's Finance – Services Section will then forward the original and one (1) copy of the claim to the Contracting Authority for certification and onward submission to the Payment Office for the remaining certification and payment action.

5. The Contractor must not submit claims until all work identified in the claim is completed.

7 Certifications

7.1 Compliance with the certifications provided by the Contractor in its bid is a condition of the Contract and subject to verification by Canada during the term of the Contract. If the Contractor does not comply with any certification or it is determined that any certification made by the Contractor in its bid is untrue, whether made knowingly or unknowingly, Canada has the right, pursuant to the default provision of the Contract, to terminate the Contract for default.

7.2 SACC Manual Clauses

A3060C (2008-05-12), Canadian Content Certification

8 Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in _____. *(to be inserted at contract award)*

9 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 supplemental general conditions 4001 (2013-01-28), Hardware Purchase, Lease and Maintenance, 4002 (2010-08-16) Software Development or Modification Services and 4003 (2010-08-16), Licensed Software;
- (c) the general conditions 2040 (2014-03-01), General Conditions-Research & Development;
- (d) Annex A Statement of Work and Appendix 1 to Annex A -Lunar Polar rover Night Survival Strategy (LPRNSS);
- (e) Annex B, Basis of Payment;
- (f) the Contractor's bid dated _____, as clarified/amended (if applicable) on_____.

10 Foreign Nationals (Canadian Contractor)

SACC Manual clause A2000C 2006-06-16) Foreign Nationals (Canadian Contractor)

11 Insurance

SACC Manual clause G1005C (2008-05-12) Insurance

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ANNEX A (See attached document)

STATEMENT OF WORK

The Statement of Work (Annex A) appended to the bid solicitation package is to be inserted at this point and forms part of this document.

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ANNEX B

BASIS OF PAYMENT

FIRM LOT PRICE Schedule of Milestones

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

Milestone No.	Description of Deliverable	Firm Amount	Delivery Date
1	Specify		
2	Specify		
3	Specify		
Etc			

Total Firm Price \$_____ (GST and QST Extra)

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ANNEX C (see attached document)

BID PREPARATION INSTRUCTIONS

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ANNEX D (see attached document)

POINT RATED CRITERIA

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APPENDIX 1 TO ANNEX A (See attached document)
LUNAR POLAR ROVER NIGHT SURVIVAL STRATEGY (LPRNSS)

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APPENDIX 2 TO ANNEX A (See attached document)
DOCUMENT NAMING CONVENTIONS

Annex A – Statement of Work

A.1 Background

The exploration of space is a highly visible endeavour, a powerful driver for scientific and technical innovation, a magnet for world-class talent, and an incentive for young Canadians to pursue careers in science and technology. To shape and determine the nature of Canada's contribution to potential future international space exploration and astronomy missions CSA's Exploration Core program was created in 2007. Exploration Core engages in three types of activities: (i) requirement development; (ii) prototyping and deployment; and (iii) building and maintaining operational infrastructure required to support prototype integration and deployment. Through (i) requirement development, Exploration Core supports CSA's exploration planning activities and defines the science and technology developments most likely to be required in future space exploration missions of interest to Canada, and assesses potential contributions that Canada could make to such missions.

This requirement requests proposals in the areas define in Section A.2, Table 1 in support of the requirement development activity of CSA's Exploration Core Program.

A.2 Objective

Requirement Development is part of the Exploration Core program of the Canadian Space Agency. Through Requirement Development, Exploration Core supports CSA's exploration planning activities and defines the science and technology developments most likely to be required in future space exploration missions of interest to Canada, and assesses potential contributions that Canada could make to such missions. Concept Studies are part of the Requirement Development activity

This requirement requests Concept Studies proposals in the areas of space exploration identified in Table 1 and detailed in Appendix 1 of Annex A.

Table 1: Requirement categories, classes and titles.

Category CS #	Concept Study Title	Detailed SOW
CS 1	Lunar Polar Rover Night Survival Strategy (LPRNSS)	Appendix 1 to Annex A

A.3 Scope

This document provides the requirements and deliverables for the categories identified above to inform the decision process when selecting Canadian-led missions or contributions to international space exploration missions by providing in general:

- 1) Definition of mission/technology goals
- 2) Conceptual design and feasibility

- 3) User requirements
- 4) Mission requirements
- 5) System/payload requirements
- 6) Cost (including detailed cost breakdown to level of subsystems)
- 7) Technology readiness and risk assessment
- 8) Technology development plan and qualification approach
- 9) Programmatic aspects

Detailed scopes for each category are given in Appendix 1 to Annex A.

A.4 Master Reference Documents

The documents identified in Table 2 provide additional information or guidelines that either may clarify the contents or are pertinent to the history of this document. They are applicable to all Categories given in Table 1.

Table 2: Reference Documents.

MRD No.	Document Number	Document Title	Rev. No.	Date
MRD-1.	ESTEC TEC-SHS/5574/MG/ap	Technology Readiness Levels Handbook for Space Applications ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/	Iss. 1 / Rev. 6	March 2009
MRD-2.	CSA-SE-STD-0001	CSA Technical Reviews Standard ftp://ftp.asc-csa.gc.ca/users/TRP/pub/SE-STD/	A	Nov 7, 2008
MRD-3.	CSA-ST-GDL-0002	CSA Technology Tree ftp://ftp.asc-csa.gc.ca/users/TRP/pub/Technology-Tree/	IR	December 2009
MRD-4.	CSA-ST-GDL-0001	CSA Technology Readiness Levels and Assessment Guidelines ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/	B	February 2014
MRD-5.	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	July 29, 2013
MRD-6.	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

MRD No.	Document Number	Document Title	Rev. No.	Date
MRD-7.	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	March, 2014
MRD-8.	CSA-ST-RPT-0003	Roadmap Framework ExCore Concept Study: Technology Roadmap CSA-ST-RPT-003 Rev A.xlsx ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRM/	A	September 2012

A.5 Project Duration

Duration of six (6) months after Contract Award.

A.6 Generic Task Description

This section presents the activities that apply to all Categories listed in Table 1. The work to be performed by the Contractor under this concept study is divided into four major Work Packages (WPs). Each WP has one or more associated major tasks. Figure 1 describes the Work Breakdown Structure (WBS):

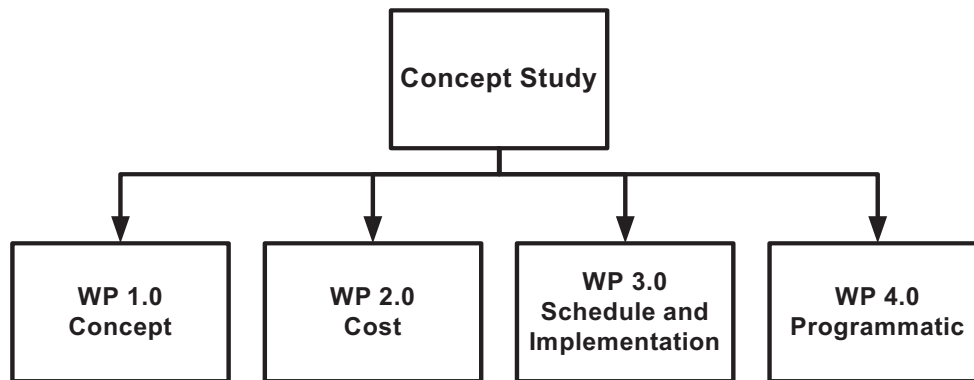


Figure 1: Work Breakdown Structure (Top Level)

A.6.1 Concept

Detailed scope, requirements, concept and task descriptions for each category are given in Appendix 1 of Annex A.

Cost

The cost is subdivided into the following elements.

- Cost
- Estimate of Canadian content

A.6.1.1 Cost

The Contractor must provide cost estimates as per Table 3 below, for all phases leading to the development, qualification, implementation, launch, operation and disposal of the hardware/software/instruments resulting from the concept.

Table 3: Cost

		Prior to Mission	Phase A	Phase B	Phase C	Phase D	Phase E	Phase F
Labour	Management							
	Technology Development							
	Design							
	Documentation							
	Reviews							
	Manufacturing							
	Assembly							
	Testing							
	Product Assurance							
	Operations							
	Total Labour							
Non-Labour	Hardware / Software Procurement							
	Tools, equipment & facilities							
	T&L							
	Overhead							
	Total Non-Labour							
Risk	Risk Contingency							
Total								

Total all Phases:

A.6.1.2 Estimate of Canadian Content

The Contractor must provide an estimate of the anticipated percentage of Canadian content relative to the overall cost presented in Table 3, what options could be undertaken to maximize the Canadian content, and their corresponding impacts and benefits.

A.6.2 Schedule and Implementation

A.6.2.1 Schedule

The Contractor must suggest a preliminary schedule relative to the overall life cycle of the Concept. The timeline must include key milestones corresponding to Preliminary Design Review (PDR), Detailed Design Review (DDR), and readiness for integration onto the mission, launch, and landing.

A.6.2.2 Technology Readiness and Risk Assessment (TRRA) and Technology Roadmap

The Contractor must perform a Technology Readiness and Risk Assessment (TRRA) in accordance with the requirements of the CSA Technology Readiness and Risk Assessment Guidelines (MRD-4) and

Technology Readiness Levels Handbook for Space Application (MRD-1), to formally document the technology status.

The Contractor must produce the TRRA with Worksheets and Rollup (CDRL 13) using Technology Readiness and Risks Assessment Worksheet (MRD-5), Critical Technology Element (CTE) Identification Criteria Worksheet (MRD-7) and rollup using Technology Readiness and Risk Assessment Rollup (MRD-6MRD-8).

The Contractor must also provide a Technology Development Plan, also known as Technology Roadmap (TRM) including the required technology developments to meet mission needs, and a plan and timeline to reach TRL 6 and 8. The TRM must be provided in the format of (MRD-8).

A.6.2.3 Development, Manufacturing and Qualification Approach

The Contractor must provide an overview of the development approach, specifying subsystem providers, key subcontractors, and the general strategy best suited for this approach. The Contractor must also list the major tasks required in the development and manufacturing cycles. The Contractor must provide the V&V and qualification approach and assumptions made.

A.6.3 Programmatic

A.6.3.1 Preliminary Mission Risk Assessment

The Contractor must provide a preliminary technical, schedule, cost and programmatic risks assessment. This assessment must also consider access to information issues, like Export Control (International Traffic in Arms Regulations (ITAR) and others).

A.6.3.2 Business Potential

The Contractor must provide information on the minimum business, in the field, required to maintain the necessary expertise in the long run.

A.6.3.3 Canadian Capabilities Development

The Contractor must provide an overview of its strategy to develop and maintain Canadian capabilities. If the overall approach of the Contractor implies technology transfer and partnership with foreign entities to develop the Canadian capabilities, the Contractor must specify teaming arrangements, Intellectual Property (IP) ownership issues, royalties, etc., as well as opportunities that this partnership would open.

A.6.3.4 Intellectual Property Management

The Contractor must identify the Background Information (BIP), the IP that will be generated, and the owners of these BIP and IP and how it will be managed and coordinated among the various collaborators and entities involved.

A.6.3.5 Preliminary Commercialisation Plan

The Contractor must provide a preliminary commercialization plan to support further Canadian positioning beyond the scope of the proposed CSA program. This must include an analysis of who the competitors are (national and international) for the proposed subsystem/technology/concept and for

the overall mission. It must identify who are the stakeholders and how Canada and/or the bidder are positioned.

This must also include potential spin-offs (space and non-space).

A.7 Concept Study Project Schedule

The project schedule prepared by the Contractor must provide a graphical representation of predicted tasks, milestones, dependencies, resource requirements, task duration, and deadlines. The project's master schedule must inter-relate all tasks on a common time scale and be in the form of a Gantt chart. The project schedule must be detailed enough to show each WBS task to be performed, the name of the person responsible for completing the task, the start and end date of each task, the deliverables and the expected duration of the task. A sample WBS is provided in Table 1 of Annex C – Technical Bid Preparation Instructions. The Contractor must also provide all WPs.

Important Notice: The estimated contract start date is October 2014.

A.8 Contract Meetings and Deliverables

This section reviews and describes the contract meetings and deliverables.

A.8.1 Contract Meetings

The Contractor must organize the meetings listed in Table 4.

Table 4: Meeting Schedule

Meeting	Date	Location
Contract Award	Start of contract (October 2014)	N/A
Kick-off Meeting	No later than 2 weeks After Contract Award (ACA)	CSA's HQ
Mid-term Review Meeting	Contract award + 3 months	CSA's HQ
Final Review Meeting	End of contract	CSA's HQ
CSA-Contractor technical team tag-up	Monthly	Telecon

All key participants under the contract must attend all the meetings. This can be done in person or via teleconference.

The Mid-term Review Meeting must cover elements typically found in a Mission Concept Review (MCR) and the Final Review Meeting must cover a typical content of a Mission Requirement Review (MRR). See MRD-22 CSA-SE-STD-0001 for a description of the MCR and MRR.

The specific intent of the Final Review Meeting will be to discuss in detail the results obtained and the proposed follow-on activities. This meeting is intended to provide an opportunity for the Contractor, the Project Authority (PA), the Scientific Authority (SA), and other invited attendees to review and discuss the project. Canada reserves the right to invite additional knowledgeable people [Public Servants or

others under Non-Disclosure Agreement (NDA)] to this meeting. Key Contractor personnel involved in the work under review must attend the meetings. The exact date and time of the review meeting will be mutually agreed to by the PA, the SA, and the Contractor.

The Contractor may request Ad-hoc Meetings with the CSA whenever required to resolve unforeseen and urgent issues. The CSA may also request such Ad-hoc Meetings with the Contractor. The selection of participants will depend on the nature of the issue.

A.8.2 Documentation, Reporting and Other Deliverables

The Contractor must submit the documentation as defined and at the date stipulated in the Contract Data Requirements List (CDRL), Table 5, to the PA. All diagrams must be clearly drawn and labelled.

In addition to any paper copy of all project documentation and reports, the Contractor must also provide the PA with an electronic copy in a format acceptable to the CSA. Both the PDF and original version, e.g. Microsoft Word or PowerPoint, must be provided to CSA. Original version of any figures or tables part of these documents must also be provided to CSA, e.g. Visio file of a figure created in Microsoft Visio, STEP file for models and drawings in CAD software. Thermal FEMs/FEAs must be delivered in formats that can be read by NX SPACE SYSTEMS Thermal Version 8.0, Structural FEMs and FEAs must be delivered in formats that can be read by NX version 7.5. Instructions on how to name electronic documents are provided in Appendix 2 to Annex A.

The cover page of each document must include the following text:

© CANADIAN SPACE AGENCY 2014

RESTRICTION ON USE, PUBLICATION OR DISCLOSURE OF PROPRIETARY INFORMATION

This document is a deliverable under contract no. _____. This document 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 any of the information contained herein for other than the specific purpose for which it was disclosed is expressly prohibited except as the Crown may otherwise determine.

Then, on all internal pages each document must include the following text:

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.

The Contractor must not publish or have published any information contained within this, without the prior written approval of the CSA.

All documents must identify the organisation's name, contract number and title and document name and must be structured in accordance with the Data Item Description (DID) referenced in the CDRL.

In addition to the disclosure obligation under Section 27 of the general conditions 2040, any Foreground Information must be fully disclosed and documented by the Contractor in the technical reports delivered by the Contractor to the Technical Authority under this Contract.

Table 5: CDRL

CDRL No.	Deliverable	Due Date	Version	DID No.
1.	Meeting Agendas	Meeting – 1 week	Final	0001
2.	Kick-off Meeting Presentation	Meeting – 1 week	Final	0002
3.	Mid-term Review Meeting Presentation	Meeting – 1 week	Final	0003
4.	Final Review Meeting Presentation	Meeting – 1 week	Final	0004
5.	Meeting Minutes	Meeting + 1 week	Final	0005
6.	Monthly Progress Reports	Monthly	Final	0006
7.	Technical Report	Draft at each milestone End of contract – 2 weeks	Draft Final	0007
8.	Foreground Intellectual Property (FIP) Disclosure	End of contract – 2 weeks	Final	0008
9.	Executive Report	End of contract – 2 weeks	Final	0009
10.	Final Data Package	End of contract – 2 weeks End of contract	Draft Final	0010
11.	Contractor Performance Evaluation	End of contract – 2 weeks	Final	0011
12.	Action Items Log (AIL)	Meeting + 1 week	Final	0012
13.	Technology Readiness and Risk Assessment Worksheets and Rollup	Draft copy at milestone End of contract – 2 weeks	Draft Final	0013
14.	Technology Roadmap Worksheet	Draft at each milestone End of contract – 2 weeks	Draft Final	0014
15.	Cost	Draft at each milestone End of contract – 2 weeks	Draft Final	0015
16.	Thermal Engineering Models and Analyses	Mid Term Review–2 weeks Final Review – 2 weeks	Final Update	0016

A.8.3 Data Items Description (DIDs)

A.8.3.1 DID-0001 – Meeting Agenda

PURPOSE:

To specify the purpose and content 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;
- f) Mandatory and desirable attendance; and
- g) Expected duration.

2) DOCUMENT BODY:

- a) Introduction, purpose, objective;
- 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 newly created/closed action items, decisions, agreements and minutes; and
- i) Set or confirm dates of future meetings.

A.8.3.2 DID-0002 – Kick-off Meeting Presentation

PURPOSE:

To present the Contractor's plan for carrying out the project and to address all significant issues.

PREPARATION INSTRUCTIONS:

The Kick-off Meeting Presentation must contain the following information, as a minimum:

- 1) Review major assumptions for the study
- 2) Review of contract deliverables;
- 3) Work requirements, WBS status and schedule;
- 4) FIP and BIP;
- 5) Licensing issues if any;
- 6) Project's funding and expected cash-flow;
- 7) Presentation to include the required copyrights and IP disclosure;
- 8) Other items as deemed appropriate

A.8.3.3 DID-0003 – Mid-Term Review Meeting Presentation

PURPOSE:

To present the results of the work done to date in the contract, and in particular since the previous meeting. The mid-term review must cover elements typically found in a Mission Concept Review (MCR). See CSA-SE-STD-0001 for a description of the MCR.

PREPARATION INSTRUCTIONS:

The Mid-Term Review Meeting Presentation must contain the following information, as a minimum:

- 1) Review current status of the work, discuss orientation and preliminary results;
- 2) Elements of a Mission Concept Review;
- 3) Technical and programmatic issues if any;
- 4) Review of contract deliverables;
- 5) Work requirements, WBS status and schedule;
- 6) FIP and BIP;
- 7) Licensing issues if any;
- 8) Project's funding and expected cash-flow;
- 9) Other items as deemed appropriate;
- 10) Presentation's slides to include the required copyrights and intellectual property disclosure

A.8.3.4 DID-0004 – Final Review Meeting Presentation

PURPOSE:

To present the overall results of the work done in the project including the elements of a Mission Requirement Review (MRR). See CSA-SE-STD-0001 for a description of the MRR.

PREPARATION INSTRUCTIONS:

The Final Review Meeting Presentation must contain the following information, as a minimum:

- 1) Detailed presentation of the work conducted (presentation of the content of the technical and/or science report, concept, design, interface, feasibility, etc.)
- 2) Elements of a Mission Requirement Review;
- 3) Technical and programmatic issues if any;
- 4) Contract deliverables;
- 5) FIP and BIP;
- 6) Licensing issues if any;
- 7) Final Funding and cash-flow;
- 8) Discuss project management issues;
- 9) Other items as deemed appropriate;
- 10) Presentation's slides to include the required copyrights and intellectual property disclosure

A.8.3.5 DID-0005 – Meeting Minutes

PURPOSE:

To provide a record of decisions and agreements reached during reviews/meetings.

PREPARATION INSTRUCTIONS:

The Meeting Minutes must contain 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, the CSA and the Public Works and Government Services Canada (PWGSC), and
 - d) Name and address of the Contractor;
- 2) Purpose and objective of the meeting;
- 3) Location;
- 4) Agenda;
- 5) Summary of the discussions, 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, numbered per the AIL (see CDRL No. **Error! Reference source not found.**, and DID-0013);
- 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."

A.8.3.6 DID-0006 – Monthly Progress Report

PURPOSE:

To record the status of the work in progress during the previous calendar month. The Progress Report is used by the Government to assess the Contractor's progress in performance of the work.

PREPARATION INSTRUCTIONS:

The Monthly Progress Report must list each deliverable and contain the following information, as a minimum:

- 1) Current % of completion
- 2) Planned and actual completion date
- 3) Brief summary of the work performed in the current month
- 4) The work planned for the following month
- 5) A highlight of problems, if any, and the proposed corrective approach
- 6) A table showing current financial status (cash flow planned vs. actual)
- 7) Any other relevant information deemed necessary.

Based on the above, the Monthly Progress Report should not exceed 3 pages.

This report is required even in the case of a fixed firm price contract.

A.8.3.7 DID-0007 – Technical Report

PURPOSE:

To fully describe the technical work done, problems encountered and achieved objectives.

(The author may define and organize additional sub-sections as deemed appropriate to present the comprehensive results of the concepts study.)

PREPARATION INSTRUCTIONS:

The Technical Report must contain the following information, as a minimum:

- 1) Technical
 - a) Overall Concept:
 - i) Mission selected (including orbit, launch options, mission duration), if applicable,
 - ii) Contribution to mission, if applicable,
 - iii) System level approach,
 - iv) Innovation,
 - v) Critical aspects, and
 - vi) Traceability to mission requirements;
 - b) Conceptual Design:
 - i) Technical approach and possible options,
 - ii) Preliminary layout,
 - iii) Functional block diagram,
 - iv) Related subsystems identification,
 - v) Subsystems trade-offs,
 - vi) Preliminary Concept of Operation, and
 - vii) Potential system operator identification;
 - c) Interface Definition;
 - d) Feasibility:
 - i) Intrinsic technical constraints,
 - ii) External operating constraints, and
 - iii) Potential solutions;
 - e) Compatibility with Target Mission(s);
 - f) User/Mission Requirements:
 - i) Mission needs,
 - ii) Key system parameters,
 - iii) Expected performance,
 - iv) Reliability, and
 - v) Technical Performance Measures:
 - (1) Functional requirements,
 - (2) Preliminary performance targets,
 - (3) Resource budgets (mass, power, thermal, processing power, etc.);
- 2) Schedule and Implementation
 - a) Schedule;
 - b) Collaboration, if applicable:

- i) Identified national and international collaboration potential,
 - ii) Types of agreements,
 - iii) Mechanisms, and
 - iv) Potential difficulties;
- c) Technology readiness and risk assessment
 - i) Current technology readiness level (TRL) and technology development risk (R&D3) as per **Error! Reference source not found.**
- d) Technology Development Roadmap

The framework of the technology roadmap is defined in **Error! Reference source not found.**

- i) Proposed roadmap for technology developments
 - (1) Required technology developments to meet mission needs, and
 - (2) Plan and timeline to reach TRL 6 and 8;
- e) Development, Manufacturing and Qualification Approach:
 - i) Development approach,
 - ii) Subsystem providers,
 - iii) Subsystem Qualification Status (if applicable)
 - iv) Key subcontractors,
 - v) General strategy,
 - vi) Development tasks, and
 - vii) Manufacturing tasks;
 - viii) Qualification plan

3) Programmatic

- a) Preliminary Mission Risk Assessment identification and mitigation:
 - i) Technical,
 - ii) Schedule,
 - iii) Cost, and
 - iv) Programmatic;
- b) Business Potential;
- c) Canadian Capabilities Development;
- d) Intellectual Property Management:
 - i) BIP, and
 - ii) FIP;
- e) Preliminary Commercialisation Plan:
 - i) Targeted market,
 - ii) Potential sales,
 - iii) Competition, and
 - iv) Marketing strategy.

A.8.3.8 DID-0008 – Contractor Disclosure of Intellectual Property

PURPOSE:

To list all Foreground and Background Intellectual Property related to the project, to be reviewed at the Final Review Meeting.

PREPARATION INSTRUCTIONS:

The Disclosure must address the questions listed the document CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY that can be found at: <ftp://ftp.asc-csa.gc.ca/users/GPITT-IPMTT/pub/>.

A.8.3.9 DID-0009 – Executive Report

PURPOSE:

To fully describe the entire project for dissemination in the public domain.

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 Executive Report must contain the following information, as a minimum:

1) Introduction (~2 pages);

Presentation of overall concept and main objectives. Illustrative picture(s) should be included.

2) Concept Overview (2-3 pages);

Discussion on main user/mission requirements, feasibility and compatibility with target mission.

3) Technology (~1 page);

Description of the innovative technologies requiring development and summary of the application fields.

4) Technology Development Roadmap, Cost and Implementation (2-3 pages);

Schedule, Technology Development Roadmap with TRL and R&D3, overall cost category, collaboration.

For the cost, the following categories must be used:

- > \$200M
- \$75M - \$200M
- \$20M - \$75M
- \$10M - \$20M
- \$5M - \$10M
- \$1M - \$5M
- <\$1M

5) Business Potential (~1 page);

Business potential, Canadian capabilities development

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

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A.8.3.10 DID-0010 – Final Data Package

PURPOSE:

The Final Data Package is a collection of all documents to be presented by the Contractor at the end of the contract.

PREPARATION INSTRUCTIONS:

The Final Data Package must consist of the final/revised version of all deliverables requested under the present contract (electronic copy). For example, with no limitation, the final data package should include presentations, minutes, monthly progress reports and other required deliverables in their final revision. It must also include the contractor disclosure of intellectual property and project evaluation sheet.

A.8.3.11 DID-0011 – Contractor Performance Evaluation

PURPOSE:

To provide an evaluation of the overall success of the project.

PREPARATION INSTRUCTIONS:

The Contractor Performance Evaluation must contain the following information, as a minimum:

- 1) Was the project completed on schedule (list deliverables with planned and actual delivery date)?
- 2) How many man-hours of highly qualified personnel (by category) did this work create or maintain?
- 3) New opportunities created by the work conducted under the study.

A.8.3.12 DID-0012 – 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 Action Item Log (AIL) must be in a tabular form, with the following headings in this order:

- 1) Item Number;
- 2) Item Title;
- 3) Open Date;
- 4) Source of AI (e.g. PDR meeting, RID, etc.);
- 5) Originator;
- 6) Office of Prime Interest (OPI);
- 7) Person responsible (for taking action);
- 8) Target/Actual Date of Resolution;
- 9) Status (Open or Closed); and
- 10) Remarks.

The date in column 8) will be the target date as long as the item is open, and the actual date once the item is closed.

A.8.3.13 DID-0013 – Technology Readiness and Risk Assessment Worksheets and Rollup

PURPOSE:

The Technology Readiness and Risk Assessment provides for all the elements of the proposed concept, as per Product Breakdown Structure (PBS), a high-level summary of the maturity of the technologies and the technology development risks.

PREPARATION INSTRUCTIONS:

The Technology Readiness and Risk Assessment must be done using MRD-4 for each technology and rolled-up into a summary using MRD-6.

A.8.3.14 DID-0014 – Technology Roadmap Worksheets

PURPOSE:

The Technology Roadmap provides an overview of the required technology developments to meet mission needs and the plan and timeline to reach TRL 6 and 8.

PREPARATION INSTRUCTIONS:

The Technology Roadmap must be done using **Error! Reference source not found..**

A.8.3.15 DID-0015 – Cost

PURPOSE:

The cost and estimated Canadian content is critical for planning and implementation of potential follow on technology and mission developments.

PREPARATION INSTRUCTIONS:

The cost is must provide the following elements

- a) Cost, including detailed subsystem-level cost breakdown and justifications; and
- b) Estimate of Canadian Content

A.8.3.16 DID-0016 – Thermal Engineering Models and Analyses

PURPOSE:

To support the design, establish feasibility of the design to meet the requirements in the design phases, and in some cases provide verification of compliance to requirements where this cannot be demonstrated directly by test or inspection.

PREPARATION INSTRUCTIONS:

GENERIC FORMAT AND CONTENT FOR ALL ANALYSES

All CAD models developed must be delivered as appropriate. Models must be delivered in the following formats:¹

- a) Mechanical design: STEP AP203 (.stp)
- b) Electrical design: .dsn, .sch, Pspice and Gerber formats
- c) Software design: UML 2.0 or XML (Extensible Markup Language)

In cases where a different tool is used from the one CSA uses, the model and outputs must be supplied in native format in addition to the required format. For generic modeling and analyses that don't use a specialty tool, CSA will accept Matlab, Excel and MathCad format data. Where a highly specialized tool is used, the delivery format must be negotiated with the TA. Translation from the Contractor's tool to the required format is only acceptable where the results can be repeated in CSA's tool. Translation that corrupts the model, loses data, or produces data that is interpreted differently, is not acceptable.

Analysis documents must contain all analysis work that is performed in support of the design. The analysis material must be sufficiently detailed so that, in combination with the delivered models, CSA or an external reviewer can reproduce the results. The analysis must establish feasibility and verification of the design to meet the requirements.

The data must include references to sources such as equations, material values, parameters and properties.

Each report must contain the following information, as a minimum:

- 1) Objectives of the analysis;
- 2) Reference to the relevant requirements;
- 3) Description of the analysis tools used;
- 4) Description of the model developed to aid the model user (if applicable);
- 5) Identification of the assumption(s) made;
- 6) Description of the main analysis steps and intermediate results;
- 7) Results of the analysis and compatibility with the requirements;
- 8) Identification of potential problem areas and presentation of alternative design solutions; and
- 9) Conclusion.

Delivered models must contain at least example outputs so that the user can check their function, and should contain the main outputs used in the analysis documents.

¹ All 2-D drawings must be submitted in PDF format, with the capability to zoom

Annex C – Bid Preparation Instructions

Outline and Content of Sections I and II of the Bid

The required outline and content of Sections I and II of Part 3 - Bid Preparation Instructions, is detailed herein. Should clarification be required, it is the responsibility of the Bidder to contact the Contracting Authority prior to submitting the bid.

Sections I and II should address only one project and be contained within a single document/file, not exceeding 60 pages, including 6) Bid Appendices. The information should be organized in the following order:

- 1) Title / Project Identification Page;
- 2) Executive Summary;
- 3) Table of Contents;
- 4) Technical Bid;
- 5) Managerial Bid;
- 6) Bid Appendices:
 - 6.1) List of acronyms used in the Bid;
 - 6.2) Bidder's Criteria Substantiation (refer to section 2 of Annex D);
 - 6.3) Résumés or NSERC form 100 or equivalent; and
 - 6.4) List of Contacts.

If applicable:

- 6.5) Corporate literature;
- 6.6) Relevant technical papers published by team members;
- 6.7) Any other Bid appendices deemed appropriate by the Bidder.

Note: The structure of Sections I and II and subsections are described below. Some of the subsection headings are followed by numbers in brackets. These numbers represent the Evaluation Criteria (see Annex D) that are applicable to that specific section/subsection.

1. Title / Project Identification Page

This is the first page of the Bid. It should be laid out in accordance with the requirements specified in Part 3 and should clearly state:

- 1) RFP file number;
- 2) The company's name and address;
- 3) The Category of the proposed project;
- 4) The title of the proposed project (the use of acronyms in the title is discouraged, unless they are described);
- 5) A short summary of the Bid summarizing the Bid in 8 lines (maximum).

2. Executive Summary

The Executive Summary of Sections I and II 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:

- 1) Project objectives;
- 2) Targeted Technology;
- 3) Main technical innovations;
- 4) Major milestones and deliverables; and
- 5) Relevance to CSA strategy and programs;

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 Bid

The Bid should describe the proposed project as outlined in the following subsections. The bidder should strive to address all items under the letter "D" of each criterion.

4.1 Impact

4.1.1 Relevance and Merit of the Concept (Evaluation Criterion 1)

This subsection should provide the substantiated evidence describing the relevance and merit of the proposed concept relative to the scope of work. It should address and substantiate how the proposed contribution addresses the scope of the work presented in Section 1.4 Scope of the individual Statements of work Annex A.

International collaboration opportunities should be highlighted and explanations given how they can help to reduce the overall cost to Canada. Letters of intent of potential collaboration partners should be provided.

4.1.2 Canadian Technology Strength (Evaluation Criterion 2)

The proposal should elaborate on the potential Canadian technology content and expertise of the proposed concept. Canadian technology strength should be emphasized. The proposal should assess the relative Canadian technology value based on the estimated total cost of the proposed contribution.

4.2 Technical and Criteria

4.2.1 Understanding the Requirements and Technical Principles (Evaluation Criterion 3)

This section should identify and substantiate in detail the underlying requirements and the technical principles and knowledge necessary for realizing the proposed concept. It should thoroughly demonstrate an understanding of these requirements and principles. The proposal should include a presentation of proposed concept and operations requirements that will be addressed by the proposed activities and objectives, and their relationship to

overall objectives. References to and a thorough discussion of the existing literature relevant to the central theme of the proposed concept is provided.

4.2.2 Feasibility of Achieving Goals and Technical Objectives (Evaluation Criterion 4)

In this subsection the Bidder should provide a description and overall feasibility assessment of the proposed approach and the degree to which it is capable of delivering the goals and technical objectives.

This includes the compatibility of the technology selected and incorporation into the proposed design for addressing the technical requirements and enhancements. The bidder should elaborate on the technical risks associated with the eventual integration and implementation of the concept.

The proposed effort should be well displayed and substantiate. A well thought-out, feasible and valid concept and methods that can obtain the desired technical results should be presented. The bid should show and substantiated that overall scenario is valid. It should be demonstrated that the proposed concept relies on well proven technology.

A preliminary technology development roadmap should be presented in order to meet the technical basic requirements and enhancements of the study.

The CSA Technology Readiness Levels and Assessment Guidelines are provided in MRD-1 and the Technology Readiness Levels Handbook for Space Applications is provided in MRD-2 for further details on technology readiness.

4.2.3 Scope of the Concept (Evaluation Criterion 5)

The section should address the scope and aspects of the proposed concept in relation to what is asked in the statement of work. It should provide a detailed description and substantiation of a relevant approach for the concept development. It should provide a preliminary design of the technology and a description of the operation concept.

5. Managerial Bid

The Managerial Bid should demonstrate the effectiveness and commitment of the Bidder in delivering the project on time and budget. Its sub-sections should address in detail: key-personnel qualifications, team organisation and arrangements, previous project experience, and the Management Plan.

5.1 Team Capability (Evaluation Criterion 6)

5.1.1 Team expertise

This subsection should identify the Principal Investigator, Project Manager and Technical Lead and outline their respective qualifications. It should identify the key members of the project's technical, and management teams and state their specific and relevant qualifications and experience for the work involved. Detailed résumés are to be put in an appendix of Sections I and II of the Bid. Provisions for back-up personnel for key positions are to be stated.

Key personnel include at least the principal investigator, project manager and technical leads for all the top-level technical work packages.

5.1.2 Team Organisation and Arrangements

This subsection should outline the roles and responsibilities of the proposed team members, and discuss and highlight the unique expertise they offer with respect to the capability of the team. This subsection should also provide details on the subcontractors' roles, responsibilities and on the nature of their contractual relationship with the prime contractor. An organisation chart should be included illustrating the structure of the proposed project team.

Letters of Agreement between the prime contractor, subcontractors, and other collaborators should be provided. These Letters of Agreement typically describe the scope-of-work, financial contributions, IP ownership, commercialisation activities, and any other applicable items. For scientific co-investigators, this letter should include the proposed role and time commitment.

5.1.3 Previous Project Experience

The Bidder should identify any previous experience with Research and Development (R&D) projects of a similar scope as the one proposed, including any projects undertaken with the CSA or other government institutions. The Bidder should list previous projects and assignments undertaken, within the last five years, which are relevant to proposed scope of work. The Bidder should identify any team members in the current Bid that participated in those other projects and describe the nature of their contributions to those projects.

Note: The Bidder may describe as many previous projects as it feels necessary in order to adequately demonstrate the experience and qualifications of the company and of the proposed team, as long as the Bid length is compliant to the requirement.

5.2 Project Management Plan (Evaluation Criterion 7)

This subsection describes the Management Plan that will be retained in order to deliver the project, and to do so in the most effective manner.

The Management Plan should contain, as a minimum, the following information: Work Break-down Structure, WP definitions, personnel allocation, managerial risk assessment, milestones and deliverables, schedule, and project control system.

The Management Plan's presentation should be based on the recognised management tools most applicable to the proposed project, such as a scope planning (WBS), schedule development charts (e.g. Gantt chart, etc.). Equivalent company-developed, project-tailored tools/charts are also acceptable, provided that the information is complete and comprehensive.

5.2.1 Work Package Definition

This Management Plan subsection should define and specify the work to be executed according to the requirements of this SOW. The project should be broken down into Work Packages (WPs). Each WP should focus on specific activities that will form the total project and, as a minimum, should define and describe the specific work to be carried out and indicate: the person responsible, the WP's associated levels-of-effort and required resources, the schedule (start and finish dates), the risks, and its associated deliverable or output.

WPs stem from the WBS. The WBS should be taken to a low enough level and the associated WP should be defined in sufficient depth in order for the Bidder to demonstrate a clear understanding of the process that will be followed to perform the project.

As a guideline, Table 1 of this attachment presents a fictitious example of a Work Package Definition Sheet.

The Bidder should provide a detailed SOW for each subcontractor along with a Letter of Agreement in Principle to be included in the Bid appendices. The subcontractors' price information should be included in the **Financial Bid only**.

Table 1: Example of Work Package Definition Sheet

Project: Novel T/R Unit Demonstration	
Work Pack Title:	
TEST SETUP WBS Ref: 2200	
1 of 1 Sheet:	WP Estimated Value: Do not indicate \$ value in Section I of Bid, indicate value in Section II
Scheduled Start: T0 + 2 weeks	Accountable Manager: Resource A
Scheduled End: T0 + 12 weeks	Resources: Resource A, Resource B, Resource C
Estimated Effort: 80 hours	
Objectives: <ol style="list-style-type: none"> 1. Deliver a functional test setup for the T/R unit 	
Inputs: <ol style="list-style-type: none"> 1. Test plan and procedure 2. Unit drawings 3. Unit Interface Control Documents 	
Tasks: <ol style="list-style-type: none"> 1. Review input documentation 2. Define requirements 3. Produce initial concept 4. Design test setup 5. Fabricate test setup 6. Commission and debug 	
Outputs and Deliverables: <ol style="list-style-type: none"> 1. Fully functional T/R unit test setup 2. Test setup log manual 3. Test setup user manual 	

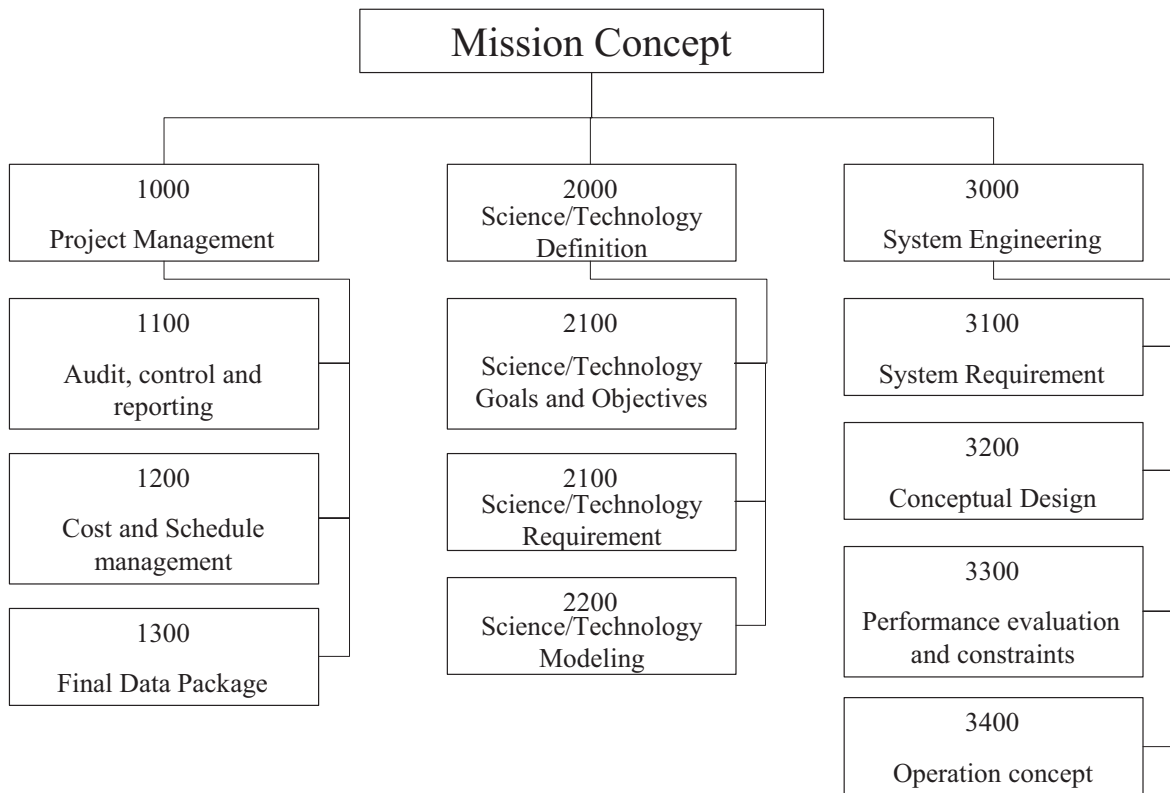


Figure 1: Example of a Work Breakdown Structure

5.2.2 Personnel Allocation

This Management Plan subsection should include a resource assignment matrix showing the level-of-effort for each individual team member that has been allocated to each WP. The matrix should identify each individual by name, and provide the estimated time (number of hours or days) required to complete each task. As a guideline, Table 2 of this attachment presents a fictitious example of a Responsibility Allocation Matrix (RAM) also known as a Resource Allocation Matrix. **The RAM should be presented in both the Technical, and Managerial Bid and the Financial Bid.**

Table 2: Example of Responsibility Allocation Matrix

WBS number	Work Pack Title	Resource A		Resource B		Resource C		Total
1.1	Project Management	A	200	P	25	P	25	250
1.2	Literature Survey	A	25	P	100	-	0	125
1.3	Requirements	P	50	A	100	P	100	250
1.4	Design	P	100	A	100	P	150	350
1.5	Build	-	0	P	200	A	150	350
1.6	Test and Analysis	A	100	P	200	P	200	500
Total			475		725		625	1825

P: Participant

A: Accountable

5.2.3 Managerial Risk Assessment

This Management Plan subsection should provide an assessment of the managerial risks involved in performing the work for the concept study, and identify critical issues that may jeopardise the successful completion of the project within cost and schedule constraints.

5.2.4 Milestones and Deliverables

Milestones and deliverables should be detailed in accordance to what is specified in Table 5 in Annex A - Statement of Work.

5.2.5 Schedule

This Management Plan subsection should relate tasks, milestones and deliverables to a project timetable. For planning purposes, the project expected start date is October 2014.

5.2.6 Project Control System

This Management Plan subsection should outline the methods and systems to be used to control tasks, schedules, and costs for the project. Any project management tool or a spreadsheet software package may be used as long as it contains, as a minimum, the information required in the Monthly Progress Report (DID-0006). Additionally, the Project Control System should provide the capability to report the amount of work per WBS item for each individual on a monthly basis.

The cost figures and values of all industrial contributions should be provided separately in the Financial Bid in Section II.

6. Bid Appendices

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

Required Bid Appendices

- 6.1) List of acronyms used in the Bid
- 6.2) Bidder's Criteria Substantiation (refer to Section 2 of Annex D).
- 6.3) Résumés: The Bid should include résumés (and/or NSERC form 100) of all key personnel and these should be appended to Sections I and II.
- 6.4) List of Contacts: The list of contacts should be appended to Sections I and II, in a format suitable for distribution and should include all of the Bidder's points-of-contact involved in the Bid development and/or contract negotiations. The following example format should be used:

Table 3: 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.				

Applicable Bid Appendices

The following Bid appendices are to be provided, *if applicable*, with Sections I and II:

- 6.5) Corporate literature: Only literature that is relevant and will be useful to support the Bid.
- 6.6) Relevant technical papers published by team members.
- 7.6) Any other Bid appendices deemed appropriate by the Bidder.

Bidders are reminded that there is a limited number of pages that the bid must not exceed. If the number of pages of Sections I and II, as described herein, is exceeded, the evaluation will strictly be based on the first 60 pages submitted, including appendices.

Annex D – Point Rated Criteria

1 *Impact / Technical / Management Point Rated Criteria*

The Bidder should achieve the minimum score requirements as indicated in Table 1: “List of Evaluation Criteria and Associated Ratings”. Bids will be evaluated according to the point-rated criteria as specified in Table 1 and at subsection 3 of this document: “Evaluation Criteria and Benchmark Statements”. The criteria are grouped under the following divisions:

- 1) Impact;
- 2) Technical; and
- 3) Management.

“Evaluation Criteria and Benchmark Statements” contains a series of evaluation criteria, each supported by a set of 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 “*Understanding the Requirements and Technical Principles*” 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)

Table 1 identifies:

- 1) The maximum point rating assigned to each criterion;
- 2) The maximum point rating possible for each division (Impact, Technical, and Management);
- 3) The maximum point rating possible for the overall score;
- 4) The minimum point rating required for the overall score.

Note that the first criterion “Merit of the Concept” has a minimum score requirement of 15 to make sure that the bidder addresses the scope of work presented in section A.3.1 of Annex A.

Table 1: List of Evaluation Criteria and Associated Ratings

Evaluation Criteria and Ratings	
	Ratings
Impact Criteria	
1. Relevance and Merit of the Concept (Minimum Score Requirement of 15)	20
2. Canadian Technology Strength	10
Maximum Score	30
Technical Criteria	
3. Understanding the Requirements and Technical Principles	20
4. Feasibility of Achieving the Goals and Technical Objectives	15
5. Scope of the Concept	15
Maximum Score	50
Management Criteria	
6. Team Capability	10
7. Project Management Plan	10
Maximum Score	20
Maximum Overall Score	100
Minimum Overall Score Requirement	70

2 Bidder's Criteria Substantiation

The Bidder is requested to provide a substantiation, which should be submitted as an appendix to their Section I.

For each of the applicable criteria, provide the substantiation and summarized cross-reference(s) to the bid.

The substantiation should be concise yet sufficiently comprehensive to ensure that the evaluators get a good overall appreciation of the bid's merit relative to the specific criterion. Cross-references to appropriate sections of the bid should be provided and the essence of the referenced information should be summarized in the substantiation.

For convenience, a template for the Self-Evaluation Table is provided in Table 1. Enter each technical/management/impact criterion section number, and the substantiation. It is expected that approximately half a page should be sufficient to make the Bidder's case for the rating chosen in the substantiation column.

Table 1: Bidder's Criteria Substantiation.

Company:	
Project Title:.	
Criteria	
Substantiation	
<i>Ex.: 1</i> <i>(criterion number)</i>	<i>Criterion substantiation and Bidder's bid cross-reference.</i> <i>It is expected that 300 words or so should be sufficient to make your case.</i>

3 EVALUATION CRITERIA AND BENCHMARK STATEMENTS

IMPACT CRITERIA

RELEVANCE AND MERIT OF THE CONCEPT

This criterion evaluates the relevance and merit of the proposed concept relative to the scope of work presented in Appendix 1 to Annex A *Scope of the individual Statements of work*.

O)

- The relevance and merit of proposed concept is not addressed.

A)

- The relevance and merit of the proposed concept are only partially addressed and not substantiated.

B)

- The relevance and merit of the proposed concept are addressed and substantiated, but gaps exist.

C)

- The relevance and merit of the proposed concept are addressed and substantiated and no gap exists.

D)

- The relevance and merit of the proposed concept are addressed in detail and well substantiated and no gap exists.

2. CANADIAN TECHNOLOGY STRENGTH

This criterion evaluates the proportion of Canadian technology or know-how and its criticality to the success of the project

0)

- The key technology and expertise relevant to the proposed concept resides outside Canada; OR
- It is unlikely that Canadian technology strength will be developed.

A)

- Some key technology and expertise to the proposed concept are within Canadian industries or academia. OR
- Canadian technology strength is not identified or it is not convincing that technology strength will be developed for Canada.

B)

- The proposal demonstrates that some key technology and expertise to the proposed concept are within Canadian industries or academia. AND
- Canadian technology strength is identified but it is not significant.

C)

- The proposal demonstrates that the majority of key technology and expertise in the bid are within Canadian industries or academia. AND
- Either Canadian technology strength is identified and substantiated, but it is not significant; or Canadian technology strength is identified and is significant but it is not fully substantiated.

D)

- The proposal demonstrates that the majority of key technology and expertise in the bid are within Canadian industries or academia; AND
- Significant Canadian technology strength is identified and substantiated.

TECHNICAL AND CRITERIA

3. UNDERSTANDING THE REQUIREMENTS AND TECHNICAL PRINCIPLES

This criterion assesses the degree to which the Bid identifies and substantiates in detail the underlying requirements and technical principles and also to what extent it thoroughly demonstrates an understanding of these requirements and principles as stated in Appendix 1 to Annex A – Statement of Work

0)

- The bid does not address the requirements, OR
- Does not identify the technical principles driving the proposed concept.

A)

- The proposal includes an incomplete overview of the main requirements OR

- The proposal demonstrates incomplete knowledge of the technical principles relevant to the goal of the study; OR
- The bid does not identify how the objectives will help in further defining these requirements; OR
- The proposal does not include an adequate review of the existing literature or that of previous relevant studies.

B)

- The proposal includes only an overview of the main requirements; AND
- The proposal exhibits a general understanding of these requirements and principles AND
- The proposal demonstrates a basic knowledge of the technical principles relevant to the goal of the study; AND
- The proposal includes a cursory review of and references to existing literature or that of previous relevant to the central theme of the proposed concept.

C)

- The proposal demonstrates identification and understanding of the main requirements; AND
- The proposal demonstrates knowledge of the technical principles relevant to the goal of the study; AND
- The bid includes a presentation of the proposed concept and operations requirements that will be addressed by the proposed activities and objectives; AND
- The proposal includes references to and a discussion of other work or previous activities relevant to the central theme of the proposed concept.

D)

- The proposal includes an exhaustive identification of the requirements; AND
- The proposal demonstrates a comprehensive knowledge of the technical principles relevant to the goal of the study; AND
- The bid includes a presentation of proposed concept and operations requirements that will be addressed by the proposed activities and objectives, and their relationship to overall objectives; AND
- The proposal includes references to and a thorough discussion of the existing literature relevant to the central theme of the proposed concept is provided.

4. FEASIBILITY OF ACHIEVING GOALS AND TECHNICAL OBJECTIVES

The criterion assesses the description and overall feasibility of the proposed approach and the degree to which it is capable of delivering the goals and technical objectives. This includes the compatibility of the technology selected and incorporation into the proposed design for addressing the technical requirements and enhancements. This criterion evaluates the technical risks associated with the eventual integration and implementation of the concept. It assesses if the proposed effort is well documented and substantiate.

O)

- The feasibility of achieving the goals and technical objectives is not demonstrated

A)

- The proposal does not present an adequate case with system(s) that can deliver the technical objectives; OR
- The proposed concept can obtain the desired technical results, but gaps exist.; OR
- Main elements of a preliminary technology development road map, in order to meet the technical basic requirements, are lacking.

B)

- The proposal presents an adequate case with system(s) that can deliver the technical objectives; AND
- The proposed concept can obtain the desired technical results, but some details or information of limited importance are omitted; AND
- Main elements of a preliminary technology development road map, in order to meet the technical basic requirements or enhancements, are lacking.

C)

- The proposal presents a well-referenced case with system(s) that can deliver the technical objectives; AND
- The proposed concept displays creative, feasible and valid concepts and methods that can obtain the desired technical results with details; AND
- Main elements of a preliminary technology development road map are presented in order to meet the technical basic requirements and enhancements of the study.

D)

- The proposal presents a well-referenced and convincing case with system(s) that can undoubtedly deliver the technical objectives. AND
- The proposed concept relies on well proven technology with one or more components having flight heritage and is substantiated with ample details; AND
- A preliminary technology development roadmap is presented in order to meet the technical basic requirements and enhancements of the study.

5. SCOPE OF THE CONCEPT

The criterion assesses the description and overall scope of the proposed Concept Study.

0)

- The bid does not address the scope and the aspects of what is requested in the SOW OR
- does not provide a description of the approach for the concept development.

A)

- The bid addresses the scope and the aspects of what is requested in the SOW, but gaps exist, OR
- It does not provide a description of the approach for the concept development.

B)

- The bid addresses the scope and the aspects of what is requested in the SOW, but gaps exist, AND
- It provides a description of the approach for the concept development, but either gaps exist or is not relevant.

C)

- The bid addresses the full scope and aspects of what is requested in the SOW, AND
- It provides a description and substantiation of a relevant approach for the concept development.

D)

- The bid addresses the full scope and aspects of what is requested in the SOW. AND
- It provides a detailed description and substantiation of a relevant approach for the concept development. AND

- The bid provides a preliminary design of the proposed concept and a description of the operation concept.

MANAGEMENT CRITERIA

6. TEAM CAPABILITY

This criterion assesses the capability (education, knowledge, experience, expertise and completeness of skill-sets in science, engineering and management) of the personnel assembled to carry out the proposal.

O)

- The proposed team does not have the required expertise; OR
- The proposal does not address this criterion.

A)

- The proposed team has no experience in conducting work similar in complexity and scope to what is requested in the SOW; OR
- The proposed team lacks expertise and may not be capable of fulfilling the statement of work (SOW); OR
- The roles and responsibilities of the team members are not defined.

B)

- The key personnel identified in the proposed team has been involved in at least one project similar in complexity and scope to what is requested in the SOW; AND
- The proposed team is lacking some expertise but demonstrates that it is capable of fulfilling the statement of work (SOW); AND
- The team may have deficiencies in the completeness of the skills of its members; AND
- Some team members have experience in the design and development of space flight hardware in a similar environment as described in the relevant SOW or space software.

C)

- The key personnel identified in the proposed team has been involved in at least two projects similar in complexity and scope to what is requested in the SOW; AND
- The expertise of the proposed team demonstrates that it is highly capable of fulfilling the statement of work (SOW); AND
- The completeness of the team is very well demonstrated through the complementarities of skills of its members and by the roles / tasks that they are assigned during the concept study; AND
- The roles and responsibilities for most of the team members, including sub-contractors, are defined; AND
- Most of the required key personnel are identified and there are qualified back-up personnel identified for most of them; AND
- The key personnel have experience in the design and development of space flight hardware in a similar environment as described in the relevant SOW or space software.

D)

- The key personnel identified in the proposed team has been involved in more than two projects similar in complexity and scope to what is requested in the SOW; AND
- The expertise of the proposed team demonstrates that it is highly capable of fulfilling the statement of work (SOW) with the potential of delivering an authoritative concept; AND
- The roles and responsibilities of all the team members, including all sub-contractors, are defined; AND
- The completeness of the team is very well demonstrated through the complementarities of skills of its members and by the roles / tasks that they are assigned during the concept study; AND

- All required key personnel are identified and there are qualified back-up personnel identified for all of them; AND
- The key personnel have significant experience in the design and development of space flight hardware in a similar environment as described in the relevant SOW and space software.

7. PROJECT MANAGEMENT PLAN

This criterion assesses the completeness of the management plan (including WBS, WPs, personnel allocation, detailed schedule and milestones, and managerial risk assessment) and evaluates the effectiveness of the described methodology in successfully achieving the stated objectives of the work to carry out this study.

O)

- The work-plan does not follow methodological approach and is unlikely to obtain the appropriate objectives; OR
- The proposal does not address this criterion.

A)

- The proposal presents a poor work-plan; OR
- The proposed methodology is not effective in achieving the objectives of the work; OR
- There is a lack of correlation between the work-plan and the management method; OR
- Risks are not identified.

B)

- The proposal presents a basic work-plan; OR
- The proposed methodology is not effective in achieving the objectives of the work; OR
- There is a lack of correlation between the work-plan and the management method; OR
- Risks are identified and mitigation strategies are insufficient.

C)

- The work-plan as described in the proposal is based on a methodological approach; AND
- The effectiveness of the proposed methodology in achieving the objectives of the work is credible; AND
- The correlation between the work-plan and the management method exists; AND
- Risks are identified and mitigation strategies are discussed.

D)

- The work-plan as described in the proposal follows a clearly defined methodology; AND
- The effectiveness of the proposed methodology in achieving the objectives of the work is highly credible; AND
- The correlation between the work-plan and the management method is clear; AND
- Comprehensive risk analysis and mitigation strategies are provided.

Appendix 1 to ANNEX A

Lunar Polar Rover Night Survival Strategy (LPRNSS)

1 Concept

The purpose of this contract is to develop concepts – alternative to radioactive heat sources – for implementation on a lunar rover, with the intention of allowing it to survive a lunar night from a lunar polar region. Furthermore, a technological roadmap indicating the path forward for reaching flight readiness of the thermal subsystem must accompany the developed concepts.

1.1 List of Acronyms

AD	Applicable Document
CSA	Canadian Space Agency
DRM	Design Reference Mission
ExCore	Exploration Core
ISRU	Lunar In-Situ Resources Utilization
LISR	Lunar ISRU and Science Rover
LPRNSS	Lunar Polar Rover Night Survival Strategy
LTOIP	Lunar Tele-Operated ISRU Platform
PSR	Permanently Shadowed Regions
RD	Reference Document
RESOLVE	Regolith and Environment Science and Oxygen and Lunar Volatile Extraction
RPM	Resource Prospector Mission
SOW	Statement of Work
STDP	Space Technology Development Program
TRL	Technology Readiness Level
VCM	Verification Compliance Matrix

1.2 Introduction

The Exploration Core (ExCore) program aims at developing and maturing technologies in preparation for future exploration mission opportunities. These activities include development of technologies from requirements definition, development of terrestrial prototypes, integration, deployment and testing up to flight analogue relevant environments such as thermo-vacuum, radiation and dusty chamber.

Under the ExCore program, the CSA has developed several rover terrestrial prototypes. One of the key goals is increasing Canadian industry, academia and government expertise in rover development. Different approaches and technologies have been explored to enhance mobility, power management, vision, navigation & control and operations. In collaboration with industry and academia, CSA conducted a number of terrestrial analogue deployments to test these rovers within an operational context. This has allowed identifying the strengths and weaknesses of the vehicles and their sub-systems. Table 1-1 presents the current fleet of CSA's rovers and their main characteristics.

Table 1-1: - Fleet of CSA'S ROVERS

Name	Category	Configuration	Dry-Mass	Size (L, W, H)	Prime Contractor
Artemis	Large	8 wheels skid-steering with active suspension	530 kg	2.83 m, 2.12 m, 2.00 m	Neptec Design Group
LELR	Large	6 wheels, 4 back wheels skid-steering and 2 front wheels Ackermann steering, passive suspension	867 kg	3.10 m, 1.99 m, 3.01 m	MDA
Artemis Jr	Medium	4 wheels skid-steering with active suspension	230 kg	1.47 m, 1.62 m, 1.53 m	Neptec Design Group
Juno	Medium	4 wheels skid-steering with active suspension	294 kg	1.38 m, 1.60 m, 0.75 m	Neptec Design Group
MESR	Medium	6 wheels , 4 wheels independent steering with passive suspension	250 kg	2.28 m, 1.62 m, 1.85 m	MDA
REX	Small	6 wheels , 6 wheels independent steering with passive suspension	140 kg	1.52 m, 1.42 m, 0.76 m	MDA
Kapvik	Micro	6 wheels , skid-steering with passive suspension	27.4 kg	0.85 m, 0.78 m, 1.21 m	MPB Communications
MRPTA	Micro	Configurable wheels/chains, skid-steering with passive suspension	30 kg	0.61 m, 0.51 m, 0.61 m	ESI

In 2013, two Lunar Tele-Operated In-Situ Resources Utilization (ISRU) Platform (LTOIP) concept studies were conducted to develop a detailed system concept of a polar moon rover. The rover had to be capable of supporting the ISRU and mobility requirements leveraged under the Resources Prospector Mission (RPM) previously referred as the Regolith and Environment Science and Oxygen and Lunar Volatile Extraction (RESOLVE) program as well as additional Canadian complementary science instruments such as multi-spectral camera, wheels/regolith interaction sensors and Measure While Drilling (MWD). Two concepts were proposed by the industry. These studies exploited existing ExCore terrestrial rovers' designs and proposed adaptations in order to enable path-to-flight. Early on, the moon context presented difficult challenges such as vacuum, very wide temperature range, harsh dusty and severe radiation environment. A series of risks were raised and clearly showed a need for further

enhancing the maturity of solutions and know-how in specific areas. To mitigate these risks, CSA put in place a series of contracts via its ExCore and Space Technology Development Program (STDP).

Part of the investigation during this previous concept study (LTOIP) was to elaborate on a rover and drilling system concept that would operate at the Lunar North Pole or South Pole for a targeted minimum mission of 7 to 14 days at the surface. As a secondary objective, it was requested to investigate options for extending the capabilities of the rover and its payloads to survive one or multiple lunar nights. The quest for water-ice and volatiles on the Moon will eventually need a rover and a suite of instruments capable of surviving the lunar night; in fact the greatest probability from what we know today will be to find them in Permanently Shadowed Regions (PSRs). The elaborated Design Reference Mission (DRM) for an RPM-like mission is currently based on a 7 day lunar operation, and includes traverses in PSRs for a maximum of six hours for any given traverse. The capability required by this study is to be able to extend this capacity beyond 6 hours in a PSR and have a hibernation capability for the rover during the lunar night.

1.2.1 Technology Descriptions

Scientists and engineers have been investigating the presence of resources in the lunar regolith for many years. Since 1994, a number of missions to the Moon have identified the presence of hydrogen in the lunar regolith at the poles. Figure 1 summarizes the missions and their main outcomes.

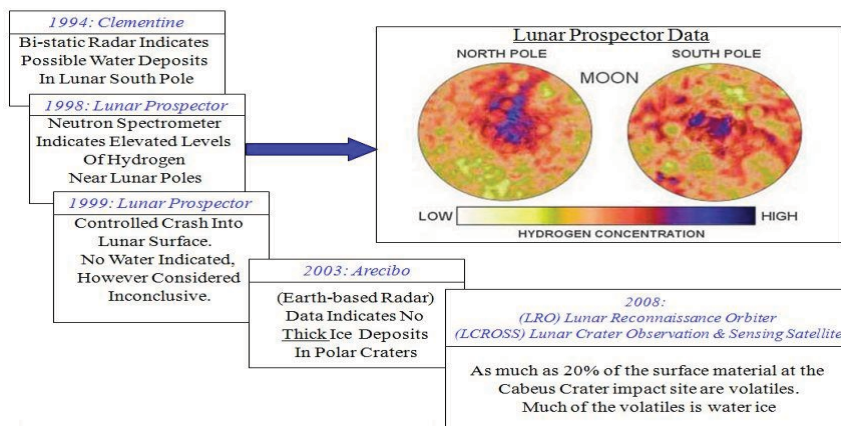


Figure 1: Lunar volatiles Moon missions

In light of these findings, the next logical step and primary goal of the lunar ISRU mission is to verify the presence of water and other volatiles on the Moon by direct, ground truth measurements of the regolith in and around permanently shadowed regions. This leads to a number of key objectives to understand what is present on the Moon, in which forms, what quantity and how it can be processed and eventually extracted and used:

- Understand the resources, water/ice (minerals, volatiles, water/ice):
- What resources are there, how abundant, and what is the areal and vertical distribution?
- Understand environment impact on extraction and processing hardware:
- What is the local temperature and pressure environment?
- What are the physical/mineralogical properties of the local regolith?
- Are there extant volatiles that are detrimental to processing hardware or humans?
- Gain knowledge to guide future mission architecture decisions

Resource Characterization	1	Determine form and conc. of H ₂ /H ₂ O in permanently shadowed regions	Science - Resource Focused
	2	Determine other volatiles or contaminants present (CO, NH ₃ , CH ₄ , HCN, ?)	
	3	Determine grain size distribution and morphology of regolith	
	4	Determine chemical/mineralogical properties	
	5	Determine difference between sunlit and local shadowed regions	
	6	Determine spatial distribution of resources	
In-Situ Resource Utilization Demo	7	Determine bulk excavation related physical properties of regolith	Engineering - Processing Focused
	8	Demonstrate capture and separation of water	
	9	Demonstrate scalable oxygen production technique	
	10	Engage & Excite Public/Education Outreach	

Figure 2: Objectives for lunar ISRU mission

A complete description of the DRM and the referenced mission is available in [RD-5]. This mission and subsequent ones are heading toward answering a number of identified Scientific Knowledge Gaps (SKGs) presented in Figure 3.

Lunar Exploration Strategic Knowledge Gaps		Instrument or Activity	RPM Relevance
I. Understand the Lunar Resource Potential			
B-1	Regolith 2: Quality/quantity/distribution/form of H species and other volatiles in mare and highlands	NSS, NIRVSS, OVEN-LAVA	VH
D-3	Geotechnical characteristics of cold traps	NIRVSS, Drill, Rover	H
D-4	Physiography and accessibility of cold traps	Rover-PSR traverses, Drill, Cameras	VH
D-6	Earth visibility timing and extent	Mission Planning	VH
D-7	Concentration of water and other volatiles species within depth of 1-2 m	NSS, NIRVSS, OVEN-LAVA	VH
D-8	Variability of water concentration on scales of 10's of meters	NSS, NIRVSS, OVEN-LAVA	VH
D-9	Mineralogical, elemental, molecular, isotopic, make up of volatiles	NIRVSS, OVEN-LAVA	VH-Volatiles L-M-Minerals
D-10	Physical nature of volatile species (e.g. pure concentrations, intergranular, globular)	NIRVSS, OVEN-LAVA	H
D-11	Spatial and temporal distribution of OH and H ₂ O at high latitudes	NIRVSS, OVEN-LAVA	M-H
D-13	Monitor and model movement towards and retention in PSR	NIRVSS, OVEN-LAVA	M
G	Lunar ISRU production efficiency 2	Drill, OVEN+ROE, LAVA+WDD	M
III. Understand how to work and live on the lunar surface			
A-1	Technology for excavation of lunar resources	Drill, Rover	M
B-2	Lunar Topography Data	Planning Products, Cameras	M
B-3	Autonomous surface navigation	Traverse Planning, Rover	M-L
C-1	Lunar surface trafficability: Modeling & Earth Tests	Planning, Earth Testing	M
C-2	Lunar surface trafficability: In-situ measurements	Rover, Drill	H
D-1	Lunar dust remediation	Rover, NIRVSS, OVEN	M
D-2	Regolith adhesion to human systems and associated mechanical degradation	Rover, NIRVSS, OVEN, Cameras	M
D-3	Descent/ascent engine blast ejecta velocity, departure angle, and entrainment mechanism: Modeling	Landing Site Planning, Testing	M
D-4	Descent/ascent engine blast ejecta velocity, departure angle, and entrainment mechanism	Lander, Rover, NIRVSS	H
F-2	Energy Storage - Polar missions	Stretch Goal: Lander, Rover	H
F-4	Power Generation - Polar missions	Rover	M

VH=Very High, H=High, M=Medium, L=Low

Figure 3: Lunar volatiles Moon missions SKGs

Previous extended lunar missions relied on radioactive material as a heat source. Usage of radioactive material presents very good advantages for long term survivability providing energy for an extended

system life but presents many risks, inconvenient, is relatively complex and is very expensive. Alternatives are then being requested by this concept study that would apply to a class of rover between small and medium rover as described in the up-coming sections.

Another important aspect is that past lunar rovers and recently the Chinese Yutu rover were relying on mechanisms to close the rover or to form a sort of enclosure for night survival and reduce heat rejection to survive lunar night, these approaches have proven to require complex mechanical and sensors system and failures of these was what cause major issues to the Chinese mission, it could not be completely powered back due to a change of configuration required between night and day. Alternatives are then required to be investigated to address these issues and increase the reliability and the life of the moon surface platform.

1.3 Reference Documents

Reference documents are listed in Table 1-2.

Table 1-2: Reference Documents

RD No.	Document Number	Document Title	Rev. No.	Date
RD-1.	MIL-STD-810G	Department Of Defense Test Method Standard. Environmental Engineering Considerations and Laboratory Tests	Rev. G	October 2008
RD-2.	Grant Heiken	Lunar Source Book: A User Guide To The Moon		
RD-3.	CSA-SE-STD-0001	CSA Technical Reviews Standard ftp://ftp.asc-csa.gc.ca/users/excore-prototyping/pub/	A	November 2008
RD-4.	CSA-SE-PR-0001	CSA Systems Engineering Methods and Practices ftp://ftp.asc-csa.gc.ca/users/excore-prototyping/pub/	Rev. B	March 2010
RD-5.	9F052-12-0307A	2012 Exploration Core Concept Studies for Space Exploration - LTOIP ftp://ftp.asc-csa.gc.ca/users/excore-prototyping/pub/	Rev. A	2012
RD-6.	NASA-STD-6016	Standard Materials And Processes Requirements For Spacecraft		October 2009
RD-7.	David Gilmore	Spacecraft Thermal Control Handbook Volume 1: Fundamental Technologies		

1.4 Scope

This document defines the functional, performance and interface requirements for the LPRNSS.

1.5 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:

“Shall”, “Must” or “Required” is used to indicate a contractual obligation;

“Should” indicates a preferred alternative but is not a contractual obligation under the contract;

“May” indicates an option;

“Will” indicates a statement of intention or fact, as does the use of present indicative active verbs.

1.6 Purpose

The purpose of this contract is to deliver a Lunar Polar Rover Night Survival Strategy (LPRNSS), baselined to the proposed LTOIP concept, **[Error! Reference source not found.]**, including:

- a. A thermal system detailed concept allowing the rover to survive lunar night at a polar location (excluding any form of radioactive heating). The concept will be accompanied by a complete thermal model and trade-studies to different options. Several options could be presented together to fulfill the thermal system requirements.
- b. A TRL Roadmap to Flight for all aspects of the thermal system. The purpose is to fully understand where we are technologically towards creating this system, and what the technology path to flight looks like, its different phases, and the cost and schedule to implement.

The intent is that the resulting strategy could in future be used on a Lunar ISRU and Science Rover (LISR).

1.7 Operational and Relevant Environment

This section describes the operational environment in which the system would eventually operate. In this contract, the rover is considered as the system, with the thermal control system being a sub-system.

The operational environment for a flight rover eventually built upon the results of this work would be a polar region of the moon. A single lunar day lasts approximately 29.5 Earth days, and at polar locations, at worst case up to 23 days of this time could be night (no sunlight). This will mean external surface temperatures from 50°C (323K) in sunlight to -233°C (40K) in a Permanently Shadowed Region (PSR). During the lunar night, surface temperatures external to a PSR could be as low as -200°C (73K). Given this environment, night survival is a non-trivial objective to meet. Previously successful, unmanned lunar rovers including China’s Jade Rabbit and Russia’s Lunokhod series, have traditionally incorporated internal radioactive heat sources and deployable mechanisms designed to close in order to maintain core temperatures at night. For the purposes of this contract, radioactive heat sources are not considered viable solutions, and the number of active mechanisms required to meet the requirements of the contract should be minimized.

The relevant environment for this contract is to assume the operational environment.

2 Technical Requirements

Given the current level of confidence with its TRL 4 rover prototypes fleet, CSA ExCore is heading towards the development of a complete TRL 6 Lunar ISRU and Science Rover (LISR). In order to achieve this goal, key subsystems have been identified. The upcoming section covers the requirements for a Lunar Polar Rover Night Survival Strategy (LPRNSS) and its associated TRL roadmap. It is the intent that the LPRNSS will be used to feed into future rover designs and mission concept of operations, including other systems such as lunar qualified power, communications, and navigation subsystems, in addition to various scientific instruments that could be considered as payloads.

The overall LPRNSS concept must be based upon the LTOIP proposed concepts and consider growth capability towards a future complete LISR. The baseline rover has a landing mass of 200-350 kg (including both the rover and payload).

2.1 Lunar ISRU & Science Rover (LISR) concept key requirements

In 2012, ExCore issued an RFP [Error! Reference source not found.] to explore concepts for a lunar mission as a follow-up to the previous TRL 4 prototyping and deployments activities relevant to lunar rover science and ISRU missions. The basis for the requirements within this LPRNSS contract relies on these previous activities and concepts developed.

The minimum envisaged mission is for a rover to operate a suite of instruments such as the NASA-provided RESOLVE instruments suite at the lunar South or North Pole for a minimum duration of seven days to an extended mission surviving the lunar night. Figure 4 is a representation of a current concept envisaged and expandable to an extended or future lunar night survival mission. The LISR includes a chassis, a drive train, a suite of sensors and communications equipments and a central payloads assembly as well as additional scientific instruments that can be added to the rover.

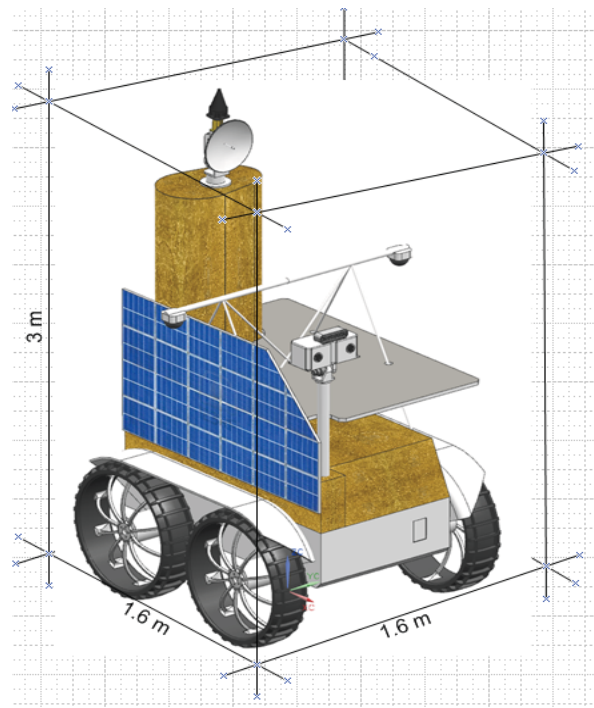


Figure 4: LISR Concept Representation

The overall requirements applicable to an entire lunar rover such as LISR are defined in [Error! Reference source not found.].

2.2 Key considerations

The following considerations are important to consider during this contract:

- In regards to the concept(s) developed under this contract, where is our technology today for the system, and what is the path to flight? What is required to bring it up to a flight level?
- Is there a practical option for the use of a thermal capture and storage medium, like a phase-change material, to keep daytime heat and reduce overnight power needs?

- Is there a practical option for the use of creating a shelter to reduce heat loss at night, or is this too many additional moving parts and complication?
- With battery degradation, what is the long term reduction in power availability? What rate of Watt-hour losses can be expected with each lunar day cycle?
- What sort of operational timelines would be required to reheat and recharge the rover when the night cycle ends and day commences?
- What strategies are to be employed to ensure that the cameras and other external sensors are kept alive? How many additional W-h per external sensor would be needed?

2.3 LPRNSS Requirements

This section lists the requirements applicable to the LPRNSS.

2.3.1 LPRNSS Functional Requirements

MANDATORY-FNC-01 LPRNSS Scope: The LPRNSS must provide thermal control for the entire LISR system described in Section 2.1, including externally mounted components and payload.

2.3.2 LPRNSS Environment Requirements

MANDATORY-ENV-01 Lifetime: The LPRNSS must provide thermal control such that the LISR is capable of surviving a full lunar day cycle.

RATIONALE: The LISR will need to operate during the day, and then survive the lunar night.

MANDATORY-ENV-02 Operation: The LPRNSS must provide thermal control to a LISR between 60-85 degrees lunar latitude.

RATIONALE: A lunar polar rover will operate within these latitude ranges. This bounds the maximum temperature to 323K instead of 373.

MANDATORY-ENV-03 Operation: The LPRNSS must maintain the operating temperature limits such that the LISR can operate in sunlight.

MANDATORY-ENV-04 Off-Night: The LPRNSS must maintain all non-operating subsystems within their survival temperature limits during the night.

MANDATORY-ENV-05 On-Night: The LPRNSS must maintain all operating subsystems within their operating temperature limits during the night.

RATIONALE: Some subsystems, like power distribution or processor may need to operate during the night for the thermal subsystem to function properly. Nothing more than basic keep-alive systems are envisioned to operate during the night-time.

MANDATORY-ENV-06 Regolith: The LPRNSS must withstand bombardment and accumulation of small-particle dust/lunar simulant.

RATIONALE: Lunar regolith has at minimum the following negative impacts:

1. Accumulates on to surfaces;
2. Changes/degrades thermo-optical properties of thermal control designs;
3. Impinges on movable parts and clogs/damages moving mechanisms;
4. Prevents seals from closing properly;
5. May cause false reading of sensors;
6. Remains in spots and may be impossible to be cleaned off completely.
7. There is a wide range of particle size in the regolith down to nano-particle sized dust. Regolith and dust can have magnetic properties and electrostatic charges (e.g. they can be charged by

the solar wind). The particle shapes are very different from those typical of Earth, being more extended and jagged due to a lack of weathering. For more information, see for example "Lunar Sourcebook" (RD-2).

- MANDATORY-ENV-07 Vacuum Environment:** The LPRNSS must be proved capable of operating in a vacuum environment at a pressure not higher than 10^{-4} Torr.
- MANDATORY-ENV-08 Solar Radiation:** The LPRNSS must meet its requirements under expected lunar solar radiation conditions.
- MANDATORY-ENV-09 Radiation Total Dose:** The LPRNSS shall only use components or assemblies that are proven suitable for at least 30 krad total dose, unless an alternative can be used such that the component or assembly on the LPRNSS is rendered non-critical or unnecessary.
- TARGET-ENV-01 Complexity:** The LPRNSS should minimize its number of active components and mechanisms.

RATIONALE: Active components greatly increase the risk factor. Minimizing or removing completely this need would go a long way to increasing confidence in the system.

3 Contractor Deliverables

See Annex A

APPENDIX 2 to ANNEX A

Document Naming Conventions

Context

This annex presents the naming convention to follow for any documentation generated under this RFP and any resulting contract.

Documents must contain 3 main components:

Project identifier

Contract Number

Date Tracking number

WXYZ-TYPE-NUM-CIE_ContractNumber_sent2014-03-30

Project Identifier

The project identifier must contain:

WXYZ: A 4-8 letter acronym of the project

TYPE: A 2 letter acronym according for the table below.

Acronym	Description
AG	Agenda
ER	Executive Report
MN	Minutes of meeting
PR	Progress Report
PT	Presentation
TN	Technical Note
MM	Animation/Multimedia

NUM: A three digits sequential number (e.g. 001, 002, etc.)

CIE: Name of Company (no space, no hyphen)

Contract Number

For example: _9F028-07-4200-03

Date Tracking Number

_sentYEAR-MONTH-DAY_draft

The *_draft* mention should be removed on the final version of the document once approved by CSA.