

**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 Far Infrared Radiometer		
Solicitation No. - N° de l'invitation 9F063-140220/A	Date 2014-06-27	
Client Reference No. - N° de référence du client 9F063-14-0220		
GETS Reference No. - N° de référence de SEAG PW-\$MTB-575-12797		
File No. - N° de dossier MTB-4-37091 (575)	CCC No./N° CCC - FMS No./N° VME	
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2014-07-28		Time Zone Fuseau horaire Heure Avancée de l'Est HAE
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input type="checkbox"/>		
Address Enquiries to: - Adresser toutes questions à: Jurca, Anca		Buyer Id - Id de l'acheteur mtb575
Telephone No. - N° de téléphone (514) 496-3378 ()		FAX No. - N° de FAX (514) 496-3822
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: AGENCE SPATIALE CANADIENNE 9F063 - Sciences et Technologies 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

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No/ N° VME

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9F063-140220/A

mtb575

9F063-14-0220

MTB-4-37091

TABLE OF CONTENTS

PART 1 - GENERAL INFORMATION

1. Introduction
2. Summary
3. Debriefings
4. Communications
5. Conflict of Interest

PART 2 - BIDDER INSTRUCTIONS

1. Standard Instructions, Clauses and Conditions
2. Submission of Bids
3. Communications - Solicitation Period
4. Applicable Laws
5. Maximum Funding

PART 3 - BID PREPARATION INSTRUCTIONS

1. Bid Preparation Instructions:
 - Section I: Technical and Managerial Bid
 - Section II: Financial Bid
 - Section III: Certifications

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

1. Evaluation Procedures
2. Basis of Selection

PART 5 - CERTIFICATIONS

1. Certifications Required Precedent to Contract Award
2. Additional Certifications Required Precedent to Contract Award

PART 6 - FINANCIAL AND OTHER REQUIREMENTS

1. Financial Capability
2. Controlled Goods Requirement

PART 7 - RESULTING CONTRACT CLAUSES

1. Statement of Work
2. Standard Clauses and Conditions
3. Term of Contract
4. Authorities
5. Proactive Disclosure of Contracts with Former Public Servants
6. Payment
7. Invoicing Instructions
8. Certifications
9. Applicable Laws
10. Priority of Documents

Solicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

11. Foreign Nationals (Canadian Contractor)
12. Insurance
13. Controlled Goods Program

List of Attachments:

Attachment 1 to Part 3: Technical and Managerial Bid Preparation Instructions

Attachment 1 to Part 4: Point Rated Evaluation Criteria

Attachment 1 to Part 5: Additional Certifications Precedent to the Contract Award

List of Annexes:

Annex A: Statement of Work and Requirements

Annex B: Basis of Payment

PART 1 - GENERAL INFORMATION

1. Introduction

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

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

The Attachments include:

- the Attachment 1 to Part 3: Technical and Managerial Bid Preparation Instructions; and
- the Attachment 1 to Part 4: Point Rated Evaluation Criteria; and
- the Attachment 1 to Part 5: Additional Certifications Precedent to the Contract Award

The Annexes include:

- Annex A: Statement of Work and requirements
- Annex B: Basis of Payment

2. Summary

(i) Project title

Far InfraRed Radiometer (FIRR) for Ice Clouds Characterization

(ii) Description

Public Works and Government Services Canada (PWGSC) on behalf of Canadian Space Agency (CSA) located in St-Hubert, (Quebec), is seeking bids to build and test an automated Far InfraRed Radiometer (FIRR) demonstrator for the characterization of ice clouds. The work solicited is intended to advance the far infrared microbolometer sensor technology up to Technology Readiness Level (TRL) 6. This sensor technology is one of those that have the potential for innovation and technological impact and has been established by the CSA as a

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

strategic technology to be developed to meet the objectives set forth by the Canadian Space Strategy. It is also an enabling technology intended for a CSA microsatellite mission candidate which aims at improving the Canadian capability in extreme weather forecasting.

(iii) Period of Contract

The contract issued will be for a period of maximum ten (10) months; specific deliverables, as identified in Annex A (Statement of Work & Requirements), shall be delivered no later than eight (8) months following the date of the contract is awarded.

(iv) Bidders must provide a list of names, or other related information as needed, pursuant to section 01 of Standard Instructions 2003.

(v) For services requirements, Bidders in receipt of a pension or a lump sum payment must provide the required information as detailed in article 3 of Part 2 of the bid solicitation.

(vi) No security requirements apply to this project.

(vii) This requirement is not subject to the trade agreements.

(viii) The requirement is limited to Canadian goods and/or services.

(ix) This procurement is subject to the Controlled Goods Program.

3. Debriefings

After contract award, 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.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

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 email to PWGSC will not be accepted.

3. Communications - Solicitation Period

All enquiries must be submitted 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 question(s) or may request that the Bidder do so, so that the proprietary nature of the question(s) is eliminated and the enquiry can be answered to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

4. 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.

5. Maximum Funding

The maximum funding available for the contract resulting from the bid solicitation is \$650,000 (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.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

PART 3 - BID PREPARATION INSTRUCTIONS

1. Bid Preparation Instructions

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

- Section I: Technical and Managerial Bid as well as the Executive Summary: (1 hard copy and 2 soft copies on CD)
- Section II: Financial Bid (1 hard copy and 1 soft copy on CD)
- Section III: Certifications (1 hard copy)

If there is a discrepancy between the wording of the soft copy and the hard copy, the wording of the hard copy will have priority over the wording of the soft copy.

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

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

- (a) use 8.5 x 11 inch (216 mm x 279 mm) paper; and
- (b) use a numbering system that corresponds to the bid solicitation.

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 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, print double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

Section I: Technical and Managerial Bid

In their Technical and Managerial Bid, bidders should demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders should demonstrate their capability and describe their approach in a thorough, concise and clear manner for carrying out the Work.

The Technical and Managerial Bid should address clearly and in sufficient depth the points that are subject to the evaluation criteria against which the bid will be evaluated. Simply repeating the statement contained in the bid solicitation is not sufficient. In order to facilitate the evaluation of the bid, Canada requests that bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, bidders may refer to different sections of their bids by identifying the specific paragraph and page number where the subject topic has already been addressed.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Part 4, Evaluation Procedures contains additional instructions that bidders should consider when preparing their technical Bid.

The structure and content requested for the Technical and Managerial Bid (Section I) are detailed in to Part 3- Attachment 1: Technical and Managerial Bid Preparation Instructions.

Section II: Financial Bid

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

Option 1:

- (a) A firm, all inclusive lot price for the Work, which must not exceed the maximum funding available as indicated in PART 2 – Section 5: Maximum funding. The total amount of Applicable Taxes are to be shown separately, if applicable. The information should be provided in accordance with the Basis of Payment at Annex B;
- (b) Prices must be in Canadian funds, Applicable Taxes excluded, and Canadian customs duties and excise taxes included.

-OR-

Option 2:

- (a) A Total Cost to a Ceiling Price, which must not exceed the maximum funding available as indicated in PART 2 – Section 5: Maximum funding. The total amount of Applicable Taxes are to be shown separately, if applicable. The information should be provided in accordance with the Basis of Payment at Annex B;
- (b) Prices must be in Canadian funds, Applicable Taxes excluded, and Canadian customs duties and excise taxes included.

Price Breakdown

Bidders are requested to detail the following elements for the firm lot price quoted in response to the Option 1, as applicable:

- (a) Labour: For each individual and (or) labour category to be assigned to the Work, indicate: i) the hourly rate, inclusive of overhead and profit; and ii) the estimated number of hours.
- (b) Equipment: Specify each item required to 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: Identify each category of materials and supplies required to complete the Work and provide the pricing basis.
- (d) Travel and Living Expenses: 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 Treasury Board (TB) 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->

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

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. The Treasury Board Secretariat's Special Travel Authorities, http://www.tbs-sct.gc.ca/pubs_pol/hrpubs/tbm_113/statb-eng.asp, also apply.

- (e) Subcontracts: Identify any proposed subcontractor and provide for each one the same price breakdown information as contained in this article.
- (f) Other Direct Charges: Identify any other direct charges anticipated, such as long distance communications and rentals, and provide the pricing basis.
- (g) Applicable Taxes: Identify any Applicable Taxes separately.

Exchange Rate Fluctuation

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

Section III: Certifications

Bidders must submit the certifications required under Part 5.

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, management and financial evaluation criteria.
- (b) An evaluation team composed of representatives of Canada will evaluate the bids.

1.1 Technical and Management Evaluation

1.1.1 Point Rated Technical and Management Criteria

Point rated Technical and Management Evaluation Criteria are described in Attachment 1 Part 4 – *Point Rated Technical and Management*. 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 criteria. Bidder must respect the maximum funding available indicated in PART 2 – Section 5: Maximum Funding (Applicable Taxes extra, as appropriate).

Bids which 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, FOB destination, Canadian customs duties and excise taxes included.

2. Basis of Selection

Basis of Selection - Highest Combined Rating of Technical Merit (80%) and Price (20%)

1. To be declared responsive, a bid must:
 - a) comply with all the requirements of the bid solicitation;
 - b) meet all mandatory evaluation criteria;
 - c) obtain the required minimum of 10 points on a scale of 15 points for the Evaluation Criterion #1 "Technical Relevance" as indicated in Table 4A.1 of Attachment 1 of Part 4 ;and
 - d) obtain the required minimum of (70) points for the overall Technical and Management portion of the bid as indicated in Table 4A.1 of Attachment 1 of Part 4.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

The rating is performed on a scale of 100 points.

2. Bids not meeting (a) or (b) or (c) or (d) will be declared non-responsive.
3. The selection will be based on the highest responsive combined rating of technical merit and price. The ratio will be 80% for the technical merit and 20 % for the price.
4. To establish the technical merit score, the overall technical score for each responsive bid will be determined as follows: (total number of points obtained) / (maximum number of points available) multiplied by the ratio of 80 %.
5. To establish the pricing score, each responsive bid will be prorated against the lowest evaluated price and the ratio of 20 %.
6. For each responsive bid, the technical merit score and the pricing score will be added to determine its combined rating.
7. Neither the responsive bid obtaining the highest technical score nor the one with the lowest evaluated price will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be recommended for award of a contract.

In the event that more than one responsive bid has the same combined rating of technical merit and price, the bid which obtained the highest number of points for the point rated Technical evaluation criteria will be recommended for award of a contract.

The table below illustrates an example where all three bids are responsive and the selection of the contractor is determined by a 80/20 ratio of technical merit and price, respectively. The total available points equal 135 and the lowest evaluated price is \$45,000 (45).

Basis of Selection - Highest Combined Rating Technical Merit (80%) and Price (20%)

Bidder	Bidder 1	Bidder 2	Bidder 3
Overall Technical	115/135	89/135	92/135
Bid Evaluated Price	\$55,000.00	\$50,000.00	\$45,000.00
Calculation of Technical Merit Score	$115/135 \times 80 = 68,15$	$89/135 \times 80 = 52,74$	$92/135 \times 80 = 54,52$
Calculation of Pricing Score	$45/55 \times 20 = 16,36$	$45/50 \times 20 = 18,00$	$45/45 \times 20 = 20,00$
Combined Rating	84,51	70,74	74,52
Overall Rating	1st	3rd	2nd

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

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 made knowingly or unknowingly, during the bid evaluation period or during the contract period.

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

1. Certifications Required 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 Integrity Provisions - 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_equality/eq/emp/fcp/list/inelig.shtml)" list (http://www.labour.gc.ca/eng/standards_equality/eq/emp/fcp/list/inelig.shtml) available from [Employment and Social Development Canada \(ESDC\) - 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.

2. Additional Certifications Required Precedent to Contract Award

The certifications in Attachment 1 to Part 5 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.

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

PART 6 - FINANCIAL AND OTHER REQUIREMENTS

1. Financial Capability

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

2. Controlled Goods Requirement

SACC Manual clause A9130T (2011-05-16), Controlled Goods Program

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

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

The Contractor must perform the Work in accordance with the Statement of Work at Annex _____ and the Contractor's technical bid entitled _____, dated _____ **(to be inserted at contract award)**.

1.1 Work Authorization

Despite any other condition of the Contract, the Contractor is only authorized to perform the Work up to the "Work Authorization Meeting and Decisions" (see Annex A – Statement of Work, section A.5.2.3) (previously known as Go-No Go meetings). Depending on the results of the review and evaluation of the Work, Canada will decide at its discretion whether to continue with the Work.

If Canada decides to continue with the Work, the Contracting Authority will advise the Contractor in writing to continue with the work in accordance with the Statement of Work. The Contractor must immediately comply with the notice.

If Canada decides not to proceed with the Work, the Contracting Authority will advise the Contractor in writing of the decision and the Contract will be considered completed at no further costs to Canada. In no event will the Contractor be paid for any cost incurred for unauthorized work.

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 Contract

The Contract period starts on the contract date for a maximum of ten (10) months.

Solicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

3.2 Delivery Date

3.2.1 The FIRR demonstrator, the rack of control equipments, the hardware and accessories required for the integration and operation of FIRR on the aircraft, and the certification package must be delivered to the flight departure site (Muskoka Airport, Gravenhurst, ON P1P 1R1) as soon as this part is ready and no later than eight (8) months following the date the contract is awarded; and

3.2.2 All other hardware, software, codes, data, and documents generated or procured during the contractual work must be delivered to the CSA as soon as this part is ready and no later than June 30, 2015.

4. Authorities

4.1 Contracting Authority

The Contracting Authority for the Contract is:

Anca Jurca
Supply Team Leader
Public Works and Government Services Canada
Quebec Region
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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

The Project Authority for the Contract is:

(will be identified in the contract)

The Project Authority named above is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the evaluation, recommendations and approvals of Progress claims, Schedule or Cost and Acceptance of the deliverable items of the Work under this Contract. Such Progress claim, scheduling, cost or acceptance of deliverables matters may be discussed with the Project Authority; however the Project 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

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

4.3 Technical Authority

The Technical Authority for the Contract is:

(will be identified in the contract)

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

(will be identified in the contract)

5. Proactive Disclosure of Contracts with Former Public Servants

En fournissant de l'information sur son statut en tant qu'ancien fonctionnaire touchant une pension en vertu de la [Loi sur la pension de la fonction publique](#) (LPFP), l'entrepreneur a accepté que cette information soit publiée sur les sites Web des ministères, dans le cadre des rapports de divulgation proactive des marchés, et ce, conformément à l'[Avis sur la Politique des marchés : 2012-2](#) du Secrétariat du Conseil du Trésor du Canada.

6. Payment

6.1 Basis of Payment

Option 1

6.1.1 Basis of Payment - Firm Price

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

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

-OR-

Option 2

6.1.1 Basis of Payment - Ceiling Price

The Contractor will be reimbursed for the costs reasonably and properly incurred in the performance of the Work, as determined in accordance with the Basis of Payment in Annex B, to a ceiling price of \$ _____. Customs duties are included and Applicable Taxes are extra.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

The ceiling price is subject to downward adjustment so as not to exceed the actual cost reasonably incurred in the performance of the Work and computed in accordance with the Basis of Payment.

6.2 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.

6.3 Method of Payment

Option 1

6.3.1 Milestone Payments - 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.

6.3.2 Schedule of Milestones

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

OR

Option 2

6.3.1 Progress Payments - Ceiling Price

1. Canada will make progress payments in accordance with the payment provisions of the Contract, no more than once a month, for cost incurred in the performance of the Work up to 90 percent of the amount claimed and approved by Canada 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) the amount claimed is in accordance with the Annex B: Basis of Payment;

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

- (c) the total amount for all progress payments paid by Canada does not exceed 90 percent of the total amount to be paid under the Contract;
 - (d) all certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives.
2. The balance of the amount payable will be paid in accordance with the payment provisions of the Contract upon completion and delivery of all work required under the Contract if the Work has been accepted by Canada and a final claim for the payment is submitted.
 3. Progress payments are interim payments only. Canada may conduct a government audit and interim time and cost verifications and reserves the right to make adjustments to the Contract from time to time during the performance of the Work. Any overpayment resulting from progress payments or otherwise must be refunded promptly to Canada.

6.4 SACC Manual Clauses

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

C0305C (2008-05-12), Cost Submission (Applicable for "Ceiling Price" contracts)

7. Invoicing Instructions

Option 1

7.1 Invoicing Instructions - Progress Claim - Firm Price

1. The Contractor must submit a claim for progress payment using form PWGSC-TPSGC 1111 (<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/1111.pdf>).

Each claim must show:

- (a) all information required on form PWGSC-TPSGC 1111;
 - (b) all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;
 - (c) the description and value of the milestone claimed as detailed in the Contract.
2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.
 3. The Contractor must prepare and certify one (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 under "Invoices" (Financial Services Section) for appropriate certification by the Project Authority identified herein after inspection and acceptance of the Work takes place;

and,

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

- b) one (1) copy of the original progress claim to the Contracting Authority identified under the section entitled "Authorities" of the Contract.
- 4. The CSA's Financial 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.

Option 2

7.1 Invoicing Instructions - Progress Claim - Ceiling Price

- 1. The Contractor must submit a claim for progress payment using form PWGSC-TPSGC 1111 (<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/1111.pdf>).

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) a list of all expenses;

Each claim must be supported by:

- (a) a copy of time sheets to support the time claimed;
- (b) a copy of the invoices, receipts, vouchers for all direct expenses, and all travel and living expenses;
- (c) a copy of the monthly progress report.
- 2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.
- 3. The Contractor must prepare and certify one (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 under "Invoices" (Financial Services Section) for appropriate certification by the Project Authority identified herein 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. The CSA's Financial 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.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

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

8. Certifications

8.1 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 entire contract period. 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.

8.2 SACC Manual Clauses

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

9. 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*).

10. 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;
- (e) Annex B, Basis of Payment;
- (f) the Contractor's bid dated _____ as clarified / amended (if applicable) on _____.

11. Foreign Nationals (Canadian Contractor)

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

12. Insurance

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

13. Controlled Goods Program

13.1 SACC Manual clause A9131C (2011-05-16), Controlled Goods Program

ATTACHMENT 1 TO PART 3

TECHNICAL AND MANAGERIAL BID PREPARATION INSTRUCTIONS

3A.1. TECHNICAL AND MANAGERIAL BID

The details provided in this Attachment complement the information introduced in Part 3 - Bid Preparation Instructions.

The Bidder should present the information about the Technical and Managerial Bid in the following order:

1. Title / Project Identification Page (see 3A.2);
2. Executive Summary (see 3A.3);
3. Table of Contents (see 3A.4);
4. Technical Relevance (see 3A.5);
5. Technical Section (see 3A.6);
6. Managerial Section (see 3A.7);
7. Bid Appendices (see 3A.8).

The structure of the Technical and Managerial Bid, and its subsections, are described below. Some of the subsection headings are followed by numbers in brackets. These numbers represent the Evaluation Criteria (see Table 4A.1 of Attachment 1 to Part 4) that are applicable to that specific section/subsection for the bid submitted by a Bidder.

3A.2 Title/Project Identification Page

The first page of the bid submitted should state the following information.

- a) The Request For Proposal file number;
- b) The company's name and address;
- c) The title of the proposed Work (the use of acronyms in the title is discouraged, unless they are described);
- d) The current and targeted TRL (up to TRL 6) of the proposed technology (refer to Annex A, Appendix A-1 Technology readiness Levels (TRLs) for TRL descriptions); and
- e) A short extract from the Executive Summary (maximum **7 lines**) of the bid.

3A.3 Executive Summary

The Bidder must provide an Executive Summary. The Executive Summary is a stand-alone document suitable for public dissemination, for example, through the CSA web site. The Executive Summary should not exceed two pages in length (8.5" x 11") and should highlight the following elements:

- a) Work objectives;
- b) Relevance to the requested technology;
- c) Main innovations;
- d) TRL development;
- e) Technical risks;
- f) Major milestones and deliverables; and
- g) Impact on the proposed technology and the associated targeted Future Mission(s).

Bidder should provide the Executive Summary in Soft copy with the only acceptable format: MS Word, WordPerfect, PDF or HTML in a separate file and not contain any proprietary markings.

3A.4 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 Soft copy version.

3A.5 Technical Relevance

3A.5.1 Relevance of the technology (Evaluation Criterion 1)

(See section 4A 3.1 Criterion 1 Technical Relevance of Attachment 1 to Part 4)

The criterion assesses the degree of relevance, which the proposed Work has with respect to CSA's requested technology. More specifically, this criterion assesses the degree to which the bid exhibits an understanding of the stated performance and functional requirements and explains how the proposed technology will contribute to meeting these requirements.

The Bidder should address and substantiate the relevance of the proposed technology to the requested technology defined in Appendix A-5 of Annex A Specific Statement of Work. The relevance to the requested technology is an essential element.

3A.6 Technical Section

The Technical Section should describe the technical aspects of the project as outlined in the following subsections.

3A.6.1 Team Technical Experience and Capacity (Evaluation Criterion 2)

(See section 4A.3.2 Criterion 2 Team Technical Experience and Capacity of Attachment 1 to Part 4)

This criterion assesses the combined technical capability and experience of the team assembled to carry out the Work. In order to do the assessment, the bidder should demonstrate capabilities and experience in developing technologies and engineering development of similar technology and comparable score and complexity to the Work detailed in the Appendix 5 of Annex A: Specific Statement of Work.

3A.6.2 Understanding the Technology (Evaluation Criterion 3)

(See section 4A.3.3 Criterion 3 Understanding the Technology of Attachment 1 to Part 4)

Bidder should demonstrate in his proposal that this criterion assesses the degree to which the bid exhibits an understanding of the fundamental concepts and trade-offs on the needs of the technology and of the proposed application as they relate to the research activity proposed. In order to do the assessment, a concise statement of the technical objectives of the Work, both in terms of its functionality and performance is to be provided. Also, a description of the proposed technology must be provided, including a description of the overall problem, an overview of the background context, such as results of literature searches, prior development, state-of-the-art, and a general description of the expected improvement, results and benefits, based on the technical objectives described in the Appendix 5 of Annex A: Specific Statement of Work.

3A.6.3 Technical Methodology (Evaluation Criterion 4)

(See section 4A.3.4 Criterion 4 Technical Methodology Criterion of Attachment 1 to Part 4)

For this criterion, the Bidder should provide an overview of the technical methodology and its correlation with the main activities of the work-plan. The methodology outlined should describe how the Work would be conducted through the utilisation of analytical methods, procedures, techniques, industry standards, best practices and the state-of-the-art for pertinent disciplines, such as "value engineering." Methodology should clearly demonstrate maturation of the particular technology in terms of TRL and define conditions and criteria, pertinent to the technology in question, which should be met at each TRL level covered by the bid.

The Bidder should also elaborate on and substantiate the proposed methodology while making references to the main activities of the work-plan described in the body of the bid and appearing in the Work Breakdown Structure (WBS), (see paragraph 3A.7.2.2 of Attachment 1 to Part 3). The effectiveness of the methodology and its correlation to the work-plan should be explained and substantiated.

The methodology and the corresponding work-plan should take in consideration the Technical Risk Assessment/Analysis (see paragraph 3A.6.4 of Attachment 1 to Part 3). For projects involving software development, the Bidder should outline the software development environment and methodology already in place (e.g., use of CASE tools, standards, quality assurance, etc.). The methodology being employed should include any of the relevant issue that could potentially

affect the progression of the work-plan. As an example, the availability of equipment, facilities and infrastructure to support successful progression of the Work will be provided here.

3A.6.4. Technical Risk Assessment/Analysis

(Will not be used as a proposal evaluation criterion)

In the technical methodology subsection the bidder should provide an assessment of the technical risks/uncertainties involved as well as the major assumptions upon which the work is based. In particular, this subsection should address any performance risks that pertain to the new technology. The risks should be identified and a Risk Mitigation Plan, that would include contingency plans, alternatives or other means of limiting adverse impacts of risks being realized, should be provided. As a guideline, Table 3A.1 presents a fictitious example of a Technical Risk Assessment Matrix, while Table 3A.2 presents an example of a Project Risk Profile Matrix.

Risk Event 1 (R1)	Limited availability of key documents	
Probability	Low	1/20 Past experience demonstrates important number of different sources for patents and articles covering this subject
Consequence to project	Low	\$5 000 - \$10 000 Cost growth Schedule delays
Risk Assessment	Low	\$250 - \$500 (R < 5% of overall project value, \$250K)
Mitigation Plan	Secure at least 2 sources for each type of document	
Contingency Plan	Use second source	

Table 3A.1: Example of a Technical Risk Assessment Matrix

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Probability			
High			R2
Medium			
Low	R1		
	Low	Medium	High
	Consequence		

Table 3A.2: Project Risk Profile Matrix

It is understood that in order to develop advanced technologies, a certain amount of technical risk should be assumed. The more innovative the technology is, the higher the technical risk will generally be. The extent to which higher technical risks are acceptable depends upon how well they have been identified, defined, assessed, planned for, and managed once realized. If the technical risks are poorly defined, or the risk mitigation is inadequately planned, then the project's evaluation score is likely to diminish.

3A.6.5 Performance Evaluation Criteria (PEC)

(Will not be used as a proposal evaluation criterion)

The Bidder should provide a list of objectively measurable or binary (yes/no) Performance Evaluation Criteria (PEC) for use as the foundation to evaluate the progress of the project and compare with the initial technical objectives. This list will be reviewed, updated if needed, and accepted by the CSA at the Kick-Off Meeting and at each Milestones/ Progress Meetings for upcoming Milestones/Progress Review Meetings. See Annex A, section A.5.2. The PEC will be used at the Work Authorization Meeting and decision as a basis for a decision to proceed with the follow-on activities of the project.

3A.7 Managerial Section

The Managerial Section should demonstrate the effectiveness and commitment of the Bidder in delivering the Work and the overall technology development up to its integration into the targeted Future Mission(s). Its subsections are Key Resource Management Experience, Management Plan.

3A.7.1 Key Resource Management Experience (Evaluation Criterion 5)

(see section 4A.3.5 Criterion 5 Key Resource Management Experience of Attachment 1 to Part 4)

The Bidder should identify his Project Manager for the bid he submits and outline his/her qualifications. Bidder It should identify the key members of the project's technical and

management teams and state their specific qualifications and experience for the work involved. Detailed resumes must be provided into an Appendix to Section I of the bid. Names of back-up personnel for key positions should also be included.

This section should also outline the roles and responsibilities of all the proposed resources, as well as discuss and highlight the unique expertise they offer with respect to the capability of the team. Bidder should include an organization chart that illustrates the structure of the proposed project team.

3A.7.2 Management Plan (Evaluation Criterion 6)

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

The Bidder should present a Management Plan. The Management Plan for its completeness and assesses its effectiveness in directing the project to a successful completion. Collaborative projects and/or projects led by University or Non-Profit Bidders should identify specific tasks and objectives related to an effective process for transfer of knowledge and technologies to industry. IP management approach must be described. The Management Plan's presentation must be based on the recognized management tools most applicable to the proposed project, such as a scope planning (Work Breakdown Structure), and schedule development charts (Gantt, Program Evaluation and Review Technique -PERT, etc). Equivalent Bidder-developed, project-tailored tools/charts are also acceptable, provided that the information is complete and comprehensive.

3A.7.2.1 Bidder Background and Related Experience

(Will not be used as a proposal evaluation criterion)

This section should contain a concise overview of the Bidder. It should cover the following elements: the nature and structure of the Bidder's organization; the level of Canadian ownership; the location, size and general description of the plant facility; the size and composition of staff; the principal product or field of endeavour; the annual business volume and general nature of the company's client base; and a list of any applications for funding from other Government sources and/or Government contracts received for similar and/or related work. This section should identify the location where the Work will be performed.

3A.7.2.2 Work Breakdown Structure and Work Package Definition

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

This Management Plan subsection should define and specify the scope of Work to be executed according to the requirements of the Statement of Work, Contract Deliverables and Meetings (Annex A). Work Breakdown Structure (WBS) is a recognized scope definition technique, while Work Packages (WP) stem from the WBS. The WBS should flow down to a low enough level and the associated WP should be defined in sufficient depth in order for the Bidder to demonstrate the process that will be followed to perform the project.

Each WP should focus on specific activities that will form the total Work and, as a minimum, should define and describe the specific work to be carried out. It should also indicate: the person

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

responsible, the WP's associated levels-of-effort and required resources, the schedule (start and finish dates), the risks, and the associated inputs and deliverable or output.

As a guideline, Figure 3A.1 presents a fictitious example of a WBS, while Table 3A.3 presents a fictitious example of a Work Package Definition Sheet. For each work packages the Bidder should provide a detailed statement of work and list the associated resources.

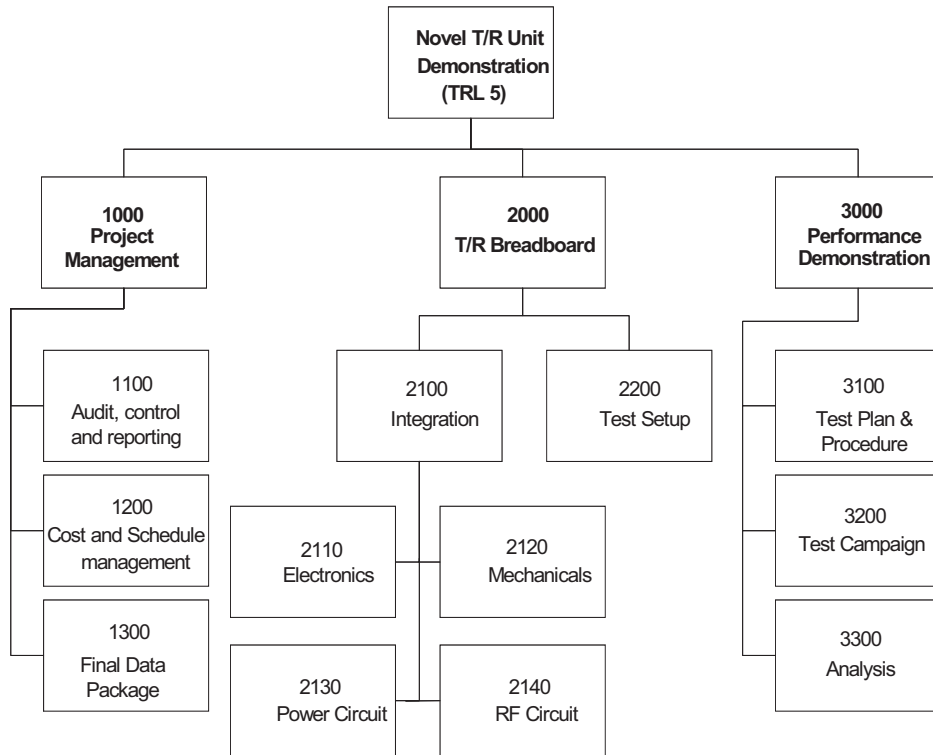


Figure 3A.1: Example of a Work Breakdown Structure

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

Project: T/R Unit Demonstration		
Work Pack Title:	TEST SETUP	WBS Ref: 2200
Sheet: 1 of 1	WP Estimated Value:	Do not indicate \$ value in Section I of the bid, indicate value only 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		
<u>Objectives:</u>		
<ul style="list-style-type: none"> Deliver a functional test setup for the T/R unit 		
<u>Inputs:</u>		
<ul style="list-style-type: none"> Test plan and procedure Unit drawings Unit Interface Control Documents 		
<u>Tasks:</u>		
<ul style="list-style-type: none"> Review input documentation Define requirements Produce initial concept Design test setup Fabricate test setup Commission and debug 		
<u>Outputs and Deliverables:</u>		
<ul style="list-style-type: none"> Fully functional T/R unit test setup Test setup log manual Test setup user manual 		

Table 3A.3: Example of Work Package Definition Sheet

3A.7.2.3 Personnel Allocation**(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)**

This Management Plan subsection should include a Responsibility Assignment Matrix (RAM) 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. Also, the RAM should identify the role of the individual, either being the accountable person for the WP (A), or being a participant (P). As a guideline, Table 4 presents a fictitious example of a RAM. The RAM should be presented in both the technical bid and the financial bid.

WBS Number	Work Package 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

Table 3A.4: Example of Responsibility Allocation Matrix (RAM)*P: Participant**A: Accountable*

3A.7.2.4 Managerial Risk Assessment**(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)**

This Management Plan subsection should provide an assessment of the managerial risks involved, provide a Risk Mitigation Plan and identify critical issues that may jeopardize the successful completion of the Work within cost and schedule constraints. As a guideline, Table 3A.5 presents a fictitious example of a Managerial Risk Assessment Matrix. Additionally, Table 3A.6 presents an example of a Project Risk Profile Matrix.

Risk Event 2 (R2)	Late delivery of test equipment	
Probability	High	1/3 Past experience with provider demonstrated poor respect of schedule
Consequence to project	High	\$110 000 (cost of securing optional test facility) Significant cost growth Significant schedule delays
Risk Assessment	High	\$55 000 High (R > 25% of overall project value)
Mitigation Plan	Identify and secure equivalent equipment in immediate geographical region Ensure equipment will be available for needed time frame Memo of understanding with facility key managers	
Response Plan	Secure equipment with MOU Confirm time frame options with facility	

Table 3A. 5: Example of a Managerial Risk Assessment Matrix

Probability			
High			R2
Medium			
Low	R1		
	Low	Medium	High
	Consequence		

Table 3A.6: Example of a Project Risk Profile Matrix

3A.7.2.5 Milestones and Deliverables

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

This Management Plan subsection should contain a definition of the milestones and describe in details all expected deliverables, including hardware, software, and relevant documentation (refer to Annex A for more details). When appropriate, the milestones and deliverables should contain all elements identified in Table A-2 of Annex A and should relate to the corresponding WP definition in a manner enabling clear monitoring of progress.

3A.7.2.6 Schedule

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

The Bidder should provide a project timetable that relates tasks, milestones and deliverables. A Gantt chart and/or PERT chart should be used to illustrate the schedule. The schedule should show significant details for events associated with achievement of major tasks, milestones and deliverables. The Bidder should demonstrate how required milestones will be met. Linkage between activities should also be identified in the schedule. For planning purposes, use a project start date of August 2014.

3A.7.2.7 Project Control System

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

This Management Plan subsection should outline the methods and systems to be used to control tasks, schedules, and costs for the Work. The Contract Plan and Report Form (PWGSC-TPSGC 9143) can be substituted by another project management tool or a spreadsheet software package as long as it contains, as a minimum, the information required in the Contract Plan and Report Form (see following link for document: <http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/formulaires-forms-eng.html>). Additionally, the Project Control System should be capable of reporting the amount of work per WBS item for each individual on a monthly basis.

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

3A.7.2.8 Background Intellectual Property and Foreground Intellectual Property

(See section 4A.3.6 Criterion 6 Management Plan of Attachment 1 to Part 4)

This subsection should identify and describe all Background Intellectual Property (BIP) that is required to conduct and/or support the Work and all Foreground Intellectual Property (FIP) expected to arise from the proposed Work. BIP and FIP element should be described in sufficient detail so as to be clearly distinguishable. The expected format to provide this information is as per Tables 3A.7 and 3A.8.

Solicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

BIP #	Title of the BIP	Types of IP (software algorithms, hardware design, patent)	Type of access to the BIP required to use/improve the FIP	Description of the BIP	Reference documentation (technical report, design document)	Origin of the BIP (internal R&D, project # or contract #)	Owner of the BIP (contractor, subcontractor)

Table 3A.7: Disclosure of Background Intellectual Property (BIP) expected to be required for the Contract

FIP #	Title of FIP	Type of FIP (copyright, invention, design, software, know-how, trade	Description of the FIP	Reference documentation (technical report, design document)	Owner of the FIP (contractor, subcontractor, or the Canada)

Solicitation No. - N° de l'invitation	Amd. No. - N° de la modif.	Buyer ID - Id de l'acheteur
9F063-140220/A		mtb575
Client Ref. No. - N° de réf. du client	File No. - N° du dossier	CCC No./N° CCC - FMS No./N° VME
9F063-14-0220	MTB-4-37091	
	secret...)	

Table 3A.8: Disclosure of the Foreground Intellectual Property (FIP) expected to be developed under the Contract

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Bidders should use of graphical representations that include block diagrams is encouraged in order to demonstrate the relationships between the various elements of the BIP and the FIP. The BIP and the expected FIP will be reviewed at the Kick-Off Meeting, and updated at each Review Meeting.

For each element of the BIP, this subsection should also specify:

- a) In what way the BIP element will be incorporated into the FIP;
- b) The type of access to each element of the BIP that is required in order to use, modify, improve and/or further develop the FIP; and
- c) The owner of the BIP.

Bidder's realizations that are software oriented and propose to improve upon existing software programs/applications will be required to provide the initial source code and associated documentation along with the final deliverables, unless the improvements can be clearly distinguished from the existing software (i.e., can be divided in different modules). In this case, the Interface Configuration Document (ICD) between the existing and new modules, and the executables of the existing module would be a deliverable. Similarly, projects that propose to improve upon existing hardware apparatus, fabrication or other processes will be required to provide current drawings, documentation and process descriptions along with the deliverables.

The Bidder should address and confirm the availability of all BIP elements to the CSA, in particular, if the final deliverables and the proof-of-concept demonstration require a special proprietary environment or tools for their operation. The Bidder will only be allowed to claim for costs associated with acquiring a research license for third-party BIP in order to conduct an assessment of such BIP to determine its usefulness to the technology being developed. The Bidder should acquire, at its own cost, a commercial license for any required third-party BIP. The acquisition of such a commercial license is strongly encouraged, although not paid for by the contract, as a demonstration of the Bidder's commitment to commercializing the FIP.

3A.8. Bid Appendices

3A.8.1 Appendices Required with the Bid

The following item should be addressed in individual appendices as part of the bids:

- a) List of Acronyms: All the acronyms used in the Section I: Technical and Managerial Bid, should be explained;
- b) Resumes: The bid should include resumes of the proposed resources and these should be appended to Section I: Technical and Managerial Bid;
- c) Relevant Technical Papers Published by Team Members: Only literature that is relevant and that would be useful to support the bid;
- d) List of Contacts: The list of contacts should be appended to Section I: Technical and Managerial Bid, in a format suitable for distribution and should include all the Bidder's points-of-contacts involved in the bid development and/or during the Contract.

Solicitation No. - N° de l'invitation

9F063-140220/A

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

9F063-14-0220

Amd. No. - N° de la modif.

File No. - N° du dossier

MTB-4-37091

Buyer ID - Id de l'acheteur

mtb575

CCC No./N° CCC - FMS No./N° VME

The following example format should be used:

Role	Name	Telephone	Fax	E-Mail
Project Manager				
Project Engineers/Head Investigator				
Contractor's Representative				
Claims(Invoicing) Officer				
Communications (for press release)				
Etc.				

Table 3A.9: Bidder's List of Contacts

If possible, and for the Project Authority ease of reference, the Bidder is also encouraged to include an electronic business card for each of the points-of-contact.

ATTACHMENT 1 TO PART 4

POINT RATED EVALUATION CRITERIA

1. TECHNICAL AND MANAGEMENT CRITERIA AND RATINGS

The Bidder must achieve the minimum score requirements as indicated in Table 4A.1: "List of Evaluation Criteria and Associated Ratings". The bid will be evaluated according to the point-rated criteria as specified in Table 4A.1 and as described in section 4A.3 "Evaluation Criteria and Benchmark Statements".

The criteria are grouped under the following divisions:

- a) Technical Relevance Criterion,
- b) Technical Criteria, and
- c) Management Criteria.

Section 4A.3 "Evaluation Criteria and Benchmark Statements" of the current attachment contains a series of evaluation criteria, each supported by a set of 5 benchmark statements (0, A, B, C, and D). Each of these statements has a corresponding relative value:

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

As an example, the maximum point rating for the "*Team Technical Experience and Capacity*" criterion is 10 points. If a Bid receives a "C" for this criterion in the evaluation process, the score attributed will be:

75% of 10 points = 7.5 points (score)

Table 4A.1 identifies:

- a) The maximum point rating assigned to each criterion;
- b) The minimum point rating required for the "Technical Relevance" criterion;
- c) The maximum point rating possible for the overall score; and
- d) The minimum point rating required for the overall score.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Evaluation Criteria and Ratings	
	Ratings
Technical Relevance Criterion	
1. Relevance of the technology	15
Minimum Score	10
Technical Criteria	
2. Team Technical Experience and Capacity	10
3. Understanding the Technology	25
4. Technical Methodology	25
Minimum Score	N/A
Management Criteria	
5. Key Resource Management Experience	10
6. Management Plan	15
Minimum Score	N/A
Maximum Overall Score	100
Minimum Overall Score Requirement	70

Table 4A.1: - List of Evaluation Criteria and Associated Ratings

4A.2. BIDDER'S CRITERIA SUBSTANTIATION

The Bidder is requested to provide a substantiation (supporting evidence), which should be submitted as an appendix to their Section I (see section 3A.8.1 "Appendices Required with the bid" of Attachment 1 of Part 3: Technical and Managerial Bid Preparation Instruction).

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 summarised in the substantiation.

For convenience, a Substantiation Table is provided in Table 4A.2 below. Enter each relevance/technical/management 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.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Company:	
Project Title:	
Criteria	
Substantiation	
<i>Ex.: 1</i> <i>(criterion number)</i>	<i>Relevance of the technology It is expected that 300 words or so should be sufficient to make your case.</i>

Table 4A.2: Substantiation Table**4A.3. EVALUATION CRITERIA AND BENCHMARK STATEMENTS**

The evaluation criteria benchmark statements are used by the evaluators as guidelines to justify their score. Bidders should use them to focus on the relevant information to be provided.

TECHNICAL RELEVANCE CRITERION**4A.3.1 CRITERION 1: TECHNICAL RELEVANCE**

This criterion assesses the degree of relevance which the proposed Work has with respect to CSA's required technology for Future Missions. More specifically, this criterion assesses the degree to which the bid exhibits an understanding of the stated performance and functional requirements and justification of the contribution of the proposed technology to meeting these requirements.

A minimum of 10 points are required for the bid to be considered compliant.

Score Benchmark Statements

- | | |
|---|--|
| 0 | The bid does not address the technology required by CSA. |
| A | The bid addresses the technology defined in Appendix A-5 of Annex A but does not show an understanding of the driving needs nor does it demonstrate how the proposed technology will contribute to meeting the stated requirements. |
| B | The bid addresses the technology defined in Appendix A-5 of Annex A but either shows a poor understanding of the driving needs, or a vague demonstration how the proposed technology will contribute to meeting the stated requirements. |

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

- C The bid addresses the technology defined in Appendix A-5 of Annex A, shows an overall understanding of the driving needs, and generally demonstrates contribution of the proposed Work to meeting the stated requirements. However, some details regarding the contribution of the proposed technology to meeting the overall requirements and/or the expected characteristics remain unclear.
- D The bid addresses the technology defined in Appendix A-5 of Annex A, shows a complete grasp of the driving needs and its importance to Canada and its stakeholders, and demonstrates a solid understanding of the performance and functional characteristics being sought, as well as a clear link between the proposed technology and stated performance and functional expected requirements.

TECHNICAL CRITERIA

4A.3.2 CRITERION 2: TEAM TECHNICAL EXPERIENCE AND CAPACITY

This criterion assesses the combined technical capability and experience of the team assembled to carry out the Work.

The proposal substantiates that the technical team:

<u>Score</u>	<u>Benchmark Statements</u>
--------------	-----------------------------

- | | |
|---|--|
| 0 | Has not demonstrated capability and experience with closely related technologies. |
| A | Has demonstrated limited capability and experience with closely related technologies. |
| B | Has demonstrated some capability and experience with closely related technologies but key capabilities are missing to form a comprehensive team. |
| C | Has worked actively with closely related technologies of comparable scope and complexity. The proposed team possesses all the capabilities and experience required to perform the Work. |
| D | Is highly experienced in developing closely related technologies and in the related engineering development of similar technology of comparable scope and complexity. The proposed team possesses all the capabilities required to perform the Work. |

4A.3.3 CRITERION 3: UNDERSTANDING THE TECHNOLOGY

This criterion assesses the degree to which the bid exhibits an understanding of the fundamental concepts of the technology and of the proposed application as they relate to the research activity proposed.

The bid:

<u>Score</u>	<u>Benchmark Statements</u>
--------------	-----------------------------

- | | |
|---|---|
| 0 | Does not exhibit an understanding of the required concepts and/or of the associated applications. |
|---|---|

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

- A Demonstrates only a limited understanding of the background or "state-of-the-art" of the technological concept(s) involved.
- B Demonstrates a general understanding of the state-of-the-art, includes a review of other work relevant to the concept, and explains why the proposed Work will lead to the expected results.
- C Demonstrates a detailed understanding of the state-of-the-art; includes a complete review of other work relevant to the central concept upon which the Work is based; and explains and provides some justification why the bid will lead to the expected results.
- D Broadens the review of fundamental concepts and other work underlying the bid to explain the full capabilities of the technology and its application, analyses and convincingly justifies the feasibility of achieving the technical objectives and the expected results.

4A.3.4 **CRITERION 4: TECHNICAL METHODOLOGY**

This criterion assesses the suggested Technical Methodology and its correlation with the work-plan as presented in the bid. It also evaluates the effectiveness of the described Methodology in resolving the technical challenges, in attaining the stated technical objectives of the Work, and in meeting requirements of the Statement of Work (SOW) described in ANNEX A.

Score Benchmark Statements

- 0 The methodology described in the proposal does not demonstrate how it will address the stated objectives.
- A The methodology described in the proposal follows a weak methodical approach.
- B The methodology described in the proposal demonstrates a somewhat acceptable approach. However, the proposal does not substantiate the effectiveness of the methodology being employed for achieving the stated objectives. Conditions and criteria to be met for each TRL level are not defined.
- C The methodology as described in the proposal demonstrates a robust approach. The proposal substantiates the effectiveness of the methodology for achieving the stated objectives. Conditions and criteria to be met for each TRL level are defined.
- D The methodology described in the proposal is based on state of the art expertise and demonstrates a robust approach. The proposal substantiates the effectiveness of the methodology being employed for achieving the technical objectives of the Work. Conditions and criteria to be met for each TRL level are well defined and elaborated.

MANAGEMENT CRITERIA

4A.3.5 CRITERION 5: KEY RESOURCE MANAGEMENT EXPERIENCE

This criterion assesses the qualifications and experience and past successes of the Project Manager and key project Scientists/Engineers identified to lead this proposal. Resumes requested to be appended to Section 1: Technical and Managerial Bid will be assessed for this criterion,

Score Benchmark Statements

- 0 The key project management team has not been identified or has no experience in successfully completing projects of similar scope, complexity and technology similar to that required for this proposal.
- A The key project management team does not have a proven track record of successfully completing projects of similar scope, complexity and technology similar to that required for this proposal.
- B The key project management resource has a moderate track record of successfully executing projects of a scope, complexity and technology similar to that required for this proposal.
- C The Project Manager and Project Scientist/Engineer identified have a proven track record of success in executing and managing projects of a scope, complexity and technology similar to that required for this proposal.
- D The Project Manager and Project Scientist/Engineers identified have a proven strong track record of success in completing projects on time, budget and performance of at least the scope, complexity and technology similar to that required for this proposal.

4A.3.6 CRITERION 6: MANAGEMENT PLAN

This criterion evaluates the Management Plan for its completeness and also assesses its effectiveness in directing the contract to a successful completion. It also assesses the Bidder's IP management approach.

The bid:

Score Benchmark Statements

- 0 Has no concrete management plan and thereby instills no confidence that the selected team will bring the contract to its successful completion.
- A Does not provide an adequate Management Plan and more than one of the subsections of the paragraph 3A.7.2 of Attachment 1 of Part 3 is not covered. Moreover, there is no BIP and/or FIP identified.

9F063-140220/A

mtb575

9F063-14-0220

MTB-4-37091

- B provides an adequate Management Plan, including identification of BIP and FIP; however, some subsections of Section 3A.7.2 of Attachment 1 of Part 3 are not covered. Consequently, the likelihood of delivering the proposed deliverables to the specified level of performance is not substantiated.
- C Provides a credible Management Plan and provides a reasonable, but not complete, BIP and FIP management approach. The plan's ability to effectively deliver on the projects requirements is demonstrated, but is somewhat limited because of lack of details.
- D Provides a coherent and comprehensive Management Plan. The plan's ability to effectively deliver on the project requirements is fully substantiated. A comprehensive IP management approach is provided.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

ATTACHMENT 1 TO PART 5

ADDITIONAL CERTIFICATIONS PRECEDENT TO CONTRACT AWARD

1. 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.

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

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. Canadian Content Certification

This procurement is limited to Canadian goods and Canadian services.

The Bidder certifies that:

- () a minimum of 80 percent of the total bid price consist 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://buyandsell.gc.ca/policy-and-guidelines/supply-manual/annex/3/6>)

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

3. 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.

Solicitation No. - N° de l'invitation

9F063-140220/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

mtb575

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

9F063-14-0220

File No. - N° du dossier

MTB-4-37091

CCC No./N° CCC - FMS No./N° VME

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. Failure to comply with the request may result in the bid being declared non-responsive.

4. 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.

Solicitation No. - N° de l'invitation

9F063-140220/A

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

9F063-14-0220

Amd. No. - N° de la modif.

File No. - N° du dossier

MTB-4-37091

Buyer ID - Id de l'acheteur

mtb575

CCC No./N° CCC - FMS No./N° VME

ANNEX A

STATEMENT OF WORK AND REQUIREMENTS

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

Solicitation No. - N° de l'invitation

9F063-140220/A

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

9F063-14-0220

Amd. No. - N° de la modif.

File No. - N° du dossier

MTB-4-37091

Buyer ID - Id de l'acheteur

mtb575

CCC No./N° CCC - FMS No./N° VME

ANNEX B BASIS OF PAYMENT

Option 1

FIRM PRICE Schedule of Milestones

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

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

Total Firm Price \$_____ (Applicable Taxes Extra)

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

ANNEX B BASIS OF PAYMENT

Option 2

CEILING PRICE

1. **LABOUR:** at the following firm rates

CATEGORY (OR NAME)

FIRM HOURLY RATE

etc.

\$ _____
\$ _____
\$ _____

Est.: \$ _____

2. **EQUIPMENT:** at laid down cost without markup
(Specify type of equipment.)

Est.: \$ _____

3. **RENTALS:** at actual cost without markup
(Specify what rentals.)

Est.: \$ _____

4. **MATERIALS AND SUPPLIES:** at laid down cost without
markup
(Specify what categories of materials and supplies.)

Est.: \$ _____

5. **TRAVEL AND LIVING EXPENSES:**

Est.: \$ _____

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal, private vehicle and incidental expenses provided in Appendices B, C and D of the National Joint Council (<http://www.njc-cnm.gc.ca/directive/travel-voyage/index-eng.php>), and with the other provisions of the directive referring to "travellers", rather than those referring to "employees" are applicable.

All travel must have prior authorization of the Project Authority. All payments are subject to government audit.

6. **SUBCONTRACTS:** at actual cost without markup
(Identify subcontractors, if applicable.)

Est.: \$ _____

7. **OTHER DIRECT CHARGES:** at actual cost without markup
(Specify what categories of direct charges.)

Est.: \$ _____

8. **OVERHEAD:** at a firm rate of ___% of item ___ above

Est.: \$ _____

9. **PROFIT:** at a firm rate of ___% of item ___ above

Est.: \$ _____

Solicitation No. - N° de l'invitation

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur

9F063-140220/A

mtb575

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

File No. - N° du dossier

CCC No./N° CCC - FMS No./N° VME

9F063-14-0220

MTB-4-37091

Estimated Cost to a Ceiling Price: \$ _____ (Applicable Taxes extra)

With the exception of the firm rate(s) and price(s), the amounts shown in the various items specified above are estimates only. Minor changes to these estimates will be accepted for billing purposes as the Work proceeds, provided that these changes have the prior approval of the Technical Authority and provided that the estimated cost does not exceed the aforementioned Ceiling Price.

ANNEX A

STATEMENT OF WORK AND REQUIREMENTS

A.1 SPACE TECHNOLOGY DEVELOPMENT PROGRAM BACKGROUND

The Space Technology Development Program (STDP) mandate is to formulate, implement and manage contracted out research and development (R&D) projects in response to identified needs and opportunities. Its objectives are to develop and demonstrate strategic technologies that have a strong potential for having a positive impact on:

- Reducing technical uncertainties for future Canadian space activities;
- Transforming key capabilities into wealth; and
- Creating knowledge through innovation.

The STDP will therefore support the development of technologies to meet the current and future needs of the Canadian Space Program (CSP).

A.2 OBJECTIVES

The objective of this Statement of Work (SOW) is to build and test a Far Infrared Radiometer for the characterization of ice clouds.

A.3 SCOPE

This document provides the requirements and deliverables for the development and advancement of a technology that is critical for the approval and implementation of a potential future Canadian space mission.

A.4 GENERIC TASK DESCRIPTION

This section presents the potential activities that might take place during typical STDP projects and are deemed appropriate within the required TRL range. Tasks will vary for different projects according to targeted TRLs and may include, but are not limited to, the standard project activities listed below in Table A-1: Guideline of Activities. Contractor should use the following guideline table to select the appropriate required activities in order to satisfy the conditions for the targeted TRLs. Technology Readiness Levels (TRLs) describe the standard language of the maturation process for technology development and evolution. TRLs are described in APPENDIX A-1 of ANNEX A).

List of Activities	
Project Management	
▪	Scope Planning (Work Breakdown Structure and Work Packages)
▪	Schedule
▪	Meetings
▪	Progress Monitoring
▪	Finance Management
▪	Documentation and Reporting
▪	Final Data Package
▪	Risk Management
	Risk Planning

Risk Identification & Characterization
Risk Analysis
Risk Mitigation and Tracking
▪ Configuration management
Sub-Contractor Management
▪ Procurement Plan
▪ IP Agreement
Needs Analysis
▪ Mission Definition
▪ Definition of Mission Requirements
▪ Environment Definition
▪ Technology Drivers and Constraints
Project Definition
▪ Objectives
Establish Objectives
Identification of Key Issues & Needs
▪ Requirements
Obtain Current Mission Documentation, and Technology Requirements
Define further Technology Requirements in terms of functional and performance characteristics
Conceptual Design
▪ Functional Analysis and Allocation
▪ Develop Operations and Development Concepts
▪ Cost Estimates
▪ Schedule Estimates
▪ Risk Analysis
▪ System Studies and Trades
▪ Identify Driving Requirements and Associated Risks
▪ Modeling and Prototyping
Design and Development Plan
Analysis
Simulation
Concept Design Review
Preliminary Design Review
Critical Design Review
Breadboard Development Plan
Algorithm Development
Define System Failure Modes
Failure Modes Effects and Analysis
Assembly processes development
Process and Test Documentation
Test Data Preparation
Evaluation of Performance
Test System Development
Component test
Acceptance test
Stand-alone functional test
Test procedures and reports
Develop formal specifications and interface control
Fabrication
Assembly and Test

Integration, Testing, Verification & Validation
Compliance
Field Trials and Demonstrations

Table A-1: Guideline of Activities

A.5 CONTRACT DELIVERABLES AND MEETINGS

This section reviews and describes the contract deliverables and meetings.

Figure A-1 is a guideline, which provides a master Milestone Schedule for typical contract duration of twelve (12) months. The figure highlights a sample schedule for the major meetings and deliverables.

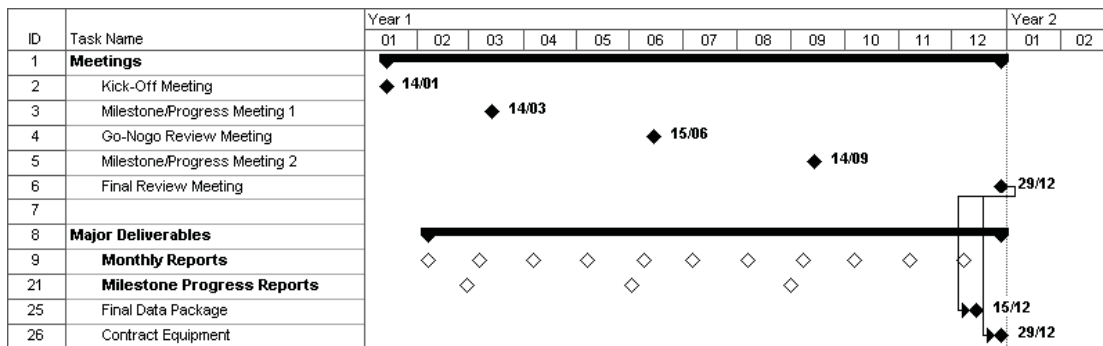


Figure A-1: Sample Meetings and Deliverables Master Schedule

Table A-2 contains the list of meetings, expected items to be covered during those meetings, and the associated contract deliverables. In addition to the mandatory deliverables (CDRL 1 to 16), there may be deliverables specific to the given contract (CDRL 17 and others). Those should be identified in the bid and agreed upon at the kick-off meeting.

CDRL No.	Deliverable	Due Date	Version
1	Meeting Agendas	Meeting – 2 week	Final
2	Kick-off Meeting Presentation	Meeting – 1 week	Final
3	Quarterly or Milestone/Progress Review Meeting Presentation	Meeting – 2 week	Final
4	Final Review Meeting Presentation	Meeting – 2 week	Final
5	Meeting Minutes	Meeting + 1 week	Final
6	Action Items Log (AIL)	Meeting + 1 week	Final
7	Monthly Progress Reports	7 th of each Month	Final
8	Milestone/Progress Technical Report	Meeting – 2 weeks	Final

CDRL No.	Deliverable	Due Date	Version
9	Disclosure of Foreground Intellectual Property (FIP)	End of contract – 2 weeks	Final
10	Executive Report	End of contract – 2 weeks	Final
11	Contractor Performance Evaluation	End of contract – 2 weeks	Final
12	Final Milestone/Progress Technical Report, including Technology Readiness Assessment	End of contract – 2 weeks	
13	Prototypes*	At Final Review Meeting	Final
14	Equipment (purchased under the contract)	At Final Review Meeting	Final
15	Software	Meeting – 2 weeks	
16	Government Furnished Equipment/Data	At contract end	
17	Contract Specific Deliverables	Identified in bid and agreed upon at kick-off meeting	

* The decision regarding the delivery of any prototype is to be made by the CSA at the end of the contract.

Table A - 2: Schedule of Contract Items

A.5.1 DOCUMENTATION, REPORTING AND OTHER DELIVERABLES

This section contains the lists of deliverables and describes their respective content and format. All documents must be typed and all diagrams must be clearly drawn and labeled. The Contractor must submit an electronic copy of each of the deliverable documents. Each electronic file must be named in accordance with CSA directives and with the federal government legislation and policies on managing information so as to be easily identified. The following guidelines detail how to name electronic documents.

Documents must contain 3 main components:

- Project Identifier,
- Contract Number, and
- Date Tracking Number.

WXYZ-TYPE-NUM-CIE_Contract Number_sent Date Tracking Number

Project Identifier

The project identifier must contain:

- WXYZ: a 4- to 8-letter acronym of the project;
- TYPE: a 2-letter acronym according to the Table A-3 below:

Acronym	Description
AG	Agenda
MN	Minutes of meeting
PT	Presentation
PR	Progress Report
TN	Technical Note

Table A-3: Letter Acronym Definition

- NUM: a three digit sequential number (e.g., 001, 002, etc.); and
- CIE: name of company (no space, no hyphen).

Contract Number

For example: _9F028-07-4200-03

Date Tracking Number

This is to reflect the submission date and must follow the Year-Month-Day format. For example: _sent 2012-10-25 (for 25 October 2012).

Non-Disclosure

The documents will not be placed in the public domain, except for the Executive Report (see A.5.1.3.1). The Contractor must indicate the following proprietary notices ("Owner of Foreground Intellectual Property (FIP)" being either the CSA or the Contractor):

On the cover:

This document is a deliverable under contract no. _____. It contains information proprietary to "Owner of Foreground Intellectual Property (FIP)", or to a third party to which "Owner of FIP" may have legal obligation to protect such information from unauthorized disclosure, use or duplication. Any disclosure, use or duplication of this document or of any of the information contained herein for other than the specific purpose for which it was disclosed is expressly prohibited outside the Government of Canada except as "Owner of FIP" may otherwise agree to in writing.

Copyright 20XX "Owner of FIP"

On all internal pages:

Use, duplication or disclosure of this document or any of the information contained herein is subject to the Proprietary Notice at the front of this document.

A.5.1.1 MONTHLY PROGRESS REPORT

On a monthly basis, no later than the seventh (7th) of each month, the contractor must provide monthly progress reports. It is requested that an electronic copy of this report be sent to the Project Authority (PA), Technical Authority (TA) and the Contracting Authority (CA) as soon as it is available. Acceptable electronic formats are: MS Word, WordPerfect, PDF, and HTML. Refer

to Section A.5.1 for instructions on how to name electronic documents. Each report must discuss the progress of the work and should include, but not be limited to, the following information:

- Statement indicating whether or not the project is on schedule and, if not, an explanation for any delays and/or a recovery plan. The report must include an updated schedule showing progress of work and modifications, if any;
- Statement indicating whether or not the project is within budget and, if not, an explanation for the deviation from the budget and a proposed recovery plan. The report must include an updated cash flow table showing, for each activity/milestone/Work Package, with start and end dates as well as actual cash flow with actual start and end dates;
- Brief summary of the technical progress of the work for each work package, including:
 - Description of major items developed, purchased or constructed during the reporting period, and
 - List of internal engineering reports produced during the reporting period;
- Summary of the proposed work for the following month, including:
 - Description of major items to be purchased during the next reporting period, including any software packages;
- Summary of problems encountered, their impact on the project and the subsequent solutions proposed or effected;
- Identification and any new Background Intellectual Property (BIP) expected to be used on the project and a description of any new Intellectual Property (IP) generated during the execution of the contract (including invention disclosures); and
- Trip reports for each conference attended or facilities visited in the course of this contract (and only if funded by the contract).

An overall assessment of the project health must be provided at the start of each report. The aim is to have an overview of the project status.

The following information should be included in the following format:

Project Element	Status	Trend	Comment
Cost	Green	↑	
Schedule	Green	↓	
Results / PEC	Red	↔	
Programmatic	Yellow	↑	

The first column identifies the project performance metrics to be assessed, namely **Project Element**. The four metrics to assess are:

- Cost,
- Schedule,
- Results against Performance Evaluation Criteria (PEC), and
- Programmatic.

The Cost, Schedule and Results/PEC metric are quantitative indicators, while the Programmatic metric is qualitative.

The second column of the table is the status for each project element.

The following table provides a definition of the different status with respect to the first three Project Elements.

Status Indicator	Interpretation		
	Cost	Schedule	Technical
Green	On or under planned project total budget	On or ahead of baseline schedule	Meets Performance Evaluation Criteria (PEC)
Yellow	Between 0 and 5% overrun	Between 0 and 5% behind schedule	Does not meet PEC but has approved recovery plan
Red	Greater than 5% overrun	Greater than 10% behind	Does not meet PEC and does not have approved recovery plan

As for the Programmatic element, the status is evaluated based on the status of the three other elements. Although the Programmatic metric takes into account Cost, Schedule and Results/PEC indicators, it is mostly influenced by the most critical element at that point in time in the project. The third column is an assessment of the trend the Project metric.

The choices are:

Trend Indicator	Interpretation
↑	The status has improved since the last review
↓	The status has worsened since the last review
↔	The status has not changed since the last review

The Fourth column is to provide the opportunity to comment the status and trend of the project element or to provide a general statement.

A.5.1.2 MILESTONE/PROGRESS TECHNICAL REPORTS

The Contractor must submit to the PA, TA and CA at least two (2) weeks prior to the due date of Milestone and/or Progress Review Meetings, a draft Milestone and/or Progress Report. The PA and TA will review the report and may request changes, as appropriate. The Contractor will then submit the revised version.

The Milestone and/or Progress Report, which must be protected, is to contain a complete description of the work undertaken and results obtained. As such it should include all pertinent technical documents that support engineering, fabrication and/or testing tasks. It should also

include an updated version, if applicable, of the Technical and Managerial Plans initially submitted. Moreover, it must provide sufficient details of the work performed to date to enable the TA to perform a full and accurate progress evaluation.

The description of the work undertaken and the results obtained should include:

- Review of technical results and accomplishments;
- Assessment of results with respect to the PEC provided in the bid (supported with the necessary design documents, engineering drawings, test plans, test results and the like);
- A clear identification of the technology advancements required to meet the objectives, along with the expected new IP and results of applicable patent searches;
- A detailed description of all FIP generated during this period and additional BIP used during the period under review;
- Details of all R&D and/or commercial licenses required to secure access to third-party BIP, if applicable;
- A detailed description of all equipment purchased during this period;
- All other Contractor's findings prior to the milestones; and
- Changes to the team, Work Breakdown Structure (WBS), level-of-effort, schedule, resource assignment matrix,

A.5.1.3 FINAL DATA PACKAGE

At least two (2) weeks prior to the due date, the Contractor must submit to the PA and TA a draft Final Data Package. The PA and TA will review the package and may request changes, as appropriate. The Contractor will then submit the final revised version. This data package must consist of stand-alone documents and will encompass all work performed throughout the contract.

The Final Data Package must consist of the following separate elements (electronic format only):

- a. Executive Report,
- b. Technical Report,
- c. Contractor's Disclosure of FIP (APPENDIX A-3 to ANNEX A)
- d. Asset Declaration Form – Prototypes and Equipment (APPENDIX A-4 to ANNEX A)

The Executive and Technical Reports should include the CSA Report Documentation Page (APPENDIX A-2 to ANNEX A).

A.5.1.3.1 EXECUTIVE REPORT

The Executive Report will be placed in the public domain (e.g., CSA's library, publication and/or website, to promote the transfer and diffusion of space technologies). The report must not exceed ten (10) pages. The Contractor must submit an electronic copy of the Executive Report in the Final Data Package. Any confidential information concerning potential spin-off and commercialization, or any information that would constitute a public disclosure of the FIP should be placed in the Technical Report.

A recommended structure for the Executive Report is as follows:

1. Covering page;
2. Introduction;

3. Technical Objectives;
4. Approach / Project Tasks;
5. Accomplishments;
6. Technology:
 - a) Description / Status of Technology (Initial TRL, Targeted TRL and Actual TRL at completion),
 - b) Innovative Aspects, and
 - c) Application Fields
7. Business Potential, Benefit and Impact on Company;
8. Ownership of Intellectual Property; and
9. Publications / References.

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

Copyright ©20XX "Owner of FIP"

Permission is granted to reproduce this document provided that written acknowledgement to the "Contractor name" or the Canadian Space Agency is made.

A.5.1.3.2 TECHNICAL REPORT

The report will contain a detailed account of all work performed under the contract. This will enable a full and accurate evaluation of the work by the PA and TA. The report should include, as appropriate, the following:

- a) Covering page (APPENDIX A-2);
- b) Executive Summary;
- c) Background information and references to relevant documentation;
- d) Review of results and accomplishments;

Where applicable, the following items should be included:

- A summary of the literature search, with copies of the main publications supplied in an appendix (without infringing upon any copyrights),
 - The system requirements specification and the interface requirements specification,
 - Feasibility studies and identification of technological risks, alternatives approaches, and trade-off analysis results,
 - Design documents,
 - Implementation documents,
 - Test plan and procedures, and
 - Concept demonstration results;
- e) Assessment of results with respect to the Performance Evaluation Criteria. This should support a statement qualifying and/or quantifying three aspects:

- Performance: the project successfully met and/or exceeded none/few/some/most or all the Performance Evaluation Criteria
 - Impact: the project identified none/few or several potential and/or actual impacts/benefits
 - Success: the project has none/some or significant potential of becoming, or already is, a success story
- f) Technology Readiness Assessment (TRL reached);
 - g) Detailed description of all equipment purchased during this period;
 - h) All other Contractor findings;
 - i) Recommendations including the potential for any further R&D of a follow-on nature;
 - j) An explicit and detailed description of all Foreground Intellectual Property (FIP) and Background Intellectual Property (BIP), if any (refer to Appendix A-3 to ANNEX A);
 - k) Conclusion;
 - l) Supporting tables, technical drawings and figures;
 - m) A copy of all R&D and/or commercial licenses required securing access to third party BIP, if applicable; and
 - n) Any additional relevant information deemed important by the Contractor.

A.5.1.3.3 CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY

At the end of the contract, a list and descriptions of all BIP required for CSA use of the FIP must be provided in the Final Data Package and reviewed at the Final Review Meeting. A list and description of all FIP resulting from project work must also be provided. Furthermore, the Contractor will complete and submit as a stand-alone document entitled "Contractor Disclosure of Intellectual Property", provided in APPENDIX A-3 of ANNEX A. The Contractor must submit an electronic copy of the Contractor Disclosure of Intellectual Property.

A.5.1.3.4 PROTOTYPES AND EQUIPMENT

All prototypes developed during the Contract must be disclosed to Canada and reviewed by the PA and TA who will advise on their final disposal and /or delivery.

The Contractor should also maintain a list of all non-consumable items procured or fabricated under the contract and/or provided by the government. As part of the Final Data Package, the Contractor must complete and submit the Asset Declaration Form found in APPENDIX A-4 of ANNEX A, for which the CSA will issue inventory bar codes at the end of the contract. The Contractor will be notified as to how the assets (equipment) should be handled after the PA and TA have reviewed the list.

A.5.1.4 CONTRACT SPECIFIC DELIVERABLES

The following is a list of contract specific deliverables that could be identified in the bid and be required depending on the TRL progression of the technology. The schedule for these and other contract specific deliverables should be identified in the bid and agreed upon at the kick-off meeting.

- Performance and functional requirements document;
- Compilation of Literature Review and Establishment of Benchmark Technical Notes (TN);
- Trade-off and Feasibility studies TN;

- Procurement Plan;
- Subcontractor IP agreement;
- Technology Design and Development Plan;
- Conceptual Design Document, including drawings and models;
- Preliminary Design Document, including drawings and models;
- Detail Design Document, including drawings and models;
- Breadboard Development Plan;
- Interface Control Documents, including drawings and models;
- Failure Modes Effects and Analysis;
- Assembly Processes Development;
- Process Documentation;
- Test Procedures and Results Reports;;
- Formal Specifications, including drawings and models;
- Qualification Plan;
- Breadboards;
- Prototypes;
- Compliance Statement;
- Electrical Model;
- Engineering Qualification Model; and
- Qualification Model.

A.5.1.5 SOFTWARE

The developed software and associated documentation will be in accordance with the software design standards and/or specifications stated in the proposal. The Contractor must provide an electronic copy of all Contractor documents describing the software development cycle, including user, maintenance and operation manuals. The developed software must also be provided in the form of well-documented source code in computer compatible format, with run-time libraries and executable files.

A.5.2 MEETINGS

As per Table A-4 below, the Contractor will schedule and co-ordinate with all the stakeholders the following meetings:

- Kick-Off Meeting,
- Milestone and Progress Review Meetings,
- Work Authorization Meeting, and
- Final Review Meeting.

Meeting	Date	Location
Kick-off Meeting	No later than 2 weeks After Contract Award (ACA)	Contractor's premises
Milestone and Progress Review Meetings	At least every 4 months	CSA's premises
Work Authorization Meeting/Decision	At the Contract Mid-point.	CSA's premises
Final Review Meeting	End of Contract	CSA's premises

Table A-4: Meetings and Decision Schedule

For all meetings, the Contractor will:

- Suggest the meeting content and deliver the suggested meeting agenda to the PA and the TA at least ten working days before the meeting;
- Deliver to the PA and the TA, all required reports and technical documents relating to the work about which the meeting is about;
- Record the minutes of the meeting; and
- Deliver one (1) electronic copy of the minutes of the meeting to the PA five working days after the meeting.

In support of the project meetings, viewgraphs and supporting presentation materials should be prepared. One (1) electronic copy should be presented to the PA and TA. Documented video materials should be prepared by the Contractor along with the supporting visual presentation material to support any demonstration of the technology. A copy of the supporting visual material should be delivered to the PA and TA.

A.5.2.1 KICK-OFF MEETING

Within two weeks of the contract award (or at a date mutually agreeable to by the PA and the Contractor) a Kick-Off Meeting (KOM) must be held to:

- Review the proposed **Performance Evaluation Criteria (PEC)**. This is a list of criteria that will be used throughout the project to evaluate the Contractor's technological progress. It will be provided in the Contractor's bid and accepted at the KOM and reviewed at each Milestone/Progress Review Meeting as well as at the Contract Mid-point Work Authorization Meeting;
- Review contract deliverables;
- Review the requirements of the work;
- Review the work schedules;
- Review risk assessment and mitigation plan;
- Review Work Breakdown Structure and Work Packages;
- Review capability to deliver work packages at agreed cost and schedule;
- Discuss exploitation strategy of technology and company capabilities;
- Discuss the BIP and review the provided list;
- Discuss the expected FIP and review the provided list (review Disclosure of FIP issues);
- Review expected cash flow, and claim format;
- Review reporting requirements;
- Review communications deliverables;
- Discuss any licensing issues; and
- Meet the personnel assigned to the work.

A.5.2.2 MILESTONE AND PROGRESS REVIEW MEETINGS

Milestone Meetings and Review Meetings will be held periodically throughout the life of a Contract to provide formal opportunities for face-to-face information exchanges as well as for progress monitoring discussions and decision making. At a minimum, a Milestone Review Meeting will be held at the end-point of each milestone. Between milestones, Progress Review Meetings should also be held with the maximum interval between such meetings not exceeding 4 months. These meetings will be scheduled by the Contractor.

The Milestone Meetings and Progress Review Meetings are intended to provide an opportunity for the Contractor, the PA, the TA, and other invited attendees to review and discuss the following in detail:

- The contents of the Milestone and/or Progress Report;
- The current % of completion and accomplishments;
- The technical work of each task;
- The current financial status (provide a table indicating planned vs. actual cash flow);
- The performance results with respect to the PEC;
- The status of Contractor's contributions (if applicable);
- The newly generated IP, status and progress of any inventions, including any experiments or other work needed to support a patent application;
- Commercialization progress, when required;
- Discuss Work Authorization Decisions by CSA, if applicable;
- Discuss relevant results achieved;
- Project management issues; and
- Other items as deemed appropriate.

A.5.2.3 WORK AUTHORIZATION MEETING AND DECISIONS

In addition to the Milestone Review and Progress Review Meetings, there will be a Work Authorization Meeting to be held approximately mid-way through the Contract (i.e., when approximately 50% of the contract value has been reached). This Work Authorization Meeting will serve as a basis for a decision to be made about whether or not to proceed with the follow-on activities of the Contract. This decision will be based primarily on the review of the achieved PEC in comparison with the PEC accepted at the Kick-Off Meeting and/or as revised at previous Milestone or Progress Review Meetings.

At the discretion of the CSA, the Kick-off and Quarterly Progress Review Meetings may be held via teleconference instead of at the contractor premises.

The Contractor may request Ad-hoc Meetings with 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.

The PA and the TA reserve the right to invite additional knowledgeable people (Public Servants or others under Non-disclosure Agreement) to Milestone/Progress Review Meetings. Key Contractor personnel involved in the work under review will attend Milestone/Project Review Meetings. The exact location, date and time of the Progress Review Meetings will be mutually agreeable to by the PA, the TA, and the Contractor.

A.5.2.4 FINAL REVIEW MEETING

The Final Review Meeting will be held at the end of the contract. The specific intent of this meeting will be to discuss in detail the results obtained (as compared to the agreed-upon PEC) and the proposed follow-on activities.

The Final Review Meeting is intended to provide an opportunity for the Contractor, the PA, the TA, and other invited attendees to review and discuss in detail:

- The contents of the Final Data Package;
- The Executive and Technical Reports;
- Disclosure of FIP;
- Meeting presentation material;
- Prototypes, technical drawings, hardware, software, equipment, as applicable; and
- Other items as deemed appropriate.

The PA and the TA reserve the right to invite additional knowledgeable people to the Final Review Meeting. Key Contractor personnel involved in the work under review should attend the Final Review Meeting. The exact location, date and time of the Final Review Meeting is to be mutually agreeable to the PA, the TA, and the Contractor.

A.5.3 FORMS

The Report Documentation Page (see APPENDIX A-2 of Annex A) should be included in both the Executive Report and Technical Report.

As part of the Final Data Package, the Contractor must complete and submit the Asset Declaration Form in APPENDIX A-2 of ANNEX A, for which CSA will issue inventory bar codes at the end of the contract. The Contractor will be notified as to how the assets (prototypes and equipment) should be handled after the PA and TA have reviewed the list.

Also, the Disclosure of Intellectual Property (APPENDIX A-3 of ANNEX A) must be completed by the Contractor and submitted as part of the Final Data Package.

List of Appendices

Appendix A-1	Technology Readiness Levels (TRLs)
Appendix A-2	Report Documentation Page
Appendix A-3	Contractor Disclosure of Intellectual Property
Appendix A-4	Asset Declaration Form - Prototypes and Equipment
Appendix A-5	Statement of work for "Far Infrared Radiometer for Ice Clouds Characterization"

APPENDIX A-1

TECHNOLOGY READINESS LEVELS (TRLs)

Source: RD-1 (CSA-ST-GDL-0001 Revision A - Technology Readiness Assessment Guidelines)

Readiness Level	Definition	Explanation
TRL 1	Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development.
TRL 2	Technology concept and/or application formulated	Once basic principles are observed, practical applications can be invented and R&D started. Applications are speculative and may be unproven.
TRL 3	Analytical and experimental critical function and/or characteristic proof-of-concept	Active research and development is initiated, including analytical / laboratory studies to validate predictions regarding the technology.
TRL 4	Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that they will work together.
TRL 5	Component and/or breadboard validation in relevant environment	The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment.
TRL 6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)	A representative model or prototype system is tested in a relevant environment.
TRL 7	System prototype demonstration in a space environment	A prototype system that is near, or at, the planned operational system.
TRL 8	Actual system completed and "flight qualified" through test and demonstration (ground or space)	In an actual system, the technology has been proven to work in its final form and under expected conditions.
TRL 9	Actual system "flight proven" through successful mission operations	The system incorporating the new technology in its final form has been used under actual mission conditions.

Table A-1-1: Definition of Technology Readiness Levels

APPENDIX A-2


Canadian Space Agency Agence spatiale canadienne	REPORT DOCUMENTATION PAGE	
Report Date:		
Title:		
Author(s):		
Performing Organization(s) Name and Address(es):		
Contract # and Title:		
Sponsoring Agency Name(s) and Address(es): Canadian Space Agency 6767 Route de l'Aéroport Saint-Hubert, Québec, Canada J3Y 8Y9 Tel: (450) 926-4800 Fax: (450) 926-4613 Scientific Authority: Project Manager:		
Abstract:		
Key Words:		
Supplementary Notes:		
Distribution/Availability:		

Table A-2-1: Template for Report Documentation Page

APPENDIX A-3
Contractor Disclosure of Intellectual Property

Background Intellectual Property (BIP)

Before contract closure, the Contractor must review its BIP disclosure and update the information provided as part of the Contractor's proposal. For the purpose of updating the BIP information, Table A-3-1 below is provided and must be filled out.

Table A-3-1 requires that each of the following be provided for each BIP:

- BIP #: simply assign a sequential number to each BIP in the table;
- Title of the BIP: provide a descriptive title of the BIP;
- Type of BIP: specify if the BIP relates to software algorithms, hardware design, invention patent, or other;
- Type of BIP access: describe the type of access to the BIP that was required in order to use, modify, improve and further develop the BIP;
- BIP Description: provide an explicit and detailed description of the BIP (refer to pertinent sections of the Technical Report, if necessary).
- Reference Documentation: specify if the documentation referred to was a technical report, design document, test results, other;
- Origin of the BIP: specify if the BIP originated from internal R&D, collaborative project, a specific contract, other; and
- Owner of the BIP: provide names and addresses of the owner of the BIP (contractor, subcontractor or Canada).

BIP #	Title of the BIP	Types of BIP	Type of access	BIP Description	Reference Documentation	Origin of the BIP	Owner of the BIP

Table A-3-1: Disclosure of actual Background Intellectual Property (BIP) used for the Contract

Please specify the name and the position of the person approving/authorizing this disclosure. This person is to sign and date the disclosure. The following notice must be visible at the top of every page of the BIP disclosure:

"Use, duplication or disclosure of this document or any of the information contained in this document, in whole or in part, without the prior written permission of "Owner of BIP" is expressly prohibited."

Foreground Intellectual Property (FIP)

In addition to the BIP disclosure, the Contractor must respond to the following for each FIP element (Table A-3-2 below must be filled out).

- FIP #: simply assign a sequential number to each FIP in the table;
- Title of FIP: provide a descriptive title of the FIP;
- Type of FIP: specify if the FIP relates to copyright, invention, design, software, know-how, trade secret, algorithms, other;
- FIP Description: provide an explicit and detailed description of the FIP (refer to pertinent sections of the Technical Report, if necessary).
- Reference Documentation: specify if the documentation referred to was a technical report, design document, test results, other;
- Owner of the FIP: provide names and addresses of the owner of the FIP

FIP #	Title of FIP	Type of FIP	FIP Description	Reference Documentation	Owner of the FIP*

Table A-3-2: Disclosure of the Foreground Intellectual Property (FIP) developed under the Contract

Note: If Canada is the owner of the FIP, the Contractor must complete Table A-3-3 below and provide the following information:

- FIP #: simply assign a sequential number to each FIP in the table;
- Title of FIP: provide a descriptive title of the FIP;
- FIP Description: provide an explicit and detailed description as well as aspects that are novel, useful and non obvious;
- Limitation: Provide limitations or drawback of the FIP;
- References: Provide references in literature or patents pertaining to the FIP;
- Has the FIP been prototyped, tested or demonstrated (e.g., analytically, simulation, hardware)? If so, provide results;
- Inventors: Provide name, coordinates and company of inventor(s) – (e.g., the person(s) who created the FIP); and
- IP Disclosure: Was the FIP or any element declared, disclosed to other parties? If so, when, where, to whom?

FIP #	Title of FIP	FIP Description	Limitations or drawback	References	Has the FIP been prototyped, tested or demonstrated	Inventors	IP Disclosure

Table A-3-3: Canadian Owned FIP Additional Information

Provide the name and the position of the person approving/authorizing this disclosure. This person is to sign and date the disclosure.

This following notice must be visible at the top of every page of the FIP disclosure:

"Use, duplication or disclosure of this document or any of the information contained in this document, in whole or in part, without the prior written permission of "Owner of FIP" or the government of Canada is expressly prohibited."

APPENDIX A-4
ASSET DECLARATION FORM - PROTOTYPES AND EQUIPMENT

Equipment Declaration: The Contractor must fill out the following form so as to identify all equipment procured under this contract.

Equipment #	Equipment description	Inventory #	Acquisition Value	Currency	Acquisition date	Manufacturer	Country	Model #	Serial #

Table A-4-1: Equipment Declaration Form

Prototype List: The Contractor must provide a list of all prototypes developed under this contract.

Prototype Name	Prototype description

Table A-4-2: Prototype Declaration Form

The decision regarding the delivery of any prototype is to be made by the CSA at the end of the contract completion

Note: Canada may reserve the right not to request compensation or replacement of government-furnished equipment (GFE) if the use of the said equipment is an integral part of the proposed research and development study or work.

Specific Statement of Work

Far Infrared Radiometer for Ice
Clouds Characterization

Far infrared radiometer for ice cloud characterization

Acronyms

FIRR: Far Infrared Radiometer

TRL: Technology Readiness Level

TICFIRE: Thin Ice Clouds in the Far Infrared Experiment

NetCare: Network on Climate and Aerosols Research

MOEMS: Micro Opto-Electro-Mechanical System

CMOS: Complementary Metal - Oxide - Semiconductor

CSA: Canadian Space Agency

NETD: Noise Equivalent Temperature Difference

EMI: Electromagnetic Interference

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" is used to indicate a mandatory requirement
- "Should" indicates a goal or preferred alternative. Such goals or alternatives are to be treated on a best efforts basis and are subject to verification as requirements are.
- "May" indicates an option
- "Will" indicates a statement of intention or fact

1. Objective

The objective of the contractual work is to build and test an automated far infrared radiometer (FIRR) demonstrator operating in the spectral range from 7 to 40 μm . The motivations behind this work are:

- to advance and validate the TRL of far infrared microbolometer technology (current TRL: 3; target TRL: 5-6)
- to evaluate the effectiveness of this sensor technology for the acquisition of low temperature targets
- to identify the optimal values of operating parameters when using this sensor technology in the context of TICFIRE microsat mission; and
- to allow a science team (NetCare and Environment Canada) to validate TICFIRE mission requirements by means of airborne characterization of ice cloud

2. Technology description

The FIRR radiometer is intended to be a demonstrator of a new microbolometer technology developed for spaceborne far infrared sensing. The issues inherent to far infrared sensing are twofold: the scaling mismatch between microbolometer size and far infrared wavelength and the ineffective radiation absorption in this spectral region. The new technology relies on a two-stage MOEMS platform specially developed to preserve the structural integrity of large area detector (pitch extended to beyond 100 μm) in space environmental conditions. It uses also the microengineering processes developed for

goldblack coating and patterning of such platform to increase its far infrared absorptance. The current focal plane array comprises 80x60 microbolometers of 104-um pitch that are monolithically integrated into CMOS readout integrated circuits. As this array is intended for airborne experiments, it requires special vacuum packaging processes to ensure that the goldblack and long term vacuum integrity can be preserved.

The Thin Ice Clouds in Far InfraRed Experiments (TICFIRE) is one candidate of CSA microsat missions. It aims to determine the contribution of ice clouds to the energy balance in view of improving extreme weather forecasting. In this mission the use of the above sensor technology for the retrieval of far infrared radiance of ice cloud is being proposed. The airborne campaign to be conducted by NetCare provides an opportunity to validate this technology for TICFIRE. As part of the validation strategy, the FIRR demonstrator is built for the science team to perform a parametric study of fundamental TICFIRE variables during their campaign. Besides validating detector performance and reliability, the results will also confirm whether the currently planned TICFIRE channels, data retrieval sequences and rates, and radiometric calibration frequency are adequate for this mission.

To this end the FIRR demonstrator will consist of: (i) a far infrared camera comprising detector package, proximity electronics, and telescope; (ii) a rotating filter wheel with several bandpass filters for channel selection; (iii) active and passive blackbodies for on-board radiometric calibration; and (iv) a pointing mirror for selective viewing of the blackbodies and ice cloud scenes. During the airborne campaign the radiometer will operate in the absence of a full time operator. It must be computerized to perform unattended operations such as spectral band selection, viewing direction selection, blackbody selection, and data acquisition within preset sequences of measurement.

It is planned that FIRR demonstrator will be flown on a Basler Turbo 67 aircraft operating at altitudes from 1 to 5 km, *i.e* exposed to temperatures and pressures as low as 233 K and 45 kPa. It must withstand the level of vibration inherent to this aircraft and meet all the standards and requirements for certification airborne operation.

3. Scope of work

This contractual work consists in building and testing the FIRR demonstrator. The scope of the work also includes tasks that pertain to the certification and integration of the demonstrator with the aircraft. FIRR shall meet the technical requirements outlined in section 4 and comprise the following components:

- far infrared detector in vacuum package
- detector proximity electronics and firmware
- far infrared telescope
- rotating filter wheel with interference bandpass filters
- active and passive calibration blackbodies
- pointing mirror device for selective viewing of ice cloud scenes (nadir and zenith) and blackbodies
- optical bench
- thermally controlled enclosure
- power supplies, controllers, and computer with dedicated users interface and software for measurement control, all mounted on a separate rack
- vibration damping interface assembly between FIRR and the aircraft floor
- hood and baffle assembly between FIRR and aircraft openings for air turbulence shielding
- hardware accessories and replacement parts required for: (i) installation and operation of FIRR and the dedicated rack of control equipments on the aircraft; and (ii) troubleshooting of issues that may arise during the campaign

- data processing scripts for the conversion of raw data into a format that allows the science team to assess the quality of daily collected data (averaged output voltage and standard deviation for each pixel, computed NETD for a given scene, etc.)

The testing of FIRR shall follow a test plan to be approved by the CSA which will include, but not be limited to, the following:

- Mechanical verification: validate the optical alignment between the pointing mirror, filter, telescope, and focal plane array; verify the dimension and mass of different subsystems
- Electrical verification: verify control and data acquisition functions for a range of parameter values; verify firmware and software (detection of glitches, accuracy in displacement of pointing mirror and filter wheel, control of measurement sequences and data acquisition)
- Performance verification: measure the NETD values for each spectral channel, validate the performance for different measuring cycles and monitor the signal stability over the cycles, perform radiometric calibration for known scenes
- Vibration and thermal cycling verification: measure the alignment and performance before and after the vibration and thermal cycling tests; the tests may be applied to the entire instrument or to specific subsystems depending on the results of risk analysis
- Certification: perform the verifications required for airborne operation certification for such as structural test, EMI test, validation of wires, cables, connectors, and harnesses against standards

Regarding the integration of FIRR to the aircraft prior to the campaign, it is the responsibility of the contractor:

- to produce certification drawing set of installation for FIRR
- to obtain certification package for the airborne integration and operation of FIRR
- to deliver FIRR to the flight departure site
- to install the floor interface assembly, hood and baffle assembly, and other hardwares required for interfacing FIRR with the aircraft
- to install FIRR and dedicated rack of control equipments on the aircraft
- to perform fit check, electrical load test, EMI test, and verify on-board instrument functionalities
- to diagnose and fix any hardware and software malfunctions of FIRR that may arise during the campaign in a timely fashion so as to prevent disruptions of the airborne experiments
- to uninstall and remove FIRR and associated hardware from the aircraft at the end of the campaign

4. Technical requirements

The technical requirements for the FIRR radiometer are as follow

Measuring conditions

[REQ-01] - The radiometer shall provide for measurements of ice cloud radiance on board of the Polar 6 (Basler Turbo 67) aircraft in both nadir and zenith viewing directions

[REQ-02] - The response dynamic range and radiometric calibration of the radiometer shall be tailored to scene temperatures in the range from 200 to 250 K

[REQ-03] - The radiometer shall provide for retrieval of radiance in the spectral bands specified in column 2 of Table I

- [REQ-04] - The radiometer shall provide for unattended selection of pre-determined spectral band, scene viewing direction, and calibration blackbody
- [REQ-05] - The radiometer shall provide for unattended radiometric calibration and data acquisition within preset sequences of measurement
- [REQ-06] - The radiometer shall meet its full specifications under the environmental conditions at its location on the aircraft where it is subjected to ambient temperatures in the range from 233 to 313 K and ambient pressures in the range from 45 to 80 kPa
- [REQ-07] - The radiometer shall meet its full specifications in the operating temperature range from 288 to 298 K and in the operating pressure range from 45 to 80 kPa
- [REQ-08] - The radiometer shall incorporate mechanisms that prevent or eliminate water vapor condensation and outgassed vapor fogging on external and internal optical surfaces
- [REQ-09] - The radiometer and the rack of control equipments should withstand the aircraft vibration environment specified in column 2 of Table II without damage or loss of performance
- [REQ-10] - The radiometer shall be installed on the aircraft via a vibration damping interface assembly that limits the vibration level at the attachment point to the values specified in column 3 of Table II
- [REQ-11] - The radiometer shall survive non-operating temperatures in the range from 233 to 313 K during transportation and integration to the aircraft without damage or loss of performance

Detector and focal plane array

- [REQ-12] - The detector shall consist of Au black coated uncooled resistive VO_x microbolometer
- [REQ-13] - The spectral response of the detector shall demonstrate an absorptance exceeding 85% over the spectral range from 7.5 to 40 μm
- [REQ-14] - The detector pitch shall be larger than 100 μm
- [REQ-15] - The focal plane array shall be close to circular shape and comprise at least 256 active detectors with a fill factor exceeding 90%
- [REQ-16] - The operability of all the detectors forming the focal plane array should be 100%
- [REQ-17] - The integration of the focal plane array into the readout integrated circuit shall be in monolithic configuration
- [REQ-18] - The readout integrated circuit shall provide random access to all detectors of the focal plane array
- [REQ-19] - The detector shall be operated in pulsed current mode during data acquisition
- [REQ-20] - The detector response shall be quantized to at least 16 bits

Table I - Spectral characteristics of the required filters

Filter ID	Transmission range (μm)	Minimum transmittance	Priority
1	7.9 - 9.5	0.8	Mandatory
2	10 - 12	0.8	Mandatory
3	12 - 14	0.8	Mandatory
4	17 - 18.5	0.7	Mandatory
5	18.5 - 20.5	0.7	Mandatory

6	20.5 - 22.5	0.6	Mandatory
7	17.25 - 19.75	0.7	Mandatory
8	22.5 - 27.5	0.6	Mandatory
9	30 - at least 40	0.5	Mandatory
10	4.5 - at least 40	0.5	Optional
11	9.3 - 10.2	0.8	Optional
12	13.2 - 17.3	0.7	Optional
13	14 - 16	0.7	Optional

Table II. Vibration limits for each axis

Frequency (Hz)	Vibration environment for radiometer design (G ² /Hz)	Maximum allowable vibration environment (G ² /Hz)
15.00	0.000300	0.000100
23.99	0.000300	0.000100
24.00	0.004000	0.001330
30.00	0.004000	0.001330
30.01	0.000300	0.000100
88.00	0.000030	0.000010
129.99	0.000030	0.000010
130.00	0.004000	0.001330
150.00	0.004000	0.001330
150.01	0.000015	0.000005
2000.00	0.000015	0.000005

[REQ-21] - The nominal operating frame rate of focal plane array should be 0.75 Hz

[REQ-22] - It shall be possible to monitor the detector substrate temperature by direct measurement

[REQ-23] - The detector substrate shall be maintained at a temperature in the range from 283 to 291 K during radiometric measurement and calibration

[REQ-24] - The stability of the detector substrate temperature shall be better than 20 mK

[REQ-25] - The response time of the detector shall be smaller than 100 ms

[REQ-26] - The responsivity of the detector should be larger than 90% of the maximum responsivity in each spectral band

[REQ-27] - The noise equivalent power of the detector in each spectral band should be smaller than 100 pW per frame under nominal operating conditions

[REQ-28] - The deviation of the detector response from linearity within its full dynamic range should be less than 1 %

Detector package

- [REQ-29] - The footprint of the detector package shall be smaller than 70 mm x 70 mm
- [REQ-30] - The height of the detector package should be less than 20 mm
- [REQ-31] - The clear aperture diameter of the detector package should exceed 10 mm
- [REQ-32] - The transmittance of the package window should be superior to 0.7 in the spectral range from 7.5 to 40 μm
- [REQ-33] - The transmittance of the package window should be larger than 95% of the maximum transmittance in each spectral band
- [REQ-34] - It shall be possible to determine the pressure inside the package by direct measurement
- [REQ-35] - The pressure inside the sealed package shall be smaller than 5 mTorr initially and smaller than 7 mTorr after the airborne campaign
- [REQ-36] - The package shall include mechanisms to reduce the amount of outgassed vapor inside the package
- [REQ-37] - The package shall provide for dynamic pumping operation when the vacuum seal is no longer effective
- [REQ-38] - It shall possible to replace the detector package on the circuit board without causing damage or loss of performance to the radiometer

Telescope

- [REQ-39] - The total transmittance of the telescope shall be superior to 0.8 in the spectral range from 7.5 to 40 μm
- [REQ-40] - The focal ratio of the telescope shall be unity or smaller
- [REQ-41] - The telescope shall have a maximum effective focal length of 20 mm
- [REQ-42] - The field-of-view of the telescope should be larger than 5 degrees

Bandpass filters

- [REQ-43] - The filter wheel shall allow for mounting a minimum of thirteen (13) bandpass filters
- [REQ-44] - One unit of each mandatory filter specified in Table I shall be mounted on the filter wheel and one spare unit of each mounted filter shall be provided as replacement part
- [REQ-45] - In the case where a mandatory filter or its spare unit cannot be obtained timely, it shall be replaced by one of the optional filters specified in Table I
- [REQ-46] - The filter shall be of circular shape with a diameter larger than 30 mm
- [REQ-47] - The transmittance of the filter shall exceed the value specified in column 3 of Table I for each spectral band
- [REQ-48] - The transmittance of the filter should be larger than 90% of the maximum transmittance in each spectral band

Calibration blackbodies

- [REQ-49] - One passive blackbody and one active blackbody shall be used for the radiometric calibration
- [REQ-50] - The calibration set point of the blackbodies shall be in the range from ambient temperature to 333 K

[REQ-51] - The temperature stability of the calibration set point shall be better than 50 mK over a calibration period of up to 60 sec

[REQ-52] - The radiance accuracy of each blackbody shall be better than +/- 5 mK

[REQ-53] - The calibration frequency shall be adjustable in the range from 0.002 to 0.1 Hz

Pointing mirror

[REQ-54] - The pointing mirror shall be rotative around the telescope optical axis and the angular position of the mirror shall be controlled

[REQ-55] - The pointing mirror shall be sized to receive the full field of view of the telescope

[REQ-56] - The pointing mirror shall provide for selective viewing of: (i) nadir looking scene; (ii) zenith looking scene; (iii) passive blackbody; and (iv) active blackbody

Data storage

[REQ-57] - The science data acquired during the airborne campaign shall be stored in a solid state drive with a storage capacity of at least 200 GB and backed up daily to a second solid state drive of equal storage capacity

Instrument budget

[REQ-58] - The radiometer shall operate on the aircraft where the maximum allocated power is 5 A at 28 +/- 10% VDC

[REQ-59] - The total mass of the radiometer, excluding that of the rack of control equipments, shall be smaller than 80 kg

[REQ-60] - The footprint of the radiometer, excluding that of the rack of control equipments, shall be less than 900 x 900 mm²

[REQ-61] - The height of the radiometer, excluding that of the rack of control equipments, shall be less than 600 mm

Storage and transportation

[REQ-62] - The radiometer shall be stored in an environment where the temperature is in the range from 273 to 313 K

[REQ-63] - The radiometer shall be stored in an environment where the relative humidity is in the range from 20 to 70%

[REQ-64] - The radiometer shall be stored and transported in waterproof and dustproof, high impact structural polymer cases with pressure equalization mechanism

[REQ-65] - During terrestrial transportation the radiometer shall withstand the vibration environment as specified in MIL-STD-810G Method 514.6C-1 Category 4 "US highway truck vibration exposure" without damage or loss of performance

[REQ-66] - During air transportation the radiometer shall withstand the vibration environment as specified in MIL-STD-810G Method 514.6C-5 Category 7 "Jet cargo general exposure" without damage or loss of performance