Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:

Travaux publics et Services gouvernementaux Canada
Place Bonaventure,
800 rue de la Gauchetière Ouest
Voir aux présentes - See herein
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
Ph0-2019-1: Phase 0 Astronomy

Solicitation No. - N° de l'invitation	**Date**
9F050-190058/A	2019-07-17

Client Reference No. - N° de référence du client
9F050-190058

GETS Reference No. - N° de référence de SEAG
PW-$MTB-550-15411

File No. - N° de dossier	**CCC No./N° CCC - FMS No./N° VME**
MTB-9-42050 (550)	

Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2019-08-26

Time Zone
Fuseau horaire
Heure Avancée de l'Est
HAE

F.O.B. - F.A.B. Specified Herein - Précisé dans les présentes
Plant-Usine: ☐ **Destination:** ☐ **Other-Autre:** ☑

Address Enquiries to: - Adresser toutes questions à:	**Buyer Id - Id de l'acheteur**
Mirfatahi, Kaveh	mtb550

Telephone No. - N° de téléphone	**FAX No. - N° de FAX**
(514) 260-4106 ( )	(514) 496-3822

Destination - of Goods, Services, and Construction:
Destination - des biens, services et construction:
AGENCE SPATIALE CANADIENNE
Exploration spatiale
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

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**
Voir Doc.	

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**

Issuing Office - Bureau de distribution
Travaux publics et Services gouvernementaux Canada
Place Bonaventure, portail Sud-Oue
800, rue de La Gauchetière Ouest
7e étage, suite 7300
Montréal
Québec
H5A 1L6

Canada

TABLE OF CONTENTS

PART 1 - GENERAL INFORMATION

1.1 Introduction

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

Part 1 General Information: provides a general description of the requirement;

Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;

Part 3 Bid Preparation Instructions: provides Bidders with instructions on how to prepare their bid;

Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;

Part 5 Certifications and Additional Information: includes the certifications and additional information to be provided; and

Part 6 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

The Annexes include the Statement of Work, the Basis of Payment, the Electronic Payment Instruments, and any other annexes.

1.2 Summary

Project Title
LiteBIRD

Description
Public Works and Government Services Canada (PWGSC) on behalf of Canadian Space Agency (CSA) located in St-Hubert, (Quebec), is seeking bids for Phase 0 of the LiteBIRD project.

Security Requirements
There are no security requirements associated with this requirements.

Period of Contract
The period of contract will be from the date of issue for a period of approximately ten (10) months.

Actual Available Budget
The budget available for the contract resulting from this bid solicitation is **$500,000.00**, all applicable taxes extra. Annex A (Statement of Work) includes a description of the work required. The Maximum amount of funding available for the contract will not exceed **$500,000.00**, all applicable taxes extra. Bids valued in excess of this amount will be considered non-responsive. This disclosure does not commit Canada to pay the maximum funding available.

Intellectual property
The intellectual property will belong to Canada, as sole owner.

Trade Agreements
This requirements is not subject to the trade agreements.

Canadian Content
This requirement is limited to Canadian goods and/or services

Electronic Bidding
This bid solicitation allows bidders to use the epost Connect service provided by Canada Post Corporation to transmit their bid electronically. Bidders must refer to Part 2 entitled Bidder Instructions, and Part 3 entitled Bid Preparation Instructions, of the bid solicitation, for further information.

1.3 Debriefings

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

PART 2 - BIDDER INSTRUCTIONS

2.1 Standard Instructions, Clauses and Conditions

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

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

The 2003 (2019-03-04) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

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

Delete: 60 days
Insert: 180 days

2.2 Submission of Bids

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

By mail or in person, at the following address:
Public Services and Procurement Canada
Acquisitions Directorate - Quebec Region
800, rue de la Gauchetiere Ouest, Portal South-**west,** Suite 7300
Montréal, Quebec H5A 1L6

Bids may also be submitted using the epost Connect service as detailed in the 2003 Standard Instructions.

The following PWGSC Regional Bid Receiving Unit e-mail address is to be used for epost Connect services:

TPSGC.RQReceptionSoumissions-QRSupplyTendersReception.PWGSC@tpsgc-pwgsc.gc.ca

Note: Bids will not be accepted if emailed directly to this email address. This email address is to be used to open an epost Connect conversation, as detailed in Standard Instructions 2003, or to send bids through an epost Connect message if the bidder is using its own licensing agreement for epost Connect.

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

2.3 Former Public Servant

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

Definitions

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

a. an individual;

b. an individual who has incorporated;

c. a partnership made of former public servants; or

d. a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

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

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

Former Public Servant in Receipt of a Pension

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

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

a. name of former public servant;

b. date of termination of employment or retirement from the Public Service.

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

Work Force Adjustment Directive

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

If so, the Bidder must provide the following information:

a. name of former public servant;

b. conditions of the lump sum payment incentive;

c. date of termination of employment;

d. amount of lump sum payment;

e. rate of pay on which lump sum payment is based;

f. period of lump sum payment including start date, end date and number of weeks;

g. number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

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

2.4 Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than 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.

2.5 Applicable Laws

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

2.6 Improvement of Requirement during Solicitation Period

Should bidders consider that the specifications or Statement of Work contained in the bid solicitation could be improved technically or technologically, bidders are invited to make suggestions, in writing, to the Contracting Authority named in the bid solicitation. Bidders must clearly outline the suggested improvement as well as the reason for the suggestion. Suggestions that do not restrict the level of competition nor favour a particular bidder will be given consideration provided they are submitted to the Contracting Authority at least ten (10) days before the bid closing date. Canada will have the right to accept or reject any or all suggestions.

2.7 Basis for Canada's Ownership of Intellectual Property

The Canadian Space Agency has determined that any intellectual property rights arising from the performance of the Work under the resulting contract will belong to Canada, for the following reasons, as set out in the *Policy on Title to Intellectual Property Arising Under Crown Procurement Contracts*:

(4.2) - the main purpose of the contract, or of the deliverables contracted for, is to augment an existing body of Canada's background information as a prerequisite to the transfer of the augmented background to the private sector, through licensing or assignment of ownership (not necessarily to the original contractor), for the purposes of commercial exploitation.

2.8 Maximum Funding

The maximum available funding, applicable taxes extra, as appropriate, for the contract for the purposes of this bid solicitation is indicated under the heading Actual Available Budget in Part 1 – Section 1.2 – Summary. Bids valued in excess of this amount will be considered non-responsive, pursuant to Part 4 – Evaluation Procedures and Basis of Selection, Section 4.1.2 – Financial Evaluation. This disclosure does not commit Canada to pay the maximum funding available.

PART 3 - BID PREPARATION INSTRUCTIONS

3.1 Bid Preparation Instructions

If the Bidder chooses to submit its bid electronically, Canada requests that the Bidder submits its bid in accordance with section 08 of the 2003 standard instructions. Bidders must provide their bid in a single transmission. The epost Connect service has the capacity to receive multiple documents, up to 1GB per individual attachment.

The bid must be gathered per section and separated as follows:

Section I: Technical and Management Bid
Section II: Financial Bid
Section III: Certifications

If the Bidder chooses to submit its bid in hard copies, Canada requests that the Bidder submits its bid in separately bound sections as follows:

Section I: Technical and Management Bid (2 hard copies and 1 soft copy on USB)

Section II: Financial Bid (2 hard copies and 1 soft copy on USB)

Section III: Certifications (2 hard copies and 1 soft copy on USB)

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

If the Bidder is simultaneously providing copies of its bid using multiple acceptable delivery methods, and if there is a discrepancy between the wording of any of these copies and the electronic copy provided through epost Connect service, the wording of the electronic copy provided through epost Connect service will have priority over the wording of the other copies.

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

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 hard copy of their bid:

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

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 (https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32573). To assist Canada in reaching its objectives, bidders should:

1) use 8.5 x 11 inch (216 mm x 279 mm) paper containing fibre certified as originating from a sustainably-managed forest and containing minimum 30% recycled content; and

2) use an environmentally-preferable format including black and white printing instead of colour printing, printing double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

Section I: Technical and Management Bid

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

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

In their management bid, Bidders must describe their capability and experience, the project management team and provide client contact(s).

Section II: Financial Bid

3.1.1 Bidders must submit their financial bid in accordance with the Pricing Schedule detailed in the Basis of Payment in Annex B.

3.1.2 Electronic Payment of Invoices – Bid

If you are willing to accept payment of invoices by Electronic Payment Instruments, complete Attachment 1 to Part 3 – Electronic Payment Instruments, to identify which ones are accepted.

If Attachment 1 to Part 3 – Electronic Payment Instruments is not completed, it will be considered as if Electronic Payment Instruments are not being accepted for payment of invoices.

Acceptance of Electronic Payment Instruments will not be considered as an evaluation criterion.

3.1.3 Exchange Rate Fluctuation

C3011T (2013-11-06) Exchange Rate Fluctuation

Section III: Certifications

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

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

4.1 Evaluation Procedures

(a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical, management and financial evaluation criteria.

(b) An evaluation team composed of representatives of Canada will evaluate the bids.

4.1.1 Technical and Management Evaluation

Mandatory and point rated technical evaluation criteria are included in Attachment 1 to Part 4.

4.1.2 Financial Evaluation

4.1.2.1 Mandatory Financial Criteria

The Bidder must submit a firm, all-inclusive lot price for the Work, which must not exceed the maximum funding available of **$500,000.00** applicable taxes extra. Bids which fail to meet the mandatory financial criteria will be declared nonresponsive. Bids valued in excess of this amount will be considered nonresponsive. This disclosure does not commit Canada to pay the maximum funding available.

4.1.2.2 Evaluation of Price

The price of the bid will be evaluated in Canadian dollars, Applicable Taxes excluded, FOB destination, Canadian customs duties and excise taxes included.

4.2 Basis of Selection

4.2.1 Basis of Selection – Highest Rated Within Budget

1. To be declared responsive, a bid must:

    a. comply with all the requirements of the bid solicitation;
    b. meet all mandatory technical evaluation criteria; and
    c. obtain the required minimum of 70 percent overall of the points for the technical evaluation criteria which are subject to point rating. The rating is performed on a scale of 100 points.

2. Bids not meeting (a) or (b) or (c) will be declared non responsive. The responsive bid with the highest number of points will be recommended for award of a contract, provided that the total evaluated price does not exceed the budget available for this requirement.

PART 5 – CERTIFICATIONS AND ADDITIONAL INFORMATION

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

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

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

5.1 Certifications Required with the Bid

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

5.1.1 Integrity Provisions - Declaration of Convicted Offences

In accordance with the Integrity Provisions of the Standard Instructions, all bidders must provide with their bid, **if applicable**, the Integrity declaration form available on the Forms for the Integrity Regime website (http://www.tpsgc-pwgsc.gc.ca/ci-if/declaration-eng.html), to be given further consideration in the procurement process.

5.2 Certifications Precedent to Contract Award and Additional Information

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

5.2.1 Integrity Provisions – Required Documentation

In accordance with the section titled Information to be provided when bidding, contracting or entering into a real property agreement of the Ineligibility and Suspension Policy (http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html), the Bidder must provide the required documentation, as applicable, to be given further consideration in the procurement process.

5.2.2 Federal Contractors Program for Employment Equity - Bid Certification

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list available at the bottom of the page of the Employment and Social Development Canada (ESDC) - Labour's website (https://www.canada.ca/en/employment-social-development/programs/employment-equity/federal-contractor-program.html#).

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

5.2.3 Additional Certifications Precedent to Contract Award

5.2.3.1 Canadian Content Certification

SACC Manual clause A3050T (2018-12-06) Canadian Content Definition

5.2.3.2 Status and Availability of Resources

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

5.2.3.3 Education and Experience

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

PART 6 - RESULTING CONTRACT CLAUSES

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

6.1 Statement of Work

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

6.2 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.

6.2.1 General Conditions

2040 (2018-06-21), General Conditions - Research & Development, apply to and form part of the Contract.

6.2.2 Canada to Own Intellectual Property Rights in Foreground Information

SACC Manual clause K3410C (2015-02-25) Canada to Own Intellectual Property Rights in Foreground Information

6.3 Term of Contract

6.3.1 Period of the Contract

The period of the Contract is from date of Contract to _____ inclusive ***(fill in end date of the period at Contract Award)***.

6.4 Authorities

6.4.1 Contracting Authority

The Contracting Authority for the Contract is:

Kaveh Mirfatahi
Supply Specialist
Public Works and Government Services Canada
Acquisitions Branch, Quebec Region
Place Bonaventure
800 de la Gauchetière Ouest
Suite 7300, Portail Sud-Ouest, Montréal, Québec H5A 1L6

Telephone: 514-260-4106
Facsimile: 514-496-3822
E-mail address: kaveh.mirfatahi@pwgsc-tpsgc.gc.ca

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

6.4.2 Project Authority

The Project Authority for the Contract is:

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

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

6.4.3 Contractor's Representative *(Contractor to fill in)*

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

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

6.5 Proactive Disclosure of Contracts with Former Public Servants *(if applicable)*

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

6.6 Payment

6.6.1 Basis of Payment

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid a firm price, as specified in Annex B – Basis of Payment for a cost of $ _____ ***(insert the amount at contract award*)**. 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.

6.6.2 Milestone Payments – Not subject to holdback

SACC Manual clause H3010C (2016-01-28) Milestone Payments – Not subject to holdback

6.6.3 Schedule of Milestones

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

6.6.4 T1204 – Direct Request by Customer Department

SACC Manual clause A9117C (2007-11-30), T1204 – Direct Request by Customer Department

6.6.5 Electronic Payment of Invoices – Contract

The Contractor accepts to be paid using any of the following Electronic Payment Instrument(s):

a. Visa Acquisition Card;
b. MasterCard Acquisition Card;
c. Direct Deposit (Domestic and International);
d. Electronic Data Interchange (EDI);

6.7 Invoicing Instructions

1. The Contractor must submit a claim for payment using form PWGSC-TPSGC 1111, Claim for Progress Payment.
   Each claim must show:

   a. all information required on form PWGSC-TPSGC 1111;

   b. all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;

   c. the description and value of the milestone claimed as detailed in the Contract.

2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.

3. The Contractor must prepare and certify **one (1) original and two (2) copies** of the claim on form PWGSC-TPSGC 1111, and 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.

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

6.8 Certifications and Additional Information

6.8.1 Compliance

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

6.8.2 Canadian Content Certification

SACC Manual clause A3060C (2008-05-12), Canadian Content Certification

6.9 Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in Quebec.

6.10 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) *SACC Manual* clause K3410C (2015-02-25) Canada to Own Intellectual Property Rights in Foreground Information;
(c) the general conditions 2040 (2018-06-21), Research & Development;
(d) Annex A, Statement of Work;
(e) Annex B, Basis of Payment;
(f) the Contractor's bid dated _____.

6.11 Foreign Nationals (Canadian Contractor)

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

6.12 Insurance

SACC Manual clause G1005C (2016-01-28) Insurance

6.13 Directive on Communications with the Media

1. Definitions

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

2. Communication Activities Format

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

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

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

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

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

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

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

The Contractor must obtain and use a high resolution printed or electronic copy of the CSA's corporate identity logo and seek advice on its application, by contacting the project authority as mentioned in Paragraph 7.5.2 of this contract.

3. Communication Activity Coordination Process

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

a. As soon as the Contractor intends to organize a Communication Activity, send a Notice to the CSA's Directorate of Communications and Public Affairs. The Communications Notice must include a complete description of the proposed Communication Activity. The Notice must be in writing in accordance with the clause Notice included in the general conditions applicable to the contract. The Communications Notice must include a copy or example of the proposed Communication Activity.

b. The contractor must provide to the CSA any and all additional document in any appropriate format, example or information that the CSA deems necessary, at its entire discretion to correctly and efficiently coordinate the proposed Communication Activity. The Contractor agrees to only proceed with the proposed Communication Activity after receiving a written confirmation of coordination of the Communication Activity from the CSA's Directorate of Communications and Public Affairs.

The Contractor must receive beforehand the authorization, approval and written confirmation from the CSA's Directorate of Communications and Public Affairs before organizing, proceeding or hosting a communication activity

ANNEX A

STATEMENT OF WORK

The Statement of Work is hereby attached.

Agence spatiale canadienne | Canadian Space Agency

CSA-LiteBIRD-SOW-0002

Canadian Space Agency
Space Exploration

LiteBIRD Statement of Work
PHASE 0

Revision A
4 June 2019

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REVISION HISTORY

Rev.	Description	Initials	Date
IR	Initial Release	DL	10 May 2019
A	Technical Authority Review	DL	4 June 2019

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1 INTRODUCTION

1.1 MISSION OVERVIEW AND SCIENCE OBJECTIVES

LiteBIRD (**L**ite satellite for the studies of **B**-mode polarization and **I**nflation from cosmic background **R**adiation **D**etection) is a next generation millimeter-wavelength space telescope being designed by the Japan Aerospace Exploration Agency (JAXA) and partners to map the Cosmic Microwave Background (CMB) polarization. Its primary science goal is to detect the signature imprinted on the CMB by gravitational waves produced a fraction of a second after the Big Bang. Detecting primordial gravitational waves would be a major scientific discovery. LiteBIRD will be instrumented with approximately 3,000 detectors spanning observation frequency bands from 40 to 400 gigahertz (GHz) with noise levels about 20 times better than was achieved with the Planck space telescope. JAXA is leading the LiteBIRD mission currently in Phase A1. The Canadian designed digital frequency multiplexing "DfMUX" readout system for the telescope's bolometer detector arrays is the current baseline for the mission.

The LiteBIRD mission and science objectives are described in more detail in [RD-01] and elsewhere. The specific signature of gravitational waves from inflation in the CMB known as "B-mode polarization" offers the possibility to observe the Universe a fraction of a second after the Big Bang. It provides a window on energy scales near 10^{16} Giga electron-volt (GeV), 12 orders of magnitude above what is accessible to earth-based particle colliders. Precise measurements of CMB B-modes also offer new constraints on the neutrino physics and provide a better census of matter in the Universe. The LiteBIRD mission is designed to provide a definitive search for primordial B-modes from inflation. Canadian researchers seek a contribution from Canada for LiteBIRD, so that the data products from the mission are available to Canadian cosmologists, who are well positioned to exploit these data to make break-through discoveries.

LiteBIRD is of key importance to the Canadian astronomy community, as it addresses one of the most fundamental questions in physics: 'How did the universe begin?', while enhancing Canadian industrial leadership in space technology. Canada is already a leader in ground and balloon-based readout systems for Transition Edge Sensor (TES) detectors. Indeed, the vast majority of the world's millimeter wave telescopes use Canadian readout technology. Canada has an established reputation as a reliable and preferred space astronomy mission partner through its involvement in missions such as James Webb Space Telescope (JWST), ASTROSAT[1], Hitomi[2], Herschel[3], Planck[4], and Far Ultraviolet Spectroscopic Explorer (FUSE). A contribution to LiteBIRD would allow Canada to enhance its leading role in ground- and balloon-based millimeter-wave telescopes and satellite platforms. It would simultaneously leverage Canadian leadership in ground and balloon-based millimetre-wave telescope projects to the space context, and train the next generation of engineers and scientists for roles in space technology in Canada.

[1] A multi-wavelength astronomy mission on an IRS-class satellite into a near-Earth, equatorial orbit
[2] also known as ASTRO-H; an X-ray astronomy satellite commissioned by JAXA for studying extremely energetic processes in the Universe
[3] Herschel Space Observatory built and operated by the European Space Agency (ESA)
[4] Planck satellite is an ESA mission

The Canadian Long Range Plan (LRP) for Astronomy 2016 Mid-Term Review [RD-02] strongly supports Canadian involvement in a CMB polarization satellite mission in the following excerpt:

- *Recommendation*
  - *The MTRP [Mid-Term Review Panel] recognizes the unique role that Canada could play in an international CMB polarization satellite mission. The MTRP strongly recommends that the CSA engage in discussions with its sister agencies for a hardware and science role in a new mission such as LiteBIRD or other mission opportunity such as PIXIE that may arise in the immediate future.*

1.2 MISSION ARCHITECTURE

LiteBIRD is a candidate for JAXA's strategic large mission and is designed to observe the CMB polarization over the full sky at large angular scales. It is planned for launch in the late 2020s on an H3 Launch Vehicle for three (3) years of observations at a Sun-Earth Lagrangian point (L2). The concept design has been studied by researchers from Japan, United States (US), Canada, and Europe during the Institute of Space and Astronautical Science (ISAS) Phase-A1. Large scale measurements of the CMB B-mode polarization are known to be the best to probe and to detect primordial gravitational waves. A three (3)-year full sky survey will be carried out with a Low Frequency (34 - 161 GHz) Telescope (LFT) and a High Frequency (89 - 448 GHz) Telescope (HFT), which achieve a sensitivity of 2.5 μK-arcminutes (arcmin) with an angular resolution 30 arcmin around 100 GHz. The concept design of the LiteBIRD system, PayLoad Module (PLM), cryo-structure, LFT, and verification plan is described in [RD-03].

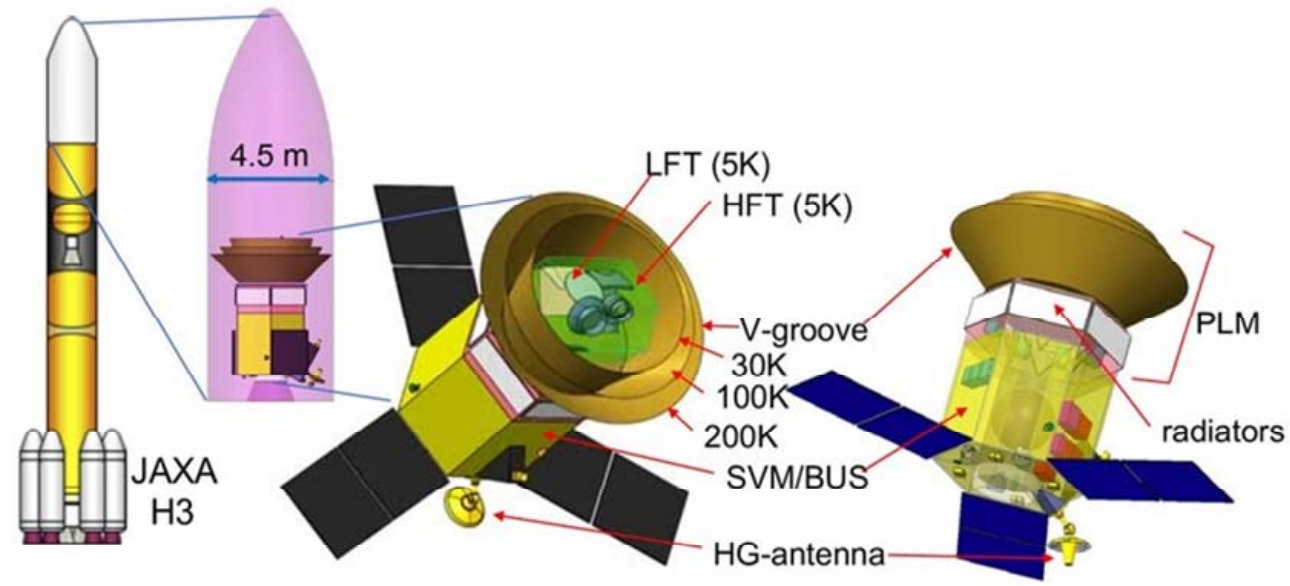

FIGURE 1-1 - OVERALL DESIGN OF THE LITEBIRD SPACECRAFT

(courtesy JAXA)

The payload concept for the LiteBIRD mission is shown in Figure 1-1.

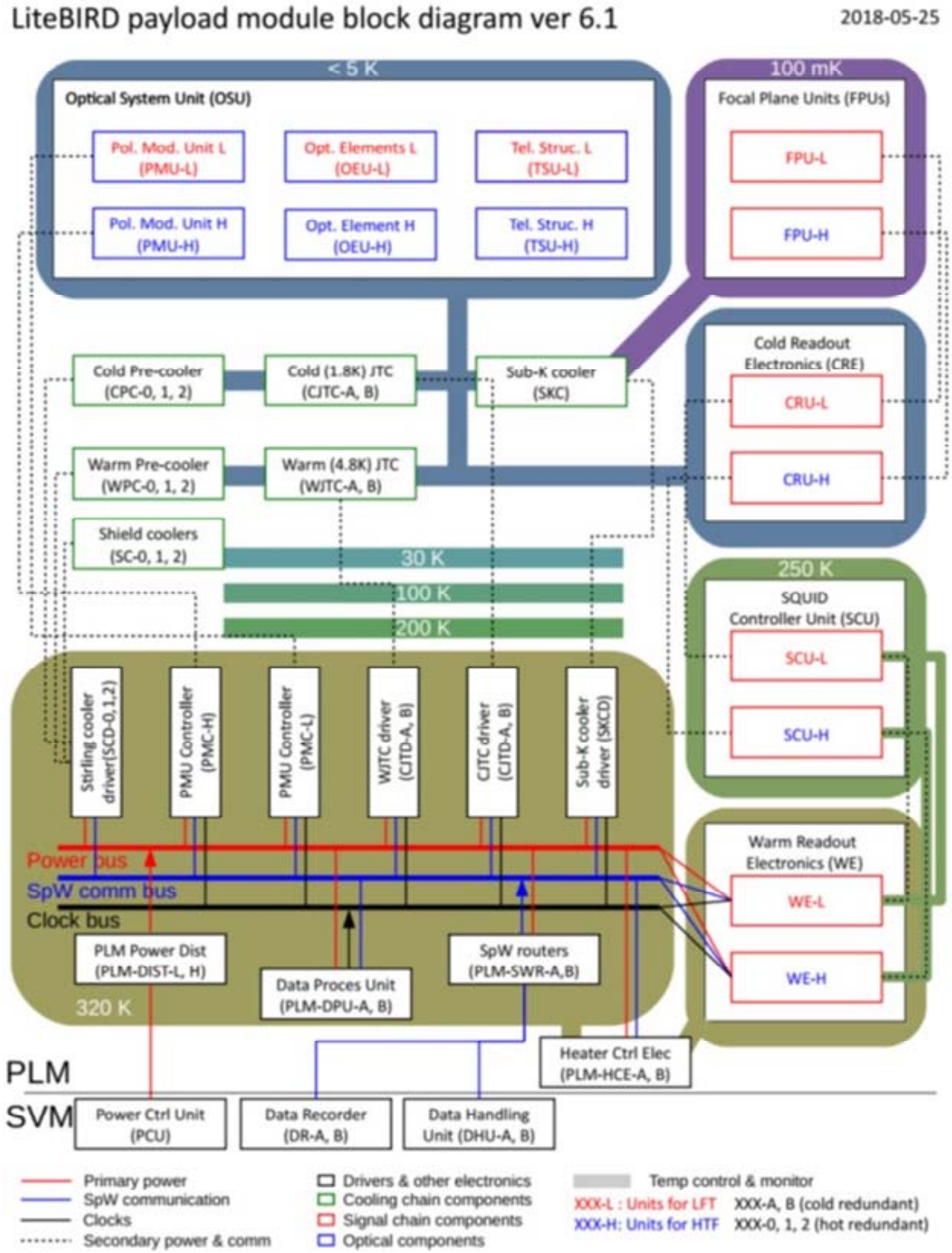

FIGURE 1-2 – LITEBIRD PAYLOAD MODULE BLOCK DIAGRAM (VER 6.1)

The Canadian contribution is the Warm readout Electronics (WE) and the SQUID Controller Units (SCU) [RD-04]. A baseline design for LiteBIRD's readout electronics that perform the required readout functions (interface the SQUIDs, biases the bolometers, captures the sky signals, and compress the data) while meeting mission requirements is based on McGill University readout technology which has successfully been used in the preeminent CMB telescopes around the world. A version of this technology, developed under CSA's STDP program, has also flown in a stratospheric balloon to establish its tolerance to space-like radiation environments and to bring the associated technology to TRL5.
In a frequency-multiplexed TES bolometer array, each bolometer is assigned a carrier frequency via a frequency-selective circuit in the cryostat. Many bolometers with distinct carrier frequencies may then share a single set of wires entering and leaving the cryostat. The proposed Canadian contribution to this mission – the WE and the SCU – will provide the frequency multiplexed readout of the cryogenically cooled TES located in the focal planes of the two (2) telescopes (HFT & LFT). There will be one set of WE and SCUs (collectively 'the equipment') for each telescope.

The CSA Contribution Study [RD-04] analyzed the LiteBIRD mission and spacecraft requirements, and defined a detailed set of requirements that applied to the Bolometer Readout Electronics. The study team worked closely with JAXA and NASA to refine and validate those requirements. Several architectures were studied for the readout system and compared for reliability, the effect of failures on detector loss, power consumption, and programmatic benefits. Based on this detailed analysis, the architecture shown in Figure 1-2 was chosen.

The WE equipment consists of two (2) operationally separate pairs of physical units, WE-Low (WE-L) and WE-High (WE-H). The WE-L equipment exclusively processes SQUID channels from the LFT and consists of the SCU-Low (SCU-L) and Signal Processing Unit-Low (SPU-L). Similarly, the WE-H consists of a SCU-High (SCU-H) and Signal Processing Unit-High (SPU-H). Both WE-L and WE-H are electrically and mechanically independent, and each provides its own internal redundancy.

The SCUs consist of enough SQUID Controller Assemblies (SCAs) to manage the SQUID channels for the associated telescope (five (5) for LFT, eight (8) for HFT). The Signal Processing Unit (SPU) hosts Digitizer Assemblies (DAs), containing Digital to Analog Converter (DAC)/ Analog to Digital Converter (ADC) boards, SPAs, containing c (FPGAs), a Power Conditioning Assembly (PCA), and if necessary, Instrument Controllers Assemblies (ICAs). These assemblies are connected through a Backplane Assembly which is used to distribute power, control and data signals.

The **design and implementation of the digital signal processing firmware** is a key element of Canadian know-how that enables the readout system for LiteBIRD. This includes both application-specific algorithms (the DfMUX readout implementation) and radiation-hard design fixtures (such as peer-to-peer monitoring for single event upsets) that are applicable to a broader range of applications.

1.3 SCOPE

This Statement of Work (SOW) defines the overall work to be performed for Phase 0 of a potential CSA contribution to the JAXA LiteBIRD mission. It also identifies the deliverables and the technical, programmatic, and administrative tasks to be performed during Phase 0.

One key result of a Phase 0 study is to provide information for CSA to clearly understand the options, costs, schedule, and risks. The systems, being either hardware or software sub-systems, that are being studied in Phase 0, remain options subject to further down-selection or de-scope. For that reason, it is important to provide information for all the elements separately. Details of the elements will be included in separate Contract Data Requirements List (CDRL) and Data Item Description (DID) (as described in Section 3 – Work Requirements). The CSA must have all the information necessary to make a decision as to whether or not to proceed with the development of the next phase.

1.4 OBJECTIVE

The objectives of the Phase 0 are to validate and consolidate users' needs, validate mission requirements, validate concept definition and design, provide a concept of operations, identify critical technologies, interfaces and preliminary systems requirements and provide key analyses to support the feasibility of the proposed concept, and prepare development plans for follow-on phases of a potential LiteBIRD contribution. At the end of this Phase 0, the CSA should have all the technical and programmatic information necessary to make an informed decision about the LiteBIRD contribution.

1.5 DOCUMENT CONVENTIONS

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

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

2 DOCUMENTS

2.1 APPLICABLE DOCUMENTS (AD)

This section lists the documents that are required for the bidder to develop the proposal.

The following documents of the exact issue date and revision level shown are applicable and form an integral part of this document to the extent specified herein; they can be obtained from the following File Transfer Protocol (FTP) site: ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/.

TABLE 2-1 - APPLICABLE DOCUMENTS

AD No.	Document Number	Document Title	Rev. No.	Date
AD-01	CSA-ST-GDL-0001	CSA Technology Readiness Levels and Assessment Guidelines	D	Mar, 2019
AD-02	CSA-ST-FORM-0003	Critical Technology Element (CTE) Identification Criteria Worksheet	B	Mar, 2019
AD-03	CSA-ST-GDL-0001	Technology Readiness and Risk Guidelines (TRRA)	D	Mar, 2019
AD-04	CSA-SE-STD-0001	CSA Systems Engineering Technical Reviews Standard	A	Nov, 2008

2.2 REFERENCE DOCUMENTS (RD)

The following documents provide additional information or guidelines that either may clarify the contents or are pertinent to the history of this document, but are not required to develop the proposal.

TABLE 2-2 - REFERENCE DOCUMENTS

RD No.	Document Number	Document Title	Rev. No.	Date
RD-01	Journal of Low Temperature Physics Sept. 2014, Volume 176, Issue 5–6	T. Matsumura et al, Mission Design of LiteBIRD		2014
RD-02		CASCA Long Range Plan 2010 CASCA Mid-Term Review of LPR Available from https://www.casca.ca/lrp2010/		2010 2016
RD-03	Proc. of SPIE Vol. 10698 106981Y-1 (SPIE Astronomical Telescopes + Instrumentation, 2018, Austin, Texas)	Y. Sekimoto et al, Concept design of the LiteBIRD satellite for CMB B-mode polarization		2018
RD-04	LBRDMCS-TN-001-McGill_9F050-170023	LiteBIRD Mission Contribution Study Final Report	5	Sep, 2018
RD-05	CSA-SE-PR-0001	CSA Systems Engineering Methods and Practices	Rev. B	Mar, 2010
RD-06		Guidelines on Costing (Treasury Board)		2016

3 WORK REQUIREMENTS

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

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

3.1 LITEBIRD / INSTRUMENT CONCEPTUAL DESIGN

The Contractor must develop or refine a Mission or Instrument Concept Document (MCD) (CDRL MD1) that supports the definition, development, and operation of the readout system. This document communicates to systems developers and users, in the user's language, the desired characteristics of the system to be developed. This document will focus on the actual LiteBIRD contribution with respect to the top level referenced documents describing the overall international mission concept and describe the Canadian contribution.

3.2 LITEBIRD / INSTRUMENT REQUIREMENTS

The Contractor must review the preliminary list of LiteBIRD mission requirements provided in this SOW, and flow down these requirements to readout system specifications, modify, refine and/or further develop as needed. The Performance and Functional Requirements (PFR) Document must be a separate document as the intent is to use this SOW in subsequent phases of the project. The focus of the requirement development should be aligned with the priority expressed in the analysis of the elements provided under the required analysis in Engineering section 3.3.4.

3.3 MISSION PLANNING AND DEVELOPMENT

Mission Planning and Development includes:

- identification of the mission costs;
- identification of the mission schedule;
- identification of the technology development required to advance the technology readiness to the appropriate level at the appropriate time;
- identification of the development and manufacturing approach;
- provision of a mission risk assessment;
- identification of potential collaborations;
- provision of a strategy for Canadian capabilities development; and
- provision of a commercialisation plan. (optional)

3.3.1 Mission Cost Estimate

The Contractor must provide an indicative Mission Cost Estimate, in accordance with Treasury Board (TB) guidelines, in the format of Table 3-1 Mission Cost Breakdown, for all phases covering development, implementation, operation, and disposal including a detailed justification for those costs that describes the type of cost analysis (analogous, bottom-up, etc.), and any assumptions made.

TABLE 3-1 – MISSION COST BREAKDOWN

Category		Phase A	Phase B	Phase C	Phase D	Phase E	Phase F
Labour	Management						
	Technology Development						
	Design						
	Documentation						
	Reviews						
	Manufacturing						
	Assembly						
	Testing						
	Product Assurance						
	Operations (Ground Systems)						
	Science Processing and Operations Center (SPOC)						
	Science Support						
	Total Labour						
Non-Labour	Hardware / Software Procurement						
	Operations (Ground Systems)						
	Science Team Support (SPOC)						
	Tools, Equipment and Facilities						
	Travel and Living						
	Other Direct Charges						
	Total Non-Labour						
Risk	Risk Contingency						
Taxes	GST						
Total By Phase							
Total All Phases							

3.3.2 Overall Mission Schedule

The Contractor must suggest a preliminary Mission Schedule relative to the overall life cycle of the mission including the impact of hardware integration and qualification milestones. The timeline must include key milestones such as Preliminary Design Review (PDR), Critical Design Review (CDR), and Launch. Refer to CSA Systems Engineering Technical Review Standard (AD-04) for a full description of all possible reviews, which may vary depending on the nature of the mission architecture.

3.3.3 Development and Manufacturing Approach

The Contractor must provide an overview of the development and manufacturing approach, specifying the major tasks required in the development and manufacturing cycles, the strategy best suited for this approach, and the identification of potential long-lead items.

3.3.4 Preliminary Mission Risk Assessment

The Contractor must provide a preliminary risk assessment (including technical, schedule, cost, and programmatic risks) for the entire mission lifecycle, starting with Phase A through to Phase F. For each risk identified, the Contractor must identify the phase of the mission to which the risk applies, the likelihood of occurrence, the impact should the risk be realized, and any possible mitigation actions that could be taken to decrease either the likelihood or the impact. Specific mitigation actions must be identified for medium and high risks. Contingency plans (i.e.: identifying alternative strategies) must also be developed for medium and high risks, or when it is uncertain that mitigation plans will be effective.

The Contractor must integrate and present all risks in a Risk Assessment Matrix. The risk assessment process and matrix are provided in AD-03.

3.3.5 Collaboration

The Contractor must identify potential partners and/or stakeholders at the national and/or international level (academic, Other Government Departments (OGD), Agencies, etc.), state the benefits of their participation in this mission and provide a preliminary assessment of roles and responsibilities, including potential in-kind or financial contributions to the life cycle mission cost.

3.3.6 Canadian Capability Development

This report must provide an estimate of the anticipated percentage of Canadian content relative to the overall cost presented in Table 3-1, what options could be undertaken to maximize the Canadian content and their corresponding impacts and benefits.

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

3.3.7 Preliminary Commercialisation Plan

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

The Contractor must provide a preliminary commercialisation plan to explain the potential economic benefits of an investment in such a mission. This plan must include a description of potential products and spin-offs (space and non-space) that can be commercialized, a stakeholder analysis, and analysis of the competitors (national and international) for the potential products.

3.3.8 Technology Readiness and Risk Assessments (TRRAs)

The Contractor must conduct a Technology Readiness and Risk Assessment (TRRA) in accordance with the requirements of the CSA TRRA guidelines (AD-03).

The main steps of the TRRA are:

a) Logically breakdown the instrument into technology elements (CDRL MD4);

b) Classify technology elements as critical or non-critical using the criteria defined in the Critical Technology Elements (CTE) worksheet (AD-02) and provide sufficient rationale for that classification (CDRL MD5);

c) Produce a TRRA for each CTE using the PDF form provided in AD-03 (CDRL MD6).

d) Prepare a report according to CDRL MD7.

As the maturity of the technology grows and requirements are better defined, the TRRA may need to be updated to reflect this progress.

The Contractor must update the TRRA to reflect the change in maturity of the system as a result of the work performed in Phase 0. For purposes of technology development, the Contractor should also provide driving requirements, cost estimate, and schedule to reach the next Technology Readiness Level (TRL) for CTE.

3.3.9 Technology Roadmap

The Contractor must provide a Technology Development Plan, also known as Technology Roadmap (TRM) including the required technology developments to meet mission needs, and a plan and timeline to reach TRL 6 and TRL 8. The TRM must be prepared in the format of (CDRL MD7).

3.3.10 Intellectual Property

The Contractor must complete the Contractor Disclosure of Intellectual Property CSA Form (CDRL MD8), identifying the Background Intellectual Property (BIP) and Foreground Intellectual Property (FIP) that will be generated in this Phase 0 contract, the owners of the BIP and how it will be managed and coordinated among the various collaborators and entities involved.

3.4 ENGINEERING

3.4.1 Preliminary System Conceptual Design

The Contractor must develop a Preliminary System Conceptual Design Document (CDRL EN400) that meets the LiteBIRD DfMUX System Mission, Performance and Functional Requirements. This concept must be substantiated by analysis as described in section 3.3.4.

3.4.2 Preliminary Interface Control Document

The Contractor must prepare a Preliminary Interface Control Document (ICD) (CDRL EN401), to the extent of the information available from LiteBIRD mission and contributing partners (JAXA, ESA and NASA), in which:

a) All external interfaces are identified and characterized.

b) All internal interfaces are identified and characterized between all sub-systems.

c) All software interfaces are identified and characterized.

International reference documents will be provided during the contract as inputs to the external interfaces.

3.4.3 Supporting Analyses

The Contractor must provide analyses in support of the conceptual design and feasibility assessment exercises (CDRL EN403).

This includes the assembly of any new technology being developed into a demonstration prototype that would be provided for integration and testing with the detector systems. This means developing the interface specifications, the wire harnesses, and refactored SQUID controller board, to the level that the system is ready for integration, and also prototyping the signal processing assembly enclosure and SQUID controller enclosure. The end to end system would first be tested with detectors and then provided to partners.

The contractor must deliver analyses and models as per the DID required to establish the mass budget, power and data budget, and a viable thermal concept and design. This will ensure that the proposed concept is fully characterized against the thermal, power, data and mass budgets, and provide a viable concept in line with the requirements.

3.5 PROJECT MANAGEMENT

The Contractor is responsible for establishing and maintaining a project management control system to ensure the cost, schedule, technical and programmatic requirements of this SOW are met. If there is information missing from this SOW for the contractor to fulfill its responsibilities to complete the contract, it is the duty of the contractor to inform the CSA as soon as this situation comes to light. If CSA does not have the information on hand or cannot obtain the information, the contractor and CSA must make and document assumptions so that the work will not be stopped. Refer to Appendix A, for the minimum required CDRL).

3.5.1 Team Organization

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

The Contractor must appoint an experienced Project Manager (PM) responsible for all aspects of the work carried out by the Contractor. The PM will act as single Point of Contact (POC) within its project organization for communications between the Contractor and the Technical Authority (TA) for the contract. In the PM's absence, the Contractor must designate an alternate to maintain continuity of communication between the Contractor and the TA.

The Contractor must also identify other essential personnel to execute the contract with appropriate qualifications and experience assigned to all positions within the project organization, including scientists with the necessary expertise to define and interpret the science requirements for the mission and data products (for the purpose of the contract work).

The Contractor must include, within its program management structure, the necessary leadership to effectively manage the performance of subcontractors in keeping with the project objectives. This implies that the subcontractors have the correct processes and/or policies in place to be able to perform and track the work to the highest standards (e.g. ISO-9000s).

3.5.2 Contractor Work Breakdown Structure

The Contractor must prepare and maintain a detailed Contractor Work Breakdown Structure (CWBS) (CDRL PM3). The CWBS must include all project management, product assurance, mission and operations planning and engineering work identified in this SOW, including subcontractors' work. Since, this work also includes the planning analysis for all phases until completion, the CWBS must contain all the Work Packages (WPs) necessary to carry out all the work for a complete mission.

3.5.3 Detailed Schedule and Critical Path

The Contractor must prepare and maintain a detailed schedule based on the CWBS for all the work to be performed under this Phase 0 contract.

The schedule must show dependencies between the activities to identify the critical path and marked on the schedule chart. The schedule must be updated at each major milestone. The schedule must include all the milestones listed in Table 3-2 – Proposed Project Milestones.

Since this work also includes the planning analysis for all the phases until completion, the schedule must contain all the WPs and tasks necessary to carry out all the work for a complete mission.

TABLE 3-2 – PROPOSED PROJECT MILESTONES

ID	Milestone (hold concurrently M2 + M3; M4 + M5)
M1	Kick-off Meeting (KoM)
M2	Mission Concept Review (MCR)
M3	Technology Readiness and Risk Assessment
M4	Mission Requirements Review (MRR)

ID	Milestone (hold concurrently M2 + M3; M4 + M5)
M5	Preliminary Systems Requirements Review
M6	Phase 0 Final Review

3.5.4 Communications and Access

The Contractor must establish and maintain a close management and technical interface with CSA to coordinate program effort and monitor the total program cost, schedule, and performance.

The Contractor must provide access to its plant and personnel, as well as to its subcontractor plants and personnel, at mutually agreeable dates, by representatives of CSA (such as CSA Quality Assurance (QA)) or other organizations nominated by the CSA, for review of program status.

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

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

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

3.5.5 Project Meetings

The Contractor must hold the meetings described in Table 3-3 Planned Meetings. Some or all of these meetings may be attended by representatives of the CSA, and/or other organizations designated by the CSA.

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

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

Additional teleconferences and face-to-face review meetings must be held if necessary when mutually agreed to by the Contractor and the CSA Mission Manager.

Meetings can be alternatively replaced by teleconferences for cost and/or time savings and when appropriate to support the scope of the meeting. All technical reviews will be chaired by the CSA Mission Manager.

TABLE 3-3 – PLANNED MEETINGS

ID	Meetings	Date Time after Contract Award	Venue
M1	Kick-off Meeting (KoM)	2 weeks	CSA/Telecon
M2	Mission Concept Review (MCR)	Combine at 4 months	CSA/Telecon
M3	Technology Readiness and Risk Assessment (TRRA)		
M4	Mission Requirements Review (MRR)	Combine at 8 months	CSA/Telecon
M5	Preliminary Systems Requirements Review		
M6	Phase 0 Final Review	10 months	CSA
	Monthly Meetings	As required	Telecon

3.5.5.1 M1 – Kick-off Meeting

This meeting will serve as an opportunity for CSA and Public Services and Procurement Canada (PSPC) to review the Contractor's plans, the requirements of the work (SOW), schedules, deliverables, risks, and address issues (CDRL PM5).

3.5.5.2 M2 – Mission Concept Review (MCR)

The MCR confirms the mission needs and examines the proposed mission's objectives and the concept for meeting those objectives and determines the project readiness to proceed with the development of mission requirements.

The Contractor must make a presentation (CDRL PM6) to demonstrate that the MCR entry and exit criteria are met, including the common entry and exit criteria, as per AD-04.

The deliverables for this review will be as per Table A-1.

3.5.5.3 M3 – Technology Readiness and Risk Assessment (TRRA)

The focus of the TRRA process is to provide inputs to the Technology Development Plan by identifying critical technologies and assessing their maturity level. The intent of this milestone is to review the PDF worksheets (CDRL MD6) for each CTE.

Please refer to section 3.3.8 for more information.

3.5.5.4 M4 – Mission Requirements Review (MRR)

The purpose of the MRR is to demonstrate the validity of the mission requirements, to examine the mission architecture, and to ensure project readiness to proceed with the development of system requirements.

The Contractor must make a presentation (CDRL PM7) to demonstrate that the MRR entry and exit criteria are met, including the common entry and exit criteria, as per AD-04.

The deliverables for this review will be as per Table A-1.

3.5.5.5 M5 – Preliminary System Requirements Review (PSRR)

The purpose of the Preliminary System Requirements Review (PSRR) is to prepare for the LiteBIRD Mission SRR for each subsystem of the LiteBIRD.

The Contractor must make a presentation (CDRL PM8) to demonstrate that the PSRR entry and exit criteria are met.

The deliverables for this review will be as per Table A-1.

3.5.5.6 M6 – Final Review Meeting (FR)

The Final Review (FR) will serve to review all final deliverables, and close all open actions.

The Contractor must make a presentation (CDRL PM9) to close the contract.

The deliverables for this review will be as per Table A-1.

3.5.6 Agendas, Minutes and Action Item Log

The Contractor must provide a meeting agenda (CDRL PM1) for all reviews and meetings including teleconferences and must deliver these to the CSA Mission Manager and/or TA no less than 5 working days before the meeting and must have it approved by the CSA Mission Manager and/or TA. Agenda can be combined with the meeting presentation as long as the information required are provided.

The Contractor must produce the minutes for all reviews and meetings including teleconferences and must deliver these to CSA (CDRL PM2). In the case of teleconferences, they must be delivered the next business day.

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

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

Also, a chart indicating how many action items are open and how many are closed since the beginning of the project must be produced for the monthly progress report and at the meetings. The AIL (CDRL PM1) must be delivered with the Monthly Progress Report PM1.

3.5.7 Project Reporting

3.5.7.1 Monthly Progress Reports

Not applicable (CDRL PM1).

3.5.8 Document Deliverables

The Contractor must deliver all documentation content listed in the CDRL tables (Appendix A) as a minimum. Documents may be combined or divided by mutual agreement to optimize production and avoid unnecessary duplication of information. The format and content of the deliverables must be in accordance with the requirements specified in the DIDs (Appendix B), both the specific DID identified in the CDRL and the DID-100 – General Preparation Instructions".

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

All documents must be delivered via the CSA CM Library for the LiteBIRD mission. Login credentials will be provided after the KoM.

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

The delivery schedule for all documentation must be as defined in the CDRL table.

The Contractor must obtain approval from the CSA for all CDRL Documents so indicated in the CDRL table.

3.5.8.1 Documents Delivered for Approval

The term "Approval" as used in this document and in other documents referred to herein, means written approval by the CSA Mission Manager of documents submitted by the Contractor. Once approved, the document is authorized for further use by CSA. The CSA does not take responsibility for the validity of the data, or statements, and the Contractor is fully responsible for the content and secondary effects derived there from.

The document may not be changed without the CSA Mission Manager approval. No request or document for which approval is required must be acted upon or implemented by the Contractor until such approval is given. The CSA Mission Manager will promptly review such requests and documents and give the necessary written approval or disapproval. If the CSA Mission Manager to fails to approve or disapprove the document within fifteen (15) working days, the document may be deemed approved.

In the event that a request or document is disapproved, the CSA Mission Manager will advise the Contractor in writing as to the reasons for such disapproval and will define the additions, deletions or corrections that the CSA Mission Manager deems necessary to render the request or document acceptable. Disapproved requests or documents that are subsequently amended by the Contractor and resubmitted for approval will be either approved or disapproved by the CSA. Approval or disapproval of resubmitted requests or documents will be based solely on those points that were not previously deemed to be acceptable.

3.5.8.2 Documents Delivered for Review

The term “Review” as used in this document and in all other documents referred to herein, means, unless specifically stated otherwise, a CSA review of the documents submitted for that purpose by the Contractor. The acceptance by the CSA Mission Manager of a document for review must imply that the document has been reviewed, commented on, revised as necessary, and has been determined to meet the requirements.

The CSA does not take responsibility for the validity of the data, or statements, and the Contractor is fully responsible for the content and secondary effects derived there from.

In the event that the CSA Mission Manager does not concur with a document submitted for review, the CSA Mission Manager will so notify the Contractor. Such notification will include a full explanation of the reasons for the lack of concurrence and will recommend the additions, deletions and/or corrections that the CSA Mission Manager deems are beneficial to the needs of the project.

The Contractor is obligated to consider implementation of the changes suggested by CSA insofar as the changes are in accordance with the relevant DID in Appendix B and this SOW. If written notification of concurrence is not provided by the CSA Mission Manager within fifteen (15) working days of the receipt of the document, the document must be deemed to have been reviewed and accepted by the CSA Mission Manager without comment.

3.5.9 Subcontract Management

The Contractor must be fully responsible for implementation and execution of all tasks, including those subcontracted to others. Whenever this is the case, the Contractor must prepare and maintain subcontract SOWs, technical requirements documents, etc., necessary to effectively manage the subcontractors’ work.

At the request of the CSA Mission Manager and/or TA, copies of subcontractor documentation must be delivered to the CSA Mission Manager and/or TA.

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

4 CONTRACTOR DELIVERABLES

4.1 DOCUMENTATION

The Contractor must deliver all documentation requested in Appendix A.

The Contractor may propose to combine documents called by more than one CDRL into one document, but this is subject to prior approval from the CSA. Where this approval is granted, the document cover page must list all the CDRL numbers that are covered by this document (see DID-100 – General Preparation Instructions).

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

Documents must be delivered in the original software application format. One electronic copy of each deliverable document must be transferred to the CSA to the address and in the format specified in DID-100 – General Preparation Instructions. No paper copy is to be delivered.

All documents must be provided as soon as completed but no less than 10 working days prior to the specified Review/Meeting unless otherwise indicated.

5 ACRONYMS

AD	Applicable Document
ADC	Analog to Digital Converter
AIL	Action Item Log
arcmin	Arcminutes
BIP	Background Intellectual Property
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CF	Contractor's Format
CM	Configuration Management
CMB	Cosmic Microwave Background
ConOps	Concept of Operations
CSA	Canadian Space Agency
CTE	Critical Technology Element
CWBS	Contractor Work Breakdown Structure
DA	Digitizer Assembly
DAC	Digital to Analog Converter
DfMUX	Digital frequency MUltipleXing
DID	Data Item Description
ESA	European Space Agency
FIP	Foreground Intellectual Property
FPGA	Field Programmable Gate Array
FR	Final Review
FTP	File Transfer Protocol
FUSE	Far Ultraviolet Spectroscopic Explorer
GeV	Giga electron-volt
GHz	gigahertz
GST	Goods and Services Tax
HFT	High Frequency Telescope
ICA	Instrument Controllers Assembly
ICD	Interface Control Document
IP	Intellectual Property
ISAS	Institute of Space and Astronautical Science
JAXA	Japan Aerospace Exploration Agency
JWST	James Webb Space Telescope
KoM	Kick-off Meeting

LFT	Low Frequency Telescope
LiteBIRD	**L**ite satellite for the studies of **B**-mode polarization and **I**nflation from cosmic background **R**adiation **D**etection
LRP	Canadian Long Range Plan
MCD	Mission Concept Document
MCR	Mission Concept Review
MRR	Mission Requirements Review
MTRP	Mid-Term Review Panel
NASA	National Aeronautics and Space Administration
OGD	Other Government Departments
PCA	Power Conditioning Assembly
PDR	Preliminary Design Review
PDF	Acrobat document format (Portable Document Format)
PFR	Performance and Functional Requirements
PLM	PayLoad Module
PM	Project Manager
POC	Point of Contact
PSPC	Public Services and Procurement Canada
PSRR	Preliminary System Requirements Review
QA	Quality Assurance
RD	Reference Document
SCA	SQUID Controller Assembly
SCU	SQUID Controller Unit
SCU-High	SCU-High
SCU-L	SCU-Low
SI	International System of Units
SOW	Statement of Work
SPA	Signal Processing Assembly
SPOC	Science Processing and Operations Center
SPU	Signal Processing Unit
SPU-H	SPU-High
SPU-L	SPU-Low
TA	Technical Authority
TB	Treasury Board
TES	Transition Edge Sensor
TRL	Technology Readiness Level

TRM	Technology Roadmap
TRRA	Technology Readiness and Risk Assessment
US	United States
WE	Warm Electronics
WE-H	WE-High
WE-L	WE-Low
WP	Work Package

APPENDICES

A CONTRACT DATA REQUIREMENTS LIST (CDRL)

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

LEGEND:

1) DID No.

- CF = Contractor's format

2) Document Versions:

- D: Draft (under Version Control, expected to be updated – up to 50% complete and correct)
- P:Preliminary (under Version Control, expected to be updated - 70% complete and correct).
- IR: Initial Release (under Configuration Control, may well be revised during normal project life - 95-100% complete & correct).
- U: Update (expected revision, but not final; under Configuration Control, previous versions remain unchanged under Configuration Control).
- F: Final (under Configuration Control, normally not expected to be revised, but could be if necessary - 100% complete and correct).

TABLE A-1 - CONTRACT DATA REQUIREMENTS LIST

CDRL No.	Title	SOW Sect. No.	DID No.	Initial Release	Update	Final	Acceptance Category
A.1 PROJECT MANAGEMENT							
PM1	Meeting Agenda	3.5.6	110			M1 – M6	
PM2	Minutes of Meetings	3.5.6	111			M1 – M6	
PM3	CWBS and Work Package Descriptions	3.5.2	102	Proposal	M1 KoM		
PM4	Mission Life-Cycle Cost Estimates	3.3.1	Table 3-1	M4 MRR		M6 FRM	
PM5	Kick-Off Meeting Presentation	3.5.5.1	CF			M1 KoM	
PM6	Mission Concept Review Presentation	3.5.5.2	CF			M2 MCR	
PM7	Mission Requirements Review Presentation	3.5.5.4	CF			M4 MRR	
PM8	Preliminary Systems Requirement Review Presentation	3.5.5.5	CF			M5 PSRR	
PM9	Final Review Presentation	3.5.5.6	CF			M6 FRM	
A.2 MISSION DOCUMENTATION							
MD1.	Mission Concept Document (MCD)	3.1	002	M2 MCR	As required	M4 MRR	
MD2.	Performance and Functional Requirements Document (PFR)	3.2	008	M4 MRR	As required	M6 FRM	
MD3.							
MD4.							
MD5.	Criticality Technology Element (CTE) Report	2.1	AD-02	M3 TRRA		M4 MRR	
MD6.	TRRA for Critical Element (PDF Worksheets)	3.3.8 or 2.1	AD-03	M3 TRRA		M4 MRR	
MD7.	TRRA Stand Alone Report	3.3.8	013	M3 TRRA	As required	M4 MRR	
MD8.	Technology Roadmap (TRM)	3.3.9	CF	M3 TRRA		M4 MRR	
MD9.	Contractor Disclosure of IP	3.3.10	App. C	Proposal		M6 FRM	
A.3 OPERATIONS							
SM							

CDRL No.	Title	SOW Sect. No.	DID No.	Initial Release	Update	Final	Acceptance Category
A.4 ENGINEERING							
EN400	Preliminary System Conceptual Design Document	3.4.1	700	M4 MRR		M6 FRM	Review
EN401	Preliminary Interface Control Document (ICD)	3.4.2	501	M5 PSRR		M6 FRM	Review
EN402	Requirements Verification Matrix	3.4	CF	M4 MRR	M5 PSRR	M6 FRM	Review
EN403	Models & Analyses	3.4.3	600	M4 MRR	M5 PSRR	M6 FRM	Review

B DATA ITEMS DESCRIPTIONS (DIDS)

DID-100 – General Preparation Instructions

PURPOSE:

This DID specifies:

a) format requirements for the preparation and formatting of deliverable project documentation;

b) document and data delivery methods, notifications and identification requirements;

c) document and data structure requirements;

d) metadata requirements for all document and data submissions.

When documentation is prepared in the Contractor's format, it must still meet the requirements of this DID.

PREPARATION INSTRUCTIONS:

1. GENERAL INSTRUCTIONS

1.1. Preparation

All documentation must be written in English and must be delivered in electronic format. Documents must be prepared using the most appropriate software (Microsoft Word, Excel, etc.). Schedules must be submitted in Microsoft Project format. Documents whose native format is not a common office program must be delivered in PDF in addition to the native format.

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

WXYZ CDRL-NUM CIE document title (ABCD)rev no._sent YYYY-MM-DD

where:

WXYZ:	3-8 letter acronym of the project (eg.: LSM)
CDRL NUM:	The CDRL Identifier (e.g. PM1)
CIE:	Company Name or Agency center originating document
Document Title	Short descriptive text
(ABCD)	Contractor's document number, in brackets, this is optional
Revision no. or letter	1st release can be revIR, rev0, or revNC (no spaces)
_sentYEAR-MONTH-DAY	Date Tracking Number

For example : LSM PM1 ACME Test Report on TVAC rev0_sent2018-03-31

Note the absence of underscores or hyphens, except for the date. Failure to observe the file naming convention will be cause for rejection of the deliverable and incur delays in the payment of the claim.

1.2. Electronic Documents Format

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

1.2.1. Page Numbering

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

1.2.2. Document Numbers

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

1.3. Delivery, Notifications and Identification Requirements

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

Documents may be delivered via e-mail or direct transfer (FTP) or on optical disks.

CSA will provide a secure FTP site (CSA PIE-ISEP portal) for delivery and sharing of documents. All deliverables must be submitted via this secure CSA portal.

Login credentials will be provided after the Kick-Off Meeting.

The CSA PIE-ISEP portal offers automatic email notification when an new document is added or removed. This notification can be personalized with a message from the sender. These notifications will be treated as a Letter of Transmittal and acknowledgement of receipt.

1.3.1. E-mailed documents

E-mailed documents must be sent to:

asc.bibliothequegc-cmlibrary.csa@canada.ca

Covering e-mails must contain the project/program acronym or equivalent identifier in the "Subject" line and include the CDRL identifier under which deliverable documents are being submitted.

1.3.2. Direct Transferred Documents

For direct transfer, a notification of the document's availability and location on a contractor repository must be sent to:

asc.bibliothequegc-cmlibrary.csa@canada.ca

If deliverables contain ITAR content, notifications of their availability on contractor repositories must be sent to: the CSA CM ITAR Receipt Desk:

CSA-CM-ITAR@asc-csa.gc.ca

The notification must include the project/program acronym or equivalent identifier and the CDRL identifier under which deliverable documents are being submitted.

1.3.3. Documents Delivered on optical disks

Hard copy and media deliverables are to be addressed to:

CM Library, 6A-100
Attention: CSA LiteBird Phase 0 Project Manager
Canadian Space Agency
6767, Route de l'Aéroport
Longueuil, QC, J3Y 8Y9
CANADA

The DVD or CD-ROM label must show the following information:

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

2. DOCUMENT STRUCTURE AND CONTENTExcept as otherwise specified, all documents must have the overall structure as follows:

a) Cover/Title Page;

b) Table of Contents;

c) Introduction;

d) Applicable and Reference Documents;

e) Body of Document; and

f) Appendices

2.2. Cover/Title Page

The title page must contain the following information:

a) Document Number and date: Volume x of y (if multivolume)

b) Rev. indicator / date of Rev.

c) Document Title

d) Project Name

e) Contract No.

f) CDRL Item No. or Nos., if one document responds to more than one CDRL, subject to prior approval from the PA.

g) Prepared for: Canadian Space Agency

h) Prepared by: Contractor name, CAGE Code, address, and phone number

i) Product tree identifier, if applicable

j) © HER MAJESTY THE QUEEN IN RIGHT OF CANADA [YEAR].

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

2.3. Table of Contents

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

2.4. Introduction

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

a) Project description and background;
b) Identification (number, title) and a brief overview of the system, hardware, or software to which the document applies;
c) Purpose of the document;
d) Scope of the document (what it includes and what it does not include);
e) Document conventions; and
f) Roles and responsibilities of the participants and stakeholders.

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

2.5. Applicable and Reference Documents

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

2.6. Body of Document

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

2.7. Appendices

Appendices may be used to provide information published separately for convenience of document maintenance. Acronyms must be in the last appendix.

3. METADATA ON DELIVERABLES

This section is optional at the discretion of the CSA Project Manager.

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

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

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

Provided by Supplier	Metadata Description	Comments
When applicable	Filename of Parent Deliverable Bundle	If part of a document Bill of Material
When applicable	Identification of Delivery Media	If physically delivered
When applicable	Originator's Repository Address of deliverable	To identify source location of document

DID-002 – Mission Concept Document (MCD)

PURPOSE:

To support the definition, development, and operation of the readout electronics system. This document communicates to systems developers and users, in the user's language, the desired characteristics of the system or instrument to be developed.

PREPARATION INSTRUCTIONS:

The MCD is an important complementary document to the System Requirements Document (SRD), the Interface Requirements Document (IRD), and the Environmental Requirements and Test Specification (ERTS). Written in a narrative form and non-specification-type prose, it describes the way in which the system is envisioned to fit and function within its operational environment.

The contents of the MCD must be tailored as outlined below.

1. Introduction
    1.1. Identification
    1.2. Scope
    1.3. System overview
    1.4. Document overview
2. Referenced documents
3. System description
    3.1. System goals and objectives
    3.2. System scope
    3.3. Minimum supporting documentation
    3.4. System states and modes
    3.5. System architecture
    3.6. System Block Diagram
    3.7. System interfaces
    3.8. System capabilities
4. Operational needs
    4.1. Mission needs
    4.2. Users' needs
5. Operations
    5.1. Operational overview
        5.1.1.Mission

DID-007 – Mission Development Plan

PURPOSE:

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

PREPARATION INSTRUCTIONS:

The plan must include the following:

1) An introduction including the scope, the purpose and a list of assumptions (if any);
2) A description of the mission including goals and objectives;
3) Identification of stakeholders and their needs and expectations;
4) A description of the estimated mission life cycle cost;
5) A description of the estimated mission schedule including all major milestones;
6) A description of the technology development required; (mock-ups/prototypes/breadboards/etc.)
7) A description of the proposed development and manufacturing approach; including the testing process
8) A description of the preliminary mission risk assessment;
9) A description of the preliminary Concept of Operation;
10) A description of potential collaborations;
11) A description of the intellectual property to be generated throughout the whole project (not just Phase 0);
12) A description of the proposed Canadian capabilities development strategy;
13) A description of the proposed commercialisation plan; and
14) Recommendations for follow-on activities.

DID-008 – Performance and Functional Requirements Document

PURPOSE:

It is proposed that a LiteBIRD Readout System Performance and Functional Requirements (PFR) be used to capture the subset of mission requirements that will be applicable to the development of the LiteBIRD readout electronics system. The PFR will include functional and performance requirements, interface requirements, mission environmental requirements and operational requirements. It will also serve to distinguish essential requirements from goals (desirable objectives), and identify gaps, assumptions, TBDs, TBCs and unknowns that must be addressed.

PREPARATION INSTRUCTIONS:

The document must include the following:

1) An introduction including the scope and purpose
2) A short description of the mission including background objectives and a list of assumptions (if any);
3) A list of applicable and reference documents (if any);
4) User requirements, which represent a clear articulation of the data and applications needs as expressed by the user community and flowing down the mission capabilities and government priorities; these requirements must be summarized in a table at the end of this section or in an Appendix;
5) Mission specific requirements applicable to LiteBIRD readout electronics including performance and functional requirements that respond to user requirements and break down as follows:
    a) functional requirements,
    b) performance requirements,
    c) operational requirements,
    d) resource allocation requirements,
    e) verification requirements,
    f) other applicable requirements types.
6) External and internal interface Requirements, including but not limited to:
    a) Electrical Interface Requirements;
    b) Thermal Interface Requirements;
    c) Mechanical Interface Requirements;
    d) Data Interface Requirements;

7) Mission environmental requirements will likely be derived from partner Agencies specific standards to be provided during the contract and will cover topics such as mechanical, thermal, vacuum, contamination, outgassing, EMC/EMI, acoustics, shock, radiation, for the following environments:
    a) Ground operations and handling
    b) Integration to payload module and launch vehicle environment (for flight segment only)
    c) Launch environment (for flight segment only)
    d) On-orbit environment (for flight segment only)
8) In-flight requirements:
    a) Operational modes
    b) Upload and download of data/telemetry
    c) Telemetry availability
    d) Commanding capabilities
    e) Staffing requirements (ground and flight segments)

The mission requirements must be summarized in one or more tables at the end of this section or in an Appendix.

DID-013 – Technology Readiness and Risk Assessment with Stand Alone Report

PURPOSE:

The Technology Readiness and Risk Assessment (TRRA) Report is used to describe in a systematic and objective fashion, at a specific point in time (milestone) in the development process, the technological readiness of a system for a particular spaceflight mission, the criticality of the constituent technologies, and the expected degree of difficulty in achieving the remaining technology development steps.

The TRRA provides for all the Critical Technology Elements (CTEs) of the proposed concept, as per the Product Breakdown Structure (PBS), a high-level summary of the maturity of the technologies and the technology development risks.

The TRRA Report is used to assess project status and technical risks, and to guide definition of risk reduction work in following phases.

Agreement on the appropriate PBS level and identification of the CTEs is required prior to the TRRA leading to the elaboration of the TRRA Report. For each CTE the TRRA Report captures the key requirements, heritage, Technology Readiness Level (TRL) achieved, Technology Need Value (TNV), the Research and Development Degree of Difficulty (R&D3) to complete the development, and references to supporting evidence for all assessments.

PREPARATION INSTRUCTIONS:

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

1. **INTRODUCTION**

   This section should include

   a) Project Description;

   b) Purpose of Document;

   c) Scope.

2. **DOCUMENTS**

   This section must include

   a) Applicable Documents (which must include the following):
      a) TRRA Guidelines (CSA-ST-GDL-0001 at latest approved revision).

   b) Reference Documents (which must include the following):
      a) TRL Handbook for Space Applications (TEC-SHS/5574; ESTEC);
      b) (all evidence documents referred to in body of report).

3. **MISSION OBJECTIVES**

   This section must provide an overview of the mission, describing the key mission requirements and any assumptions.

4. MISSION ENVIRONMENT

This section must describe in detail the mission environment and any assumptions.

This section should include a summary comparison table(s) between heritage and current mission environments with references to source documents.

5. PRODUCT BREAKDOWN STRUCTURE

This section must provide a table or diagram with hierarchy of PBS and element numbers.

This section must provide schematics illustrating the elements of the PBS and their parts.

This section should use the CSA proposed PBS provided in Appendix E to this SOW.

6. KEY PERFORMANCE PARAMETERS (KPPS) FOR EACH CTE

This section must describe the Key Performance Parameter(s) identified for each PBS element (where applicable). The KPP description must identify what parameter value/range is currently achievable and what is required.

7. CRITICAL TECHNOLOGY ELEMENTS (CTES)

a) Description of the CTE;

b) Rationale for selecting the CTEs.

The intent of this section can be met by completing and cross-referencing the Critical Technologies Elements Identification Criteria Worksheet (CSA-ST-FORM-0003).

8. TECHNOLOGY MATURITY AND VIABILITY ASSESSMENTS

This section must include a sub-section for each CTE covering:

a) Description;

b) Main requirements (including KPP(s) associated with this CTE);

c) Heritage and compliance;

d) TRL achieved;

e) R&D3;

f) TNV.

The intent of this section can be met by completing and cross-referencing the applicable Technology Readiness and Risk Assessment Worksheet (CSA-ST-FORM-0001) for each CTE and including the Technology Risk Matrix generated from the Technology Readiness and Risk Assessment Data Rollup Tool (CSA-ST-RPT-0002).

9. TRRA SUMMARY AND RECOMMENDATIONS

This section must include a Summary table of results with columns covering:

- PBS # ; Technology Name; TRL (calculated); TNV (user input);
- R&D3 (user input); TNV • Δ-TRL (calculated); /R&D3/ (calculated).

This section must present a summary of remaining Technology R&D Options, Risks, Cost, and Feasibility for each CTE of the PBS.

This section must summarize the recommended technology development plan and should refer to a separate Technology Development Plan report if appropriate.

10. CONCLUSIONS

This section should include a statement regarding current overall state of TRRA assessment and identify any open work.

11. APPENDIX A – TECHNOLOGY READINESS AND RISK ASSESSMENT WORKSHEETS

This section must include, or refer to an attachment which includes, all of the completed worksheets: the Critical Technologies Elements Identification Criteria Worksheet (CSA-ST-FORM-0003 – AD-02), the Technology Readiness and Risk Assessment Worksheet (CSA-ST-FORM-0001 (AD-03) for each CTE and rollup using the Technology Readiness and Risk Assessment Data Rollup Tool (CSA-ST-RPT-0002). These worksheets can be obtained from the FTP site:

ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/.

DID-102 – CWBS and Work Package Descriptions

PURPOSE:

The Contractor Work Breakdown Structure (CWBS) is used during planning for estimating resources and scheduling the work. During the implementation phase, it is used for reporting and controlling costs and schedule.

PREPARATION INSTRUCTIONS:

The Contractor must provide a Work Breakdown Structure (WBS) chart describing all the project elements that organize and define the total scope of the project, including subcontracted work, and must be deliverable-oriented.

The Contractor must prepare and maintain a WBS Dictionary made up of Work Package Descriptions (WPDs) for every element to the lowest level of the WBS. Each WPD must include, as a minimum:

a) A unique identifier traceable to the WBS;

b) A title;

c) The name of the individual responsible for completion of the work;

d) The **scope** of the work package;

e) The start date and duration;

f) Required **inputs** and dependencies;

g) A description of every activity covered by the WPD including the level of effort and earned value measurement method for each activity, and all non-labour costs;

h) Assumptions;

i) **Output** and work package acceptance criteria;

j) Issue date;

k) Version number; and

l) List of deliverable with delivery milestone.

DID-105 – Project Schedule

PURPOSE:

To provide a schedule planning and control system for the project and to provide visibility to the CSA of the program progress and status.

PREPARATION INSTRUCTIONS:

The project schedule must be based on the CWBS, in the form of a Gantt chart. The schedule must be provided in MS Project software format, and in PDF (8.5 x 14" sheet or larger). The project schedule must be detailed enough to show each CWBS task to be performed, and must provide the following information:

1) dependencies,
2) resource requirements,
3) the start and end date of each task (baseline and actual),
4) task duration,
5) completion status in percentage;
6) deadlines and milestones, and
7) critical path.

The schedule must show dependencies between the Contractor and other organizations.

The tasks related to deliverables must be limited to three months in the project schedule. When applicable, the Contractor must divide longer tasks into smaller significant tasks.

Tasks that are not related to any specific deliverable, such as Project Management and S&MA activities, must be grouped separately from the deliverables, and must be shown at the top of the chart.

DID-107 – Progress Report

PURPOSE:

The Progress Report presents the results of the work done to date in the contract, and in particular since the previous report. The Progress Report is used by the Government to assess the Contractor's progress in performance of the work.

PREPARATION INSTRUCTIONS:

The Monthly Progress Report must include status data and information summarizing project management, technical and schedule progress and accomplishment for each element of the Contractor's Work Breakdown Structure (CWBS). The report must address the major activities of the reporting period and must emphasize major achievements and events of special significance. Difficulties and/or problems that have affected the work progress, proposed corrective actions, project impact expected and concerns for the future, must also be reported.

Each progress report must answer the following questions:

1) Is the project on schedule?
2) Is the project within budget?
3) Is the project free of any areas of concern in which the assistance or guidance of the CSA may be required?

Each negative response must be supported with an explanation.

The Progress Report must include the following information, as a minimum:

1) Summary outlook, including technical performance, work performed, schedule and cost status (at CWBS level 2), organization and key personnel changes and areas of concerns;
2) Financial status including actual and forecasted expenditures, by month, as compared to the original monthly planned expenditure profile;
3) Updated milestones payment plan;
4) A detailed integrated project schedule status including:
    a) Dependencies between activities,
    b) Percent of completion for all activities,
    c) List of completed milestones,
    d) Critical path,
    e) 1st level subcontractor's activities having impact on WP delivery date;
    f) All other activities having an impact on WP delivery date.
5) Schedule variances from the plan, including deviations from schedule and proposed corrective actions for significant variances;
6) Major meetings schedule update;

7) Status of the work in progress, specifically the work performed in the previous calendar period; sufficient sketches, diagrams, photographs, etc. must be included, if necessary, to describe the progress accomplished;
8) The work projected for the next period, and estimated date of completion of next milestone;
9) Outline of technical and programmatic issues, with solutions recommended;
10) Contractual issues, including changes to activities and costs;
11) Subcontracts events, status and issues;
12) Equipment ordered, received, made and assembled;
13) Description of trips or conferences connected with the Contract during the period of the report;
14) Risk status report including previous issues resolved, status of on-going risks (changes, likelihoods and impacts), and identification of new risks, their likelihood and impact, and proposed mitigation action;
15) Status of all action items from previous review(s) and meeting(s).

DID-110 – Meeting Agenda

PURPOSE:

The Meeting Agenda specifies the purpose and content of a meeting.

PREPARATION INSTRUCTIONS:

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

1. **DOCUMENT HEADER:**
   a) Title;
   b) Type of meeting;
   c) Project title, project number, and contract number;
   d) Date, time, and place;
   e) Chairperson; and
   f) Expected duration.
2. **DOCUMENT BODY:**
   a) Introduction;
   b) Opening Remarks: CSA;
   c) Opening Remarks: Contractor;
   d) Review of previous minutes and all open action items;
   e) Project technical issues;
   f) Project management issues;
   g) Other topics;
   h) Review of newly created/closed action items, decisions, agreements and minutes; and
   i) Set or confirm dates of future meetings.

DID-111 – Minutes of Meetings

PURPOSE:

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

PREPARATION INSTRUCTIONS:

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

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

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

DID-112 – Action Items Log (AIL)

PURPOSE:

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

PREPARATION INSTRUCTIONS:

The Action Item Log (AIL) must be in a tabular form, with the following headings in this order:

1) Item Number;
2) Item Title;
3) Description of the action required;
4) Open Date;
5) Source of AI (e.g. PDR meeting, RID, etc.);
6) Originator;
7) Person responsible (for taking action);
8) Target/Actual Date of Resolution;
9) Progress update;
10) Rationale for closure;
11) Status (Open or Closed); and
12) Remarks.

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

DID-501 – Interface Control Document (ICD)

PURPOSE:

To define and control the interfaces between several cooperating or attached Hardware Configuration Items (HWCI) or Configuration Software Configuration Items (CSCI).

PREPARATION INSTRUCTIONS:

The ICD may describe the interfaces between a readout system and its subsystems and all external systems or subsystems with which it interfaces (External ICD), or it may define all interfaces amongst subsystems within a system (Internal ICD).

Examples of External ICDs are:

- Spacecraft-to-Launch Vehicle ICD
- Spacecraft-to-Ground Segment ICD

Examples of Internal ICDs are:

- Spacecraft Internal ICD (e.g. between Bus and Payloads)
- Ground Segment Internal ICD

The specific requirements below must be tailored accordingly.

The ICD may be structured by types of interfaces (as defined above), or by subsystem and then by types of interfaces under each subsystem.

The ICD must contain the following information, as a minimum, tailored as required by the type of ICD as described above, and the particular system and interfaces being defined:

1. Purpose and Scope
2. Applicable and Reference Documents
3. Identification (name, number) and brief overview of the system and role within the system, of the interfaces to which the ICD applies
4. Interface diagrams showing by name and identifier all interfaces among the HWCIs and CSCIs to which this ICD applies
5. Identification (name, identifier) and purpose of each of the interfaces
6. Physical / Mechanical Interfaces
    6.1. Coordinate System
    6.2. Dimensions and tolerances
    6.3. Units of measurement
    6.4. Envelope, Volume and Mass Properties
    6.5. Attachment methods
    6.6. Alignment features

7. Structural/Mechanical Interfaces
    7.1. Applied Loads and Disturbances (including random vibrations, frequency spectrum)
    7.2. Acoustics
    7.3. Depressurization/Repressurization
    7.4. Ground Handling Environment
8. Thermal/Fluids Interfaces
    8.1. General Requirements (touch temperature, condensation prevention, etc.)
    8.2. Thermal Environment
    8.3. Payload/Subsystems Cooling
    8.4. Vacuum Exhaust Interfaces
9. Electrical Power Interfaces
    9.1. Electrical Power Requirements, Sources and Allocation
    9.2. Power Supply characteristics and limits
    9.3. Overload protection and limits
    9.4. Power control
    9.5. Electrical connectors (types, pinouts, locations, mating and demating)
    9.6. Cable schematics
10. Electromagnetic Compatibility (EMC)
    10.1. EMC Classifications
    10.2. Host system produced interference environment
    10.3. Payload produced interference environment
    10.4. Bonding and grounding
    10.5. Power and signal circuits isolation
11. Command and Data Handling (C&DH)
    11.1. Communications Technology (RS-422, Ethernet, Analog, Discrete, video, laptop, etc.)
    11.2. Signal Characteristics
    11.3. Response / Telemetry Format
    11.4. Request/Command Format
    11.5. Processing Requirements
    11.6. Connector/Pin Interface
    11.7. Data Acquisition, Storage and Management
    11.8. Synchronization
    11.9. Application Programming Interfaces

12. Environmental Interfaces
13. Any environmental factors not addressed elsewhere in the ICD (e.g. radiation, atmosphere, illumination, etc.)
14. Materials and Processes Interfaces
15. Human Factors Interfaces
16. Propulsion Interfaces
17. Pyrotechnic Interfaces
18. Fire Prevention
19. Ground Operations and scientific data processing
    - 19.1. Facilities
    - 19.2. Payload Handling
    - 19.3. Ground Support Equipment (GSE)
    - 19.4. Communications Requirements
    - 19.5. Power Requirements
    - 19.6. Special Equipment
    - 19.7. Storage

DID-600 – Models and Analyses

PURPOSE:

To support the feasibility assessment and provide background information on the concept and design at system level, it is required to conduct analyses. This DID is to provide guidelines on deliverables related to analyses conducted including CAD models, tools and data to be delivered to the CSA focusing on thermal and power related analysis and models.

PREPARATION INSTRUCTIONS:

GENERIC FORMAT AND CONTENT FOR ALL ANALYSES

All CAD models developed must be delivered as appropriate.

Models must be delivered in the following formats:

a) Mechanical design: STEP AP203 (.stp)

b) Electrical design: .dsn, .sch, Pspice and Gerber formats, or applicable native format and a .pdf export

c) NX Space Systems Thermal native format (NX 10 or higher)

d) Software design: UML 2.0, XML or specific format definition provided as part of the SOW

e) Model-based Systems Engineering Model (if required): Artisan Studio.

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

Analysis documents must contain all analysis work that is performed in support of the design. This includes, but is not limited to, any spreadsheet (e.g. Excel) and script (e.g. Matlab) used to elaborate the analysis. The analysis material must be sufficiently detailed that, in combination with the delivered models, CSA or an external reviewer can reproduce the results. The analysis must establish feasibility and verification of the design to meet the requirements.

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

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

a) Objectives of the analysis;

b) Reference to the relevant requirements;

c) Description of the analysis tools used;

d) Description of the model developed to aid the model user (if applicable);

e) Identification of the assumption(s) made;

f) Description of the main analysis steps and intermediate results;

g) Results of the analysis and compatibility with the requirements;

h) Identification of potential problem areas and presentation of alternative design solutions; and

i) Conclusion.

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

SPECIFIC CONTENTS

THERMAL MODEL AND ANALYSIS:

The Thermal Model and Analysis must predict the operating temperature of the electronic or other heat-sensitive components, allowable flight temperature margins, and internal and external heat exchange breakdown. The analysis must cover the worst cases of the operating environment using beginning and end of life properties. Furthermore, sensitivity analyses must be performed on critical and marginal components.

Thermal analysis and budgeting must include allowance for contamination build-up (i.e. regolith) for cryogenically operated equipment and radiative surface. Sources of thermal and thermo-optical properties, including contact conductances must be provided.

Specific attention must be given to account for thermal contact resistance variation with key parameters of contact (pressure, material, surface finish, flatness) as they vary with temperature.

Margins for temporal stability must be determined both for spatial and temporal variations, and must cover transient events such as operational manoeuvres worst-case variations, and operational states.

ELECTRICAL POWER AND DISTRIBUTION MODEL AND ANALYSIS:

The Electrical Power and Distribution Analysis must document all analyses and activities performed to evaluate the system electrical power and distribution design, providing information on the following aspects, as a minimum:

1) Electrical architecture: power, grounding, shielding, data, and redundancy;

2) Electronics: circuitry, protection, and switching of components; and

3) Power budgets and distribution.

The power analysis must consider the whole life of the system, if the design is such that power generation or consumption properties change. Power analysis must cover mean and peak behaviour for each mode of operation of the system. A power operational profile must be defined, indicating, for each phase of the mission, the corresponding maximum and average power during the sunlight and eclipse portion of the mission and the energy margin (if applicable).

The power analysis must be complete, showing all calculations and assumptions used for every item estimated.

DID-700 – System Conceptual Design Document

PURPOSE:

In its preliminary form, to describe the preliminary system conceptual design proposed to meet the mission requirements.

In its final form, to describe the conceptual design of the system, to assist in finalizing the design of the system and allocating the requirements to subsystems, to demonstrate its feasibility and to support programmatic estimates.

PREPARATION INSTRUCTIONS:

NOTE: This DID comprises two sets of requirements: the first for the preliminary form of the document and the second for its final form.

Preliminary form

The preliminary document must include the following:

1) An introduction including the scope, the purpose and a list of assumptions (if any);
2) A description of the overall system conceptual design;
3) A description of any payload detailed analysis, breadboard design and performance (field) testing, if applicable; and
4) A description of any trade-off studies performed.

Final form

The final document must include the following:

1) Introduction: recalling the major objectives and guidelines for the project;
2) Architecture, design and interfaces: giving a high level description of the architecture and design of the system and its subsystems, including internal and external interfaces;
3) Trade-offs: criteria definition, analysis, criteria results, decisions;
4) Design decisions: rationales for design choices;
5) Budgets: a summary of the engineering budgets and TPMs, and margins, their allocation to subsystems;
6) Drawings and schematics: architectural diagrams for the main aspects of the system (structure, electronics, power, communications, software, etc.) describing and referencing important design drawings such as functional interconnect diagrams, activity flow diagrams, ICDs;
7) Analyses: summarizing the analyses performed, main results and problems encountered; this is a summary of each full analysis report presented separately;
8) Tests: summarizing all the tests to be performed to verify the performance and environmental requirements;

9) Operations concepts: summarizing the operations of the system in both nominal and contingency conditions;
10) Maintenance approach: describing the maintenance approach especially for maintainable items such as the spares for manned systems, flight software and ground systems;
11) Matrix: To demonstrate design compliance to requirements by providing clear link between design and requirements. Indication of design compliance, non-compliance and partial compliance.
12) The contractor must provide substantiated analyses and/or test results that support the feasibility of the concept as a minimum for the following: thermal, energy, mass and data budgets. These analysis and/or tests must be provided.

C CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY

C.1 PURPOSE

The BIP/FIP Disclosure Report serves to identify FIP produced under the Contract with the CSA, as well as any BIP elements that were used to develop the FIP.

This is not to be confused with the identification of the FIP and BIP that will be generated throughout the entire project, which is documented in DID-007 – Mission Development Plan.

C.2 DEFINITIONS

Intellectual Property (IP)	means any information or knowledge of an industrial, scientific, technical, commercial artistic or otherwise creative nature relating to the work recorded in any form or medium; this includes patents, copyright, industrial design, integrated circuit topography, patterns, samples, know-how, prototypes, reports, plans, drawings, Software, etc.
Background Intellectual Property (BIP)	IP that is incorporated into the Work or necessary for the performance of the Work and that is proprietary to or confidential information of the Contractor, its subcontractors or any other third party.
Foreground Intellectual Property (FIP)	IP that is first conceived, developed, produced or reduced to practice as part of the Work under the Contract.

C.3 INSTRUCTIONS FOR COMPLETING IP DISCLOSURE TABLES

Identification

- The Contractor must respond to the 7 questions in Table C-1 when Foreground Intellectual Property (FIP) is created under the Contract with the CSA.

BIP

- If the Contractor intends to use Background Intellectual Property (BIP) to develop the FIP, the Contractor must complete Table C-2 (Disclosure of BIP brought to the project by the Contractor) and forward it to the CSA Project Manager before the beginning of the Contract if any.
- At the end of the Contract, the Contractor must review and update the BIP disclosure (Table C-2) when applicable.
- Only the BIP elements that were used to develop the FIP elements should be listed.

FIP

- At the end of the Contract, the Contractor must complete Table C-3 (Disclosure of the FIP developed under the Contract).
- If Canada is the owner of the FIP and identifies some FIP elements that would benefit from being patented by Canada, the Contractor must also complete Table C-4 (Canada's Owned FIP Additional Information).

General Instructions for BIP and FIP tables

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

TABLE C-1 - CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY

Contractor Legal Name:	
Project Title supported by the Contract:	
CSA Project Manager of the Contract:	
Contract #:	
Date of the disclosure:	

Will there be Contractor's Background Intellectual Property brought to the project:

☐ Yes - Complete Table C-2 - Disclosure of Background Intellectual Property

☐ No

For Canada's owned IP, are there any IP elements that, to your opinion, would benefit from being patented by Canada?

☐ Not applicable, FIP resides with the Contractor

☐ Yes - Complete Table 5 5 - Canada's Owned Additional Information

☐ No

For the Contractor:

Signature	Date

For CSA Project Manager:

Signature	Date

TABLE C-2 - BIP DISCLOSURE

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

TABLE C-3 - FIP DISCLOSURE

1 **FIP ID #**	2 **Project Element**	3 **Title of FIP**	4 **Type of FIP**	5 **Description of the FIP**	6 **Reference documentation**	7 **BIP used to generate the FIP**	8 **Owner of the FIP**	9 **Patentability**
Enter an ID # specific to each FIP element *(e.g.FIP-CON-99, where CON is the contract acronym)*	*Describe the system or sub-system for which the FIP element was developed (e.g. a camera, ground control, etc.)*	*Use a title that is descriptive of the FIP element.*	*Specify the form of the FIP e.g. invention, trade secret, copyright, industrial design*	*Specify the nature of the FIP e.g. software, design, algorithm, etc.?*	*Provide the full title and number of the reference document where the FIP is fully described. The reference document must be available to Canada*	*BIP referenced in Table C-2 (e.g. BIP-CON-2, 15)*	*Specify which organization owns the FIP e.g. Contractor, Canada* or Subcontractor.* *Provide the name of the subcontractor if not owned by the prime contractor.* **If Canada is the owner of the FIP, complete Table C-4 below.* *Provide reference to contract clauses that support FIP ownership.* *Provide reference to WPDs under which the technical work has been performed.*	*In the case where the IP is owned by Canada, indicate with an "X", any IP elements described is patentable and complete Table C-4 only for this IP.*

TABLE C-4 - CANADA'S OWNED FIP ADDITIONAL INFORMATION

1 **FIP ID #**	2 **Title of FIP**	3 **Aspects of FIP that are novel, useful and non obvious**	4 **Limitations or drawback of the FIP**	5 **References in literature or patents pertaining to the FIP**	6 **Has the FIP been prototyped, tested or demonstrated?** (e.g. analytically, simulation, hardware)? Provide results	7 **Inventor(s)**	8 **Was the FIP disclosed to other parties?**
ID# should be same as corresponding FIP element in Table C-3.	*Title of FIP should be same as corresponding FIP element in Table C-3.*	*How is the FIP addressing a problem (useful) and what is thought to be novel in this solution (novel)?*	*Describe the limitations of present apparatus, product or process*	*Provide references in published literature or patents relating to the problem or subject if any.*	*Describe briefly how the process, product or apparatus performed during testing or simulation. Provide reference document # where the performance is compiled if applicable.*	*Provide name and coordinates of the person(s) who created the FIP*	*Has any publication or disclosure of the FIP or any of its elements been made to third parties? If so, provide when, where and to whom.*

ANNEX B

BASIS OF PAYMENT

PHASE 0

SCHEDULE OF MILESTONES

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

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

Phase 0 Total Firm Price $_____ (All taxes applicable Extra)

ATTACHMENT 1 to PART 3 OF THE BID SOLICITATION

ELECTRONIC PAYMENT INSTRUMENTS

The Bidder accepts to be paid by any of the following Electronic Payment Instrument(s):

( ) VISA Acquisition Card;
( ) MasterCard Acquisition Card;
( ) Direct Deposit (Domestic and International);
( ) Electronic Data Interchange (EDI);

ATTACHMENT 4 TO PART 1

TECHNICAL BID AND EVALUATION CRITERIA

The technical bid and evaluation criteria are hereby attached.

Technical bid and evaluation criteria

General Information

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

1. Title / Project Identification Page
2. Table of Contents;
3. Technical Criteria;
4. Managerial Criteria;
5. Bid Appendices.

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 that are applicable to that specific section/subsection for each bid.

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);

1. Technical Bid

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

1.1 Relevance Criteria

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

This section should address the scope and aspects of the proposed concept in relation to what is specified in the statement of work. It should describe the approach for the concept development including a preliminary design of the systems.

This section should provide substantiated evidence describing the relevance and merit of the proposed concept relative to past, ongoing, and planned bidder activities. In doing so, this section should describe the degree of relevance that the Bidder’s technology has with respect to the scope of work presented in the SOW and an understanding of the stated performance and functional requirements including explanations as to how the proposed solution would achieve the requirements. The relevance of the proposed technology will consider the components selected including their design, maturity levels, and space flight heritage.

The bid should highlight International collaboration opportunities including mandatory collaboration with partner Agencies and collaborators. Letters of intent for other potential collaboration partners should be included with explanations as to how they contribute to the development.

The proposed concept should clearly address the requirements of the system as described in Appendix A to the SOW.

1.1.2 Canadian Technology Strength and Space Flight Heritage (Evaluation Criterion 2)

The proposal should elaborate on potential Canadian technology content of the proposed contribution. Canadian niche technologies and capabilities should be emphasized. The proposal should assess the relative value of Canadian technology compared with the estimated total cost of the proposed contribution.

This section should also describe the bidder's previous space flight experience with a system providing similar capabilities. The Bidder should provide information about their past experience with closely related technology, substantiated by flight data analyses.

1.2 Technical Criteria

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

In this section, the Bidder should provide an overview of the technical methodology and its correlation with the main activities of the work-plan. The methodology outlined in this section should describe how the work would be conducted using analytical methods, procedures, techniques, industry standards, best practices, and the state-of-the-art for pertinent disciplines.

The Bidder should also elaborate on and substantiate the proposed methodology while referring to the main activities of the work-plan described in the body of the bid and appearing in the Work Breakdown Structure (WBS). The effectiveness of the methodology and its correlation to the work-plan should be explained and substantiated in this section.

The methodology and the corresponding work-plan should take into consideration the Technical Readiness and Risk Assessment. Concerning software, the Bidder should outline the software development environment and methodology already in place. The methodology to be employed should include any other relevant issue that could impede progress of the work-plan, for example, the availability of equipment, facilities, and infrastructure to support successful progress of the work.

This section should identify and substantiate in detail the underlying requirements and the technical principles and knowledge necessary to realize the proposed concept. It should thoroughly demonstrate an understanding of these requirements and principles. The proposal should include a presentation of proposed concept and operations requirements that will be addressed by the proposed activities and objectives, and their relationship to the overall objectives. A thorough review of the existing literature relevant to the central theme of the proposed concept should be provided.

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

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

The proposed effort should be well presented and substantiated through well-conceived and feasible concepts and methods to obtain the desired technical results. The bid should explain and substantiate that the overall scenario is valid and demonstrate that the proposed concept is based on well proven technology. Details on technology readiness are provided in The CSA Technology Readiness Levels and Assessment Guidelines (AD-01) and the Technology Readiness Levels Handbook for Space Applications (AD-04).

2. Managerial Bid

The Managerial Bid should demonstrate the effectiveness and commitment of the Bidder to deliver the project on time and within budget. Subsections should address in detail: key-personnel qualifications, team organization and arrangements, previous project experience, and the Management Plan.

2.1 Team Capability (Evaluation Criterion 5)

2.1.1 Team expertise

This subsection should identify the Project Manager and Technical Lead, and outline their respective qualifications. It should identify the key members of the project's technical and management teams and state their specific qualifications for the work required. Detailed résumés are to be included in an appendix in Section I of the Bid. Back-up personnel for key positions are to be identified.

2.1.2 Team Organization and Arrangements

This subsection should outline the roles and responsibilities of the proposed team members, and discuss and highlight the unique expertise that they offer with respect to the capability of the team. This subsection should also provide detailed roles and responsibilities of the key human resources. An organization chart should illustrate the structure of the proposed project team.

2.1.3 Previous Project Experience

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

Note: The Bidder may describe as many previous projects as it feels are necessary to demonstrate the experience and qualifications of the company and of the proposed team, as long as the Bid limit of 50 pages is not exceeded.

2.2 Project Management Plan (Evaluation Criterion 6)

This subsection describes the Management Plan to deliver the project in the most effective manner.

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

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

2.2.1 Work Package Definition

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

WPs stem from the WBS. The WBS should be taken to a low enough level and the associated WP should be defined in sufficient depth for the Bidder to demonstrate a clear understanding of the process to be followed to carry out the project. As a guideline, Table 1 presents a sample Work Package Definition Sheet.

Table 1: Example of Work Package Definition Sheet

Project: Novel 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 Bid, indicate value in Section II			
Scheduled Start:	T0 + 2 weeks	Accountable Manager:	Resource A
Scheduled End:	T0 + 12 weeks	Resources:	Resource A, Resource B, Resource C
Estimated Effort:	80 hours		
Objectives: 1. Deliver a functional test setup for the T/R unit			
Inputs: 1. Test plan and procedure 2. Unit drawings 3. Unit Interface Control Documents			
Tasks: 1. Review input documentation 2. Define requirements 3. Produce initial concept 4. Design test setup 5. Fabricate test setup 6. Commission and debug			
Outputs and Deliverables: 1. Fully functional T/R unit test setup 2. Test setup log manual 3. Test setup user manual			

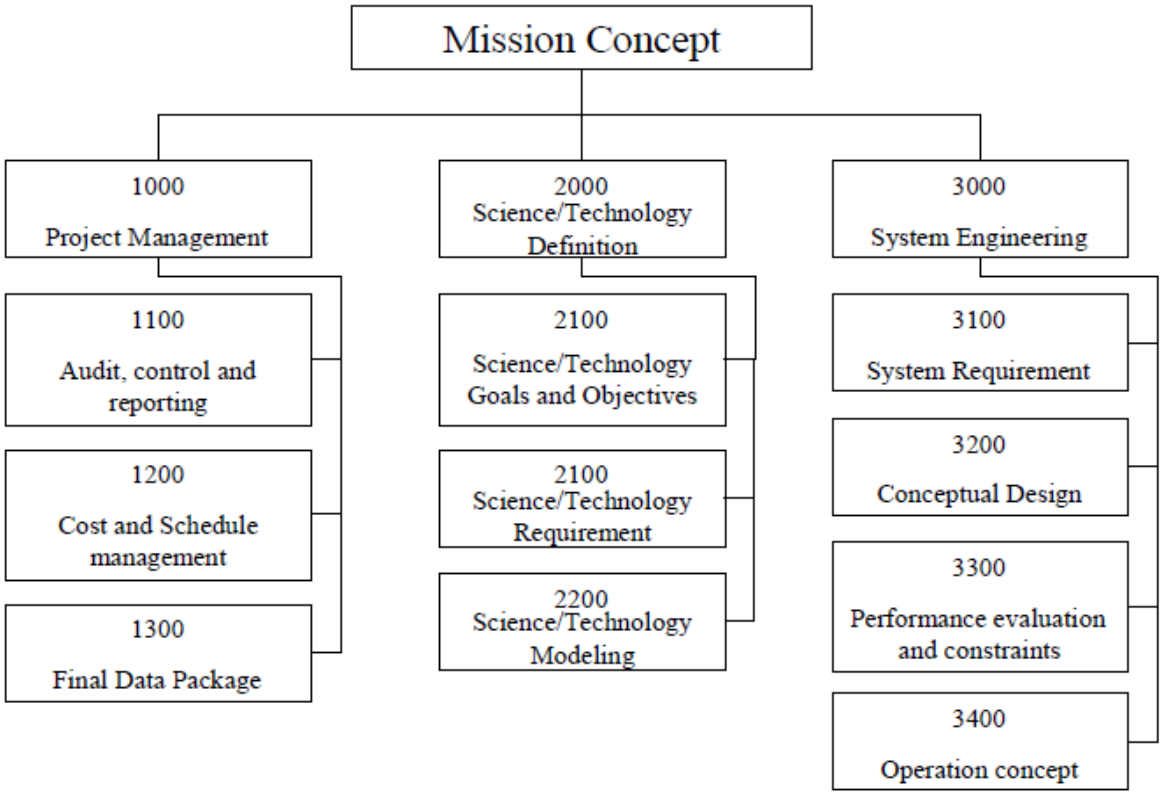

Figure 1: Example of a Work Breakdown Structure

2.2.2 Resources Allocation

The Management Plan subsection should include a resource assignment matrix showing the level-of-effort for each individual team member apportioned to each WP. The matrix should identify individuals by name and provide the estimated time (number of hours or days) required to complete each task. As a guide, Table 2 presents a sample of a Resource Allocation Matrix (RAM). The RAM should be presented in the Managerial Bid.

Table 2: Example of Resource Allocation Matrix

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

P: Participant; *A: Accountable*

2.2.3 Managerial Risk Assessment

The Management Plan subsection should assess the managerial risks and identify critical issues that may impede successful completion of the project within cost and schedule constraints.

2.2.4 Milestones and Deliverables

Milestones and deliverables should be detailed in accordance with the Statement of Work.

2.2.5 Schedule

The Management Plan subsection should relate tasks, milestones and deliverables to a project timetable.

2.2.6 Project Control System

The Management Plan subsection should outline the methods and systems to be used to control tasks, schedules, and costs for the project. Any project management tool or a spreadsheet software package may be used as long as it contains, as a minimum, the information required in the Milestone Reports.

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

3.1 Required Bid Appendices

1) List of acronyms used in the Bid
2) Bidder's Criteria Substantiation (this annex, Section 4.2).
3) Résumés: The Bid should include résumés (and/or "Canadian Common CV") of all key personnel resources proposed and these should be appended to Section I.
4) List of Contacts: The list of contacts should be appended to Section I, in a format suitable for distribution and should include all of the Bidder's points-of-contact involved in the Bid development and/or contract negotiations. The following sample format should be used:

Table 3: Sample List of Contacts

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

3.2 Applicable Bid Appendices

The following Bid appendices are to be provided, *if applicable,* with Section I:
1) Corporate literature: Only literature that is relevant and useful to support the Bid.
2) Relevant technical and/or scientific papers published by team members.
3) Other Bid appendices deemed appropriate by the Bidder.

Bidders are reminded that the Bid should not exceed 50 pages.

4. POINT RATED CRITERIA

4.1 Relevance / Technical / Management Point Rated Criteria

The Bidder should achieve the minimum score requirements as indicated in Table 4: "List of Evaluation Criteria and Associated Ratings". Bids will be evaluated according to the point-rated criteria as specified in Table 4 and at subsection 4.3 of this document: "Evaluation Criteria and Benchmark Statements". The criteria are grouped under the following divisions:

1) Relevance;
2) Technical; and
3) Management.

"Evaluation Criteria and Benchmark Statements" contain a series of evaluation criteria, each supported by a set of benchmark statements (0, A, B, C, D). Each of these statements has a corresponding 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 "*Understanding the Requirements and Technical Principles"* criterion is 20 points. If a Bid receives a "C" for this criterion, the score will be:

75% of 20 points = 15 points (score)

Table 4 identifies:

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

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Table 4: List of Evaluation Criteria and Associated Ratings

Evaluation Criteria and Ratings	
	Ratings
Relevance Criteria	
1. Relevance and Merit of the Concept	20
2. Canadian Technology Strength & Space Flight Heritage	20
Maximum Score	***40***
Technical Criteria	
3. Understanding the Requirements and Technical Principles	20
4. Feasibility of Achieving Goals and Technical Objectives	20
Maximum Score	***40***
Management Criteria	
5. Team Capability	10
6. Project Management Plan	10
Maximum Score	***20***
Maximum Overall Score	***100***
Minimum Overall Score Requirement	***70***

4.2 Bidder's Criteria Substantiation

The Bidder is requested to provide their own substantiation, which should be submitted as an appendix to their Section I. The substantiation should be concise yet sufficiently complete to give the evaluators a good overall appreciation of the bid's merit relative to each criterion. Cross-references to appropriate sections of the bid should be provided and the essence of the referenced information should be summarized in the substantiation.

For convenience, a template for the Self-Evaluation Table is provided in Table 5. Enter each technical / management / impact criterion section number, and the substantiation. Approximately half a page should be sufficient to make the Bidder's case for the rating assigned in the substantiation column.

Table 5: Bidder's Criteria Substantiation.

Company: **Project Title:**.	
Criteria Substantiation	
Ex.: ***1*** *(criterion number)*	*Criterion substantiation and Bidder's bid cross-reference.* *Approximately300 words should be sufficient to make the case.*

4.3 EVALUATION CRITERIA AND BENCHMARK STATEMENTS

RELEVANCE CRITERIA

1. RELEVANCE AND MERIT OF THE CONCEPT

This criterion evaluates the relevance and merit of the proposed concept relative to the scope of work presented in the SOW. **Furthermore, this criterion assesses the degree to which the bid shows technical compliance to the proposed technology.**

0)

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

A) Poor

- The relevance and merit of the proposed concept are only partially addressed and not substantiated; OR
- The bid addresses the technology but neither shows an understanding of the driving needs nor demonstrates how the proposed technology will contribute to meeting the stated requirements.

B) Average

- The relevance and merit of the proposed concept are addressed and substantiated, but gaps exit; AND
- The bidder demonstrates a capacity to meet some requirements, but without a credible plan.

C) Good

- The relevance and merit of the proposed concept are addressed and substantiated and no gap exists; AND
- The bidder demonstrates a capacity to meet all of the requirements, substantiated by a credible plan to achieve all requirements; AND
- The proposed technology is based on a design proven in space or high altitude balloons.

D) Excellent

- The relevance and merit of the proposed concept are addressed in detail, well substantiated, and no gap exists; AND
- The bidder demonstrates a capacity to meet all of the requirements, substantiated by a credible plan to achieve all requirements; AND
- The proposed technology includes components proven in space or high altitude balloons.

2. CANADIAN TECHNOLOGY STRENGTH & SPACE FLIGHT HERITAGE

This criterion evaluates the proportion of Canadian technology or know-how and its criticality to the success of the project including the identification of critical design components and an assessment compatibility, maturity level, and space heritage.

0)

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

A) Poor

- Some key technology and expertise for the proposed concept reside within Canadian industry or academia. OR
- Canadian technology strength is not identified or it is not convincing that technology strength will be developed for Canada; OR
- The selected components lack justification regarding compatibility, maturity levels, and space heritage.

B) Average

- The proposal identifies some of the critical design components, outlines their technical specification, and demonstrates compatibility, but with limitations in the proposed design; OR
- The proposal demonstrates that some key technology and expertise for the proposed concept reside within Canadian industry or academia; OR
- The choice of most selected components is justified by their compatibility, maturity levels, and space heritage; OR
- Canadian technology strength is identified, but it is not significant.

C) Good

- The proposal identifies the critical design components, outlines their technical specifications, and demonstrates compatibility with the proposed design; AND
- The choice of some components is partly justified by their compatibility, maturity levels, and space heritage; AND
- The proposal demonstrates that the majority of key technology and expertise in the bid reside within Canadian industry or academia; AND
- Either Canadian technology strength is identified and substantiated, but it is not significant; or Canadian technology strength is identified and is significant but it is not fully substantiated.

D) Excellent

- The proposal identifies critical design components, outlines their technical specification and demonstrates compatibility with the proposed design; AND
- The choice of selected critical components is well justified by their compatibility, maturity levels, and space heritage; AND
- The proposal demonstrates that the majority of key technology and expertise in the bid are within Canadian industries or academia; AND
- Significant Canadian technology strength is identified and substantiated.

TECHNICAL CRITERIA

3. UNDERSTANDING THE REQUIREMENTS AND TECHNICAL PRINCIPLES

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

0)

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

A) Poor

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

B) Average

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

C) Good

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

D) Excellent

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

4. FEASIBILITY OF ACHIEVING GOALS AND TECHNICAL OBJECTIVES

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

0)

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

A) Poor

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

B) Average

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

C) Good

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

D) Excellent

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

MANAGEMENT CRITERIA

5. TEAM CAPABILTY

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

0)

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

A)

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

B)

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

C)

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

D)

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

6. PROJECT MANAGEMENT PLAN

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

0)

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

A)

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

B)

- The proposal presents a basic work-plan; AND
- The proposed methodology is effective in achieving the objectives of the work; OR
- There is a lack of correlation between the management plan and the management method; OR
- Risks are identified and mitigation strategies are insufficient.

C)

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

D)

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