



**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**

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|--|--|
| <b>Title - Sujet</b><br>MSFP Platform  |  |
| <b>Solicitation No. - N° de l'invitation</b><br>9F052-180576/A   | <b>Date</b><br>2019-03-13  |
| <b>Client Reference No. - N° de référence du client</b><br>9F052-18-0576   |  |
| <b>GETS Reference No. - N° de référence de SEAG</b><br>PW-\$MTB-550-15264  |  |
| <b>File No. - N° de dossier</b><br>MTB-8-41285 (550)   | <b>CCC No./N° CCC - FMS No./N° VME</b>                                     |
| <b>Solicitation Closes - L'invitation prend fin</b><br><b>at - à 02:00 PM</b><br><b>on - le 2019-04-30</b>   | <b>Time Zone</b><br><b>Fuseau horaire</b><br>Heure Avancée de l'Est<br>HAE |
| <b>F.O.B. - F.A.B.</b><br><b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input checked="" type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>  |  |
| <b>Address Enquiries to: - Adresser toutes questions à:</b><br>Mirfatahi, Kaveh  | <b>Buyer Id - Id de l'acheteur</b><br>mtb550                               |
| <b>Telephone No. - N° de téléphone</b><br>(514) 260-4106 ( )   | <b>FAX No. - N° de FAX</b><br>(514) 496-3822                               |
| <b>Destination - of Goods, Services, and Construction:</b><br><b>Destination - des biens, services et construction:</b><br>AGENCE SPATIALE CANADIENNE<br>Exploration spatiale/<br>Space Exploration<br>6767 ROUTE DE L AEROPORT<br>ST HUBERT<br>Québec<br>J3Y8Y9<br>Canada |  |

**Instructions: See Herein**

**Instructions: Voir aux présentes**

**Vendor/Firm Name and Address**

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

**Issuing Office - Bureau de distribution**

Travaux publics et Services gouvernementaux Canada  
Place Bonaventure, portail Sud-Oue

800, rue de La Gauchetière Ouest

7e étage, suite 7300

Montréal

Québec

H5A 1L6

|  |  |
|--|--|
| <b>Delivery Required - Livraison exigée</b>  | <b>Delivery Offered - Livraison proposée</b> |
| <b>Vendor/Firm Name and Address</b><br><b>Raison sociale et adresse du fournisseur/de l'entrepreneur</b>   |  |
| <b>Telephone No. - N° de téléphone</b><br><b>Facsimile No. - N° de télécopieur</b>   |  |
| <b>Name and title of person authorized to sign on behalf of Vendor/Firm</b><br><b>(type or print)</b><br><b>Nom et titre de la personne autorisée à signer au nom du fournisseur/<br/>de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b> |  |
| <b>Signature</b>   | <b>Date</b>                                  |

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## **PART 1 - GENERAL INFORMATION**

### **1.1 Introduction**

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

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

The Annexes include the Statement of Work, the Basis of Payment, the Electronic Payment Instruments, the Federal Contractors Program for Employment Equity - Certification, and any other annexes.

### **1.2 Summary**

#### **Project Title**

MicroPrep System for the International Space Station (ISS)

#### **Description**

Public Works and Government Services Canada (PWGSC) on behalf of Canadian Space Agency (CSA) located in St-Hubert, (Quebec), is seeking bids for the design of the MicroPrep System. The contract must be completed in four (4) phases: The scope of Phases A, B and C includes the design of the MicroPrep System including the manufacturing, testing, delivery of a Development Model, delivery of an Engineering Qualification Model and associated maintenance kit, ground commanding and telemetry station and ground support equipment. The scope of the optional phase D includes the manufacturing, testing, and delivery of one (1) Flight Model and two (2) Ground Models (GM) and associated commissioning and maintenance kits, ground commanding and telemetry stations and ground support equipment. The Phase D scope also includes on-orbit commissioning as well as support to launch and integration of one (1) Flight Model into the ISS.

#### **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 thirty-seven (37) months. Phase A, B and C 26 months and phase D (D1 and D2) 11 months.

### **Actual Available Budget**

The budget available for the contract resulting from this bid solicitation is **\$8,000,000.00**, 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 **\$8,000,000.00**, all applicable taxes extra. The Maximum amount of funding available for the contract phase A, B and C will not exceed **\$5,200,000.00**, all applicable taxes extra. The Maximum amount of funding available for the contract phase D1 (optional) will not exceed **\$2,600,000.00**, and phase D2 (optional) will not exceed **\$200,000.00**, 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

### **Controlled Goods Program**

This procurement could be subject to the Controlled Goods Program.

### **Bidders' Conference**

There is an optional bidders' conference associated with this requirement. Consult Part 2 – Bidder Instructions.

### **Federal Contractors Program (FCP) for Employment Equity**

The Federal Contractors Program (FCP) for employment equity applies to this procurement; refer to Part 5 – Certifications and Additional Information, Part 7 - Resulting Contract Clauses and the annex titled Federal Contractors Program for Employment Equity - Certification.

### **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) (https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

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MTB-8-41285

Buyer ID - Id de l'acheteur  
mtb550  
CCC No./N° CCC - FMS No./N° VME

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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](#) (2018-05-22) 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 Gauchetière 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](mailto:TPSGC.RQReceptionSoumissions-QRSupplyTendersReception.PWGSC@tpsgc-pwgsc.gc.ca)

Bids will not be accepted if emailed directly to this e-mail address. This email address is to initiate an epost Connect conversation, as detailed in the 2003 Standard Instructions – section 08.

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 Mandatory Non-Disclosure Agreement Requirement**

The Bidder must review the documents identified in attachment 1 to Part 2 to prepare his bid. The bidder must request the documents from the Contracting Authority listed below through e-mail. The above mentioned documents contain information that is confidential or proprietary to Canada or third party. The Bidder must sign a Non-Disclosure Agreement in the form set out in Attachment 1 to Part 2 and return the original duly signed to the Contracting Authority before being provided with a copy of the documents. Bidders must destroy the documents mentioned above at the end of the RFP period, or upon request from the Contracting Authority within thirty (30) days following that request.

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## 2.8 Bidders' Conference

A Bidders' conference will be held at 6767 Route de l'Aéroport, St-Hubert, Qc, J3Y 8Y9 on April 17, 2019 from 2 pm to 4 pm. The conference will begin at 2 O'clock EST. The scope of the requirement outlined in the bid solicitation will be reviewed during the conference and questions will be answered. It is recommended that bidders who intend to submit a bid attend or send a representative. During the conference, The National Research Council (NRC) will demonstrate the operations of the MicroPrep System. It will be possible to see the system in operation and to observe the construction. NRC will assist CSA during the questions and answers period.

Bidders are requested to communicate with the Contracting Authority before the conference to confirm attendance. The Bidder must sign a Non-Disclosure Agreement in the form set out in Attachment 1 to Part 2 and return the original duly signed to the Contracting Authority before the day of the Bidders' conference. Bidders should provide, in writing, to the Contracting Authority, the name(s) of the person(s) who will be attending and a list of issues or questions they wish to table no later than April 11, 2019 at 10:00 AM EST.

### **Note:**

For participants who are unable to be present, they can connect via WebEx and toll free line, which are provided following the signature of the non-disclosure agreement. Attendance to the bidders' conference is non mandatory, meaning, you do not have to attend to be able to bid. You may submit your questions in advance to the Contracting Authority identified in the RFP.

Any clarifications or changes to the bid solicitation resulting from the bidders' conference will be included as an amendment to the bid solicitation. Bidders who do not attend will not be precluded from submitting a bid.

## 2.9 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.

## 2.10 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 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 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) (<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 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.

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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.

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

#### **4.1.1 Technical 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 **\$8,000,000.00** applicable taxes extra.

The Maximum amount of funding available for the contract phase A, B and C will not exceed **\$5,200,000.00**, all applicable taxes extra. The Maximum amount of funding available for the contract phase D1 (optional) will not exceed **\$2,600,000.00**, and phase D2 (optional) will not exceed **\$200,000.00**, all 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 50 percent overall of the points for each of the technical evaluation criteria which are subject to point rating. The rating is performed on a scale of 54 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](http://www.tpsgc-pwgsc.gc.ca/ci-if/declaration-eng.html) 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 procurement agreement of the [Ineligibility and Suspension Policy](http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Bidder must provide the required documentation, as applicable, to be given further consideration in the procurement process.

### 5.2.2 Federal Contractors Program for Employment Equity - Bid Certification

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

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

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

### 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 - SECURITY, FINANCIAL AND OTHER REQUIREMENTS**

### **6.1 Financial Capability**

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

### **6.2 Controlled Goods Requirement**

SACC Manual clause [A9130T](#) (2014-11-27) Controlled Goods Program

## **PART 7 - RESULTING CONTRACT CLAUSES**

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

### **7.1 Statement of Work**

The Contractor must perform the Work in accordance with the Statement of Work at Annex A and the Contractor's technical bid entitled \_\_\_\_\_, dated \_\_\_\_\_.

#### **7.1.1 Optional Goods and/or Services**

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

The Contracting Authority may exercise the option at any time before the expiry of the Contract by sending a written notice to the Contractor.

### **7.2 Standard Clauses and Conditions**

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

#### **7.2.1 General Conditions**

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

#### **7.2.2 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

### **7.3 Term of Contract**

#### **7.3.1 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*).

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9F052-180576/A

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File No. - N° du dossier  
MTB-8-41285

Buyer ID - Id de l'acheteur  
mtb550  
CCC No./N° CCC - FMS No./N° VME

---

## 7.4 Authorities

### 7.4.1 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.

### 7.4.2 Project Authority

The Project Authority for the Contract is:

Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Address: \_\_\_\_\_

Telephone: \_\_\_\_-\_\_\_\_-\_\_\_\_\_  
Facsimile: \_\_\_\_-\_\_\_\_-\_\_\_\_\_  
E-mail address: \_\_\_\_\_

### 7.4.3 Contractor's Representative (*Contractor to fill in*)

Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Address: \_\_\_\_\_

Telephone: \_\_\_\_-\_\_\_\_-\_\_\_\_\_  
Facsimile: \_\_\_\_-\_\_\_\_-\_\_\_\_\_  
E-mail address: \_\_\_\_\_

## 7.5 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.

## 7.6 Payment

### 7.6.1 Basis of Payment (Milestone 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.

### 7.6.2 Basis of Payment (Limitation of Expenditure) (Phase D-2)

Canada's total liability to the Contractor under the Contract must not exceed \$ \_\_\_\_\_ (**insert the amount at contract award**). Customs duties are included and Applicable Taxes are extra.

No increase in the total liability of Canada or in the price of the Work resulting from any design changes, modifications or interpretations of the Work, will be authorized or paid to the Contractor unless these design changes, modifications or interpretations have been approved, in writing, by the Contracting Authority before their incorporation into the Work. The Contractor must not perform any work or provide any service that would result in Canada's total liability being exceeded before obtaining the written approval of the Contracting Authority. The Contractor must notify the Contracting Authority in writing as to the adequacy of this sum:

- a. when it is 75% committed, or
- b. four months before the contract expiry date, or
- c. as soon as the Contractor considers that the contract funds provided are inadequate for the completion of the Work,

whichever comes first.

If the notification is for inadequate contract funds, the Contractor must provide to the Contracting Authority a written estimate for the additional funds required. Provision of such information by the Contractor does not increase Canada's liability.

### 7.6.3 Method of Payment – Milestone Payments

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

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

#### 7.6.4.1 Schedule of Milestones

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

#### 7.6.5 Method of Payment – Limitation of Expenditure (Option D-2)

1. Canada will make progress payments in accordance with the payment provisions of the Contract, no more than once a month, for cost incurred in the performance of the Work, up to 90 percent of the amount claimed and approved by Canada if:
  - a. an accurate and complete claim for payment using form [PWGSC-TPSGC 1111](#), Claim for Progress Payment, and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
  - b. the amount claimed is in accordance with the basis of payment;
  - c. the total amount for all progress payments paid by Canada does not exceed 90 percent of the total amount to be paid under the Contract;
  - d. all certificates appearing on form [PWGSC-TPSGC 1111](#) have been signed by the respective authorized representatives.
2. The balance of the amount payable will be paid in accordance with the payment provisions of the Contract upon completion and delivery of all work required under the Contract if the Work has been accepted by Canada and a final claim for the payment is submitted.
3. Progress payments are interim payments only. Canada may conduct a government audit and interim time and cost verifications and reserves the rights to make adjustments to the Contract from time to time during the performance of the Work. Any overpayment resulting from progress payments or otherwise must be refunded promptly to Canada.

#### 7.6.5 SACC Manual Clause

[A9117C](#) (2007-11-30), T1204 – Direct Request by Customer Department

#### 7.6.6 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);

#### 7.7 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 (if applicable)
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.

## **7.8 Certifications and Additional Information**

### **7.8.1 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.

### **7.8.2 Federal Contractors Program for Employment Equity - Default by the Contractor**

The Contractor understands and agrees that, when an Agreement to Implement Employment Equity (AIEE) exists between the Contractor and Employment and Social Development Canada (ESDC)-Labour, the AIEE must remain valid during the entire period of the Contract. If the AIEE becomes invalid, the name of the Contractor will be added to the "[FCP Limited Eligibility to Bid](#)" list. The imposition of such a sanction by ESDC will constitute the Contractor in default as per the terms of the Contract.

### **7.8.3 SACC Manual Clauses**

[A3060C](#) (2008-05-12), Canadian Content Certification

## 7.9 Applicable Laws

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

## 7.10 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 \_\_\_\_\_.

## 7.11 Foreign Nationals (Canadian Contractor)

*SACC Manual* clause [A2000C](#) (2006-06-16) Foreign Nationals (Canadian Contractor)

## 7.12 Insurance

*SACC Manual* clause [G1005C](#) (2016-01-28) Insurance

## 7.13 Controlled Goods Program (if applicable)

*SACC Manual* clause [A9131C](#) (2014-11-27) Controlled Goods Program

## 7.14 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

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File No. - N° du dossier  
MTB-8-41285

Buyer ID - Id de l'acheteur  
mtb550  
CCC No./N° CCC - FMS No./N° VME

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## **ANNEX A**

### **STATEMENT OF WORK**

The Statement of Work is hereby attached.



**CSA-MFSP-SOW-0001**

# **Canadian Space Agency Space Exploration Projects**

**International Space Station  
MicroFluidic Sample Preparation (MFSP) Platform**

**Statement Of Work (SOW)**

**Revision A  
March 6, 2019**

**FOR CANADIAN SPACE AGENCY USE ONLY**

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ISS MFSP Platform SOW

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## 1 INTRODUCTION

### 1.1 SCOPE

The MicroFluidic Sample Preparation (MFSP) system is intended to perform automated extraction of macromolecules from different sample specimens, and produce clean, concentrated samples that are suitable for on-board / in-situ analysis. The equipment will be deployed on the International Space Station (ISS) to support the identification, characterization and mitigation of risks to humans in space. The MFSP supports Canada's continued commitment to the ISS and contributes to the enhancement of Canada's return on ISS investment.

This Statement of Work (SOW) defines the work for Phases A, B, C and optional Phase D of the MFSP.

The scope of Phases A, B and C is the design of the MFSP System. The MFSP System is composed of a platform and single-use cartridges for sample processing. The Contractor will design the platform to accept the cartridges provided as Government Furnished Material (GFM). For the purpose of the contract, Canada will share with the Contractor design documentation of the platform (Government Furnished Information (GFI)) to ensure integrity of the microfluidic technology. Also, included in Phase C, are the manufacturing, testing, verification and delivery of an Engineering Qualification Model (EQM) and Ground Operations (Command and Data Handling) Software.

The scope of the optional Phase D is the manufacturing, testing, and delivery of one Flight Model (FM) and two Ground Models (GM) and associated commissioning and maintenance kits, ground commanding and telemetry stations and ground support equipment. The Phase D scope also includes on-orbit commissioning as well as support to launch and integration of one FM into the ISS.

A Phase E Logistic and Sustaining Engineering (L&SE) plan will be prepared and brought to maturity throughout Phases ABCD work. The plan will include pricing, sparing and maintenance approaches for the Canadian Space Agency (CSA) to be able to award an Operations support phase contract at a later date.

The launch of the MFSP Platform System to the ISS is excluded from the scope of work. The CSA is responsible for the launch and any associated coordination activities. The scope of work also excludes on-orbit operation as well as science utilization of the MFSP Platform System after commissioning.

The MFSP Platform System must meet the requirements as defined in Section 2.1, Applicable Documents. These include the specific Platform functional and performance requirements as well as other applicable requirements such as ISS engineering, interface, quality, safety and operational requirements.

## 1.2 TECHNICAL BACKGROUND

A collaborative effort lead by the National Research Council (NRC) and supported by CSA has permitted the development of a novel microfluidic actuation method, combining regulated pressure control in a centrifugal microfluidic platform as a mean to facilitate integration and automation of complex assays in centrifugal microfluidics and improve reliability of fluidic-based sample preparation.

A programmable air pump and multiple miniature electromechanical valves are placed on a rotating stage and connected to microfluidic cartridges. The electronic system is designed to ensure that the valves, the pump and the other active elements can be computer-controlled in real time while the platform is rotating at high speed. Electrical power and computer commands can be sent through a slip-ring to switch the states of the electromechanical valves with a temporal resolution of only a few milliseconds. The platform can thus connect one or more inlets of the microfluidic devices to either atmospheric pressure (i.e. a regular vent) or to a controlled regulated pressure provided by the pump while the platform is rotating at high speed.

It is also noteworthy that all the access ports of the microfluidic cartridges can be connected to the pneumatic system of the rotating platform, thus drastically reducing the risk of expelling liquids out of access holes. In addition to the pneumatic control described previously, the platform also contains a motor controlling the rotation, advanced thermoelectric-based temperature control as well as all electronics and software required to perform automated sequences. The platform will require at least three (3) fundamental hardware functions to perform the assay: rotation control, pneumatic pressure control and temperature control.

The purpose of this SOW is to describe the work required to take the technology developed by NRC and create an internal payload on the ISS.

The platform must be designed to interface with the ISS Expedite the Processing of Experiments for Space Station (EXPRESS) Rack, and fit within the volume of a single or double Middeck Locker (MDL). A custom interface system must be designed to ensure simple and rapid installation of the cartridges on the platform following insertion of the raw sample. The electrical and data interface must comply with ISS requirements.

## 1.3 MISSION CONCEPT

The overall goal of the MFSP mission is to ensure the availability and functionality of a universal sample preparation equipment on-board the ISS that can be used in conjunction with CSA's Bio-Analyzer, NASA Deoxyribonucleic Acid (DNA) sequencer or leveraged by any other ISS partner to conduct life science experiments.

Two (2) immediate objectives are:

1. **Objective 1:** To provide real-time specific biological samples preparation capability onboard the ISS to increase current science and diagnostic capabilities and as a stepping stone for future missions beyond low Earth orbit.
2. **Objective 2:** To acquire and demonstrate sample-to-answer capability in conjunction with other analytical devices existing onboard ISS.

The MFSP mission will include:

- Design and development of ISS-compliant cartridges for isolation, purification, concentration or dilution of proteins and nucleic acids in biological samples including but not limited to blood, saliva, urine and cell culture medium;
- Design and development of an ISS-compliant platform based on the Power-Blade platform designed by NRC;
- Design and development of ground support infrastructure in the Payload Telescience Operations Center (PTOC);
- Payload integration in conjunction with NASA;
- Launch and commissioning of the MFSP System (ISS-compliant platform and cartridges) on ISS;
- Leverage use and interfaces with existing or soon to be available analytical instruments onboard ISS in order to maximize science capacities and achieve sample-to-answer capability;
- Leverage in-process Announcements of Opportunity (AO) (e.g. CSA's Life Science Research Systems (LSRS), NASA's Human Exploration Research Opportunities (HERO)) to identify and target science that can potentially be enhanced by the use of the MFSP System;
- Advertise the MFSP Platform System in future AOs or call for ISS science (e.g. future International Life Science Research Announcements (ILSRAs), MRA).
- Support commissioning, maintenance and regular real-time operations of the MFSP Platform System from the PTOC.

Figure 1-1 shows the mission elements and the associated sequence of events from development to full science operation. After successful commissioning, the MFSP Platform System will be declared operational by CSA and ready to support scientific investigations.

Figure 1-2 shows the operation concept including the flight and ground-based mission elements.

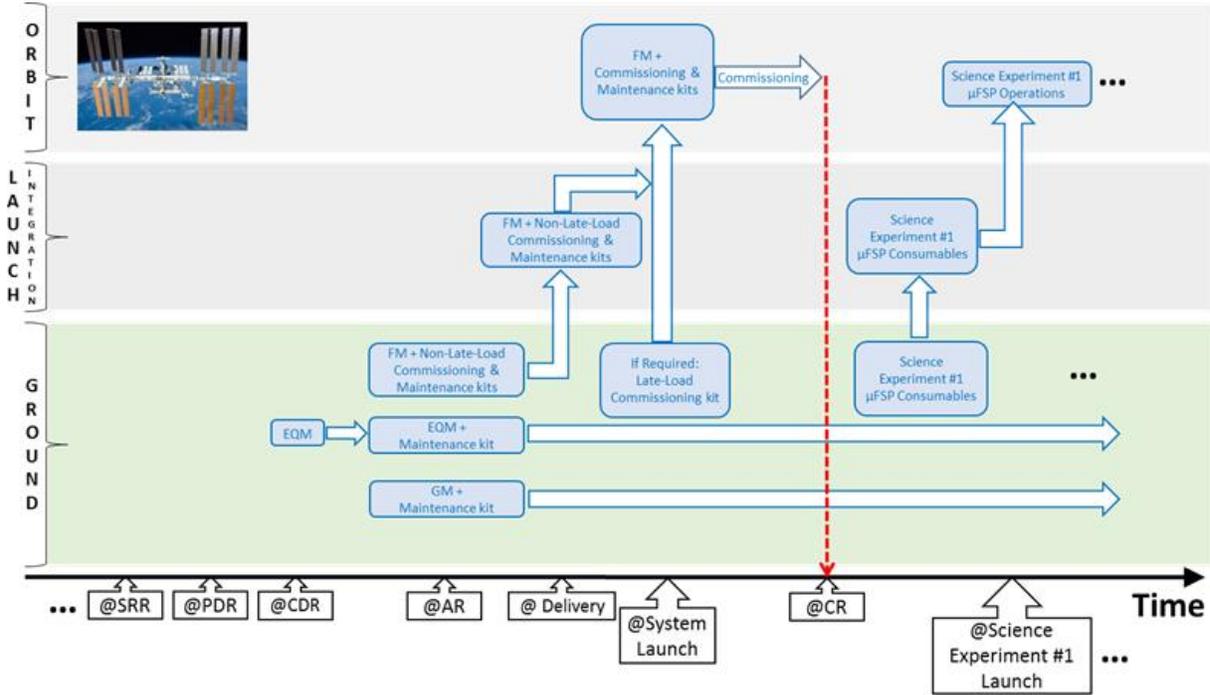


FIGURE 1-1 – MISSION CONCEPT AND TIMELINE

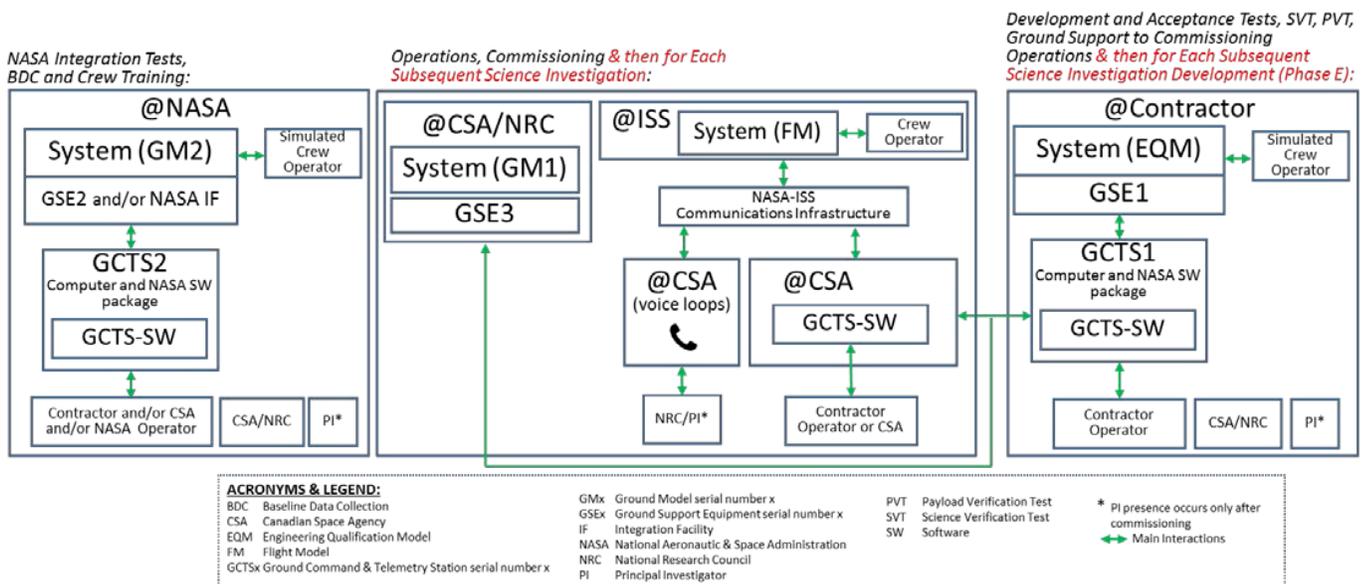


FIGURE 1-2 – MFSP TEST & OPERATION CONCEPT

## 1.4 DEFINITIONS, LANGUAGE, AND DOCUMENT CONVENTION

### 1.4.1 Definitions

The following definitions are applicable to this document.

|  |  |
|--|--|
| Cartridge                                      | Hardware developed by NRC to be installed in the platform to process samples.  |
| Cartridge Device                               | Refers to the assembly made of the consumable items and ancillary that are required to perform the activities that meet the requirements of this document.   |
| Contract                                       | * Public Works and Government Services Canada (PWGSC)-awarded contract responding to the requirements set out in the current SOW.  |
| Contract Authority                             | * The PWGSC representative that has the authority to sign Contracts and approve modifications and invoices for the Government of Canada (GoC).   |
| Contractor                                     | Contractor refers to the Canadian prime Contractor responsible for delivering the work as per this SOW.  |
| Development Model (DM)                         | A DM is built for ground demonstration of the platform functionality and cartridge integration, including installation and removal. Commercial parts are used and the DM is used in Phase B and C.   |
| Engineering Qualification Model (EQM)          | An EQM is fully representative of the FM (i.e., form, fit and function) and reflects flight standard design, materials and processes in accordance with the Product Assurance (PA) and Configuration and Data Management (CADM) requirements. The EQM will be used for verification of all requirements and subjected to qualification level environmental testing. The EQM must be upgradable and deliverable as an FM within a 4-month notice, to be launched and to serve as the FM backup in the case that the FM fails. |
| Flight Model (FM)                              | The FM is built to full flight standards in accordance with PA and CADM requirements. FMs are subjected to acceptance level environmental testing.   |
| Ground Commanding and Telemetry Station (GCTS) | Software developed for Operational Ground Control Commanding and Data Handling (C&DH) of the FM on the ISS, installed in the CSA PTOC and integration verified with the ISS C&DH network. This is also required to complete verification activities with the EQM and is deliverable on a stand-alone laptop for operating the GM.  |
| Ground Model (GM)                              | The GM is form, fit and function/performance equivalent to the FM but is not necessarily built with flight grade parts and is not subjected to environmental testing.  |
| Ground Support and Test Equipment              | Any items required to operate or test the EQM, FM and GM(s), such as a stand-alone laptop with Ground Commanding and Telemetry Station (GCTS), Ethernet and power cables (with flight or flight-like connectors) and a power supply or converter as needed. Packaging and shipping containers to ensure units are not damaged in transport.  |
| System   | Assembly of the platform with cartridge(s), including hardware and software.   |

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|                          |  |
|--------------------------|--|
| Platform                 | Equipment (hardware and software) developed by the Contractor to process sample contained in the cartridge.  |
| Project                  | Defined here as the sum of activities specified and under authority of the CSA.  |
| MFSP System              | All interacting components of the MFSP including platform hardware, software, cartridges and GCTS.   |
| Technical Authority (TA) | * The CSA Scientific/TA for the project is the person responsible for the management of the Work on behalf of the CSA. They, or the delegate, will be the direct interface with the Contractor and will monitor progress on the contract, verify that the contract Work has been completed satisfactorily, and will indicate this by signing off on claims together with the Contract Authority, and participate in negotiating changes to the contract. |
| Virtual Machine          | A digital representation of the physical object and serves as a basis for simulating the behavior of the MFSP System.  |
| Work                     | * The work specifically described in this SOW or resulting from the requirements herein.   |

*\* These definitions are part of the General Conditions 2040 or identified in the contract document. They have been added here for sake of completeness and convenience in understanding this document. The definitions presented in 2040 or the contract document, take precedence in case of discrepancy.*

### 1.4.2 Language

As English is the standard oral and written language for design, development, operation and utilization on the ISS, the Contractor must use English for this Work, and for exchanges with CSA, along with System International (SI) units.

### 1.4.3 Document Convention

The following verbs, as used in this document, have the specific meaning as indicated below:

|          |   |
|----------|---|
| “must”   | Indicates a mandatory requirement.                    |
| “should” | Indicates a preferred, but not mandatory alternative. |
| “may”    | Indicates an option.                                  |
| “will”   | Indicates a statement of intention.                   |

## **1.5 ROLES AND RESPONSIBILITIES**

Many partners share the responsibilities for the success of this effort. Here is a summary of their roles and responsibilities:

### **CSA:**

1. Contractual TA.
2. Main coordinator for the overall Work.
3. Main interface and generates agreement with the ISS Program and the ISS International Partners (IP).
4. Manifests the MFSP Platform System for launch to the ISS.
5. Coordinates all in-flight activities.

### **NRC:**

1. Technical support to CSA for the MFSP Platform System.
2. Main coordinator for the Cartridge Work.
3. Designs, constructs, tests, qualifies, certifies, delivers and commissions the cartridges.
4. Provide microfluidic expertise to the Contractor to ensure adequate performance of the platform.

### **NASA:**

1. Overall ISS integrator.
2. Technical authority for all ISS processes and acceptability.
3. Provides the Payload Integration Manager (PIM) that will facilitate the integration of the MFSP System into the ISS program.
4. Coordinates launch with launch provider, based on the manifest request from CSA.
5. Provides resources required to support the mission.

### **Contractor:**

1. Designs, constructs, tests, qualifies, certifies, delivers and commissions the platform.
2. Prepare MFSP Platform System level documentation of the MFSP Platform System, including cartridges (with support from CSA/NRC).
3. Prepare the EIDP for the MFSP Platform System (i.e. configuration management, etc.).
4. Verify the work performed by NRC for cartridges to ensure compliance to requirements. Inform CSA of any issue or problem.
5. Interface with NASA database for MFSP space qualification data input.
6. Launch package readiness.

### **Public Works and Government Services Canada (PWGSC):**

1. Contractual Authority.
2. The only entity allowed to change the scope of Work.

## 2 DOCUMENTS

### 2.1 APPLICABLE DOCUMENTS

The following documents latest release versions are applicable and form an integral part of this document to the extent specified herein.

| AD No. | Document Number  | Document Title   |
|--------|------------------|--|
| AD-01  | CSA-MFSP-RD-0001 | MFSP Platform Functional and Performance Requirements Document |
| AD-02  | CSA-MFSP-ID-0001 | MFSP Platform Interface Requirements Document                  |
| AD-03  | CSA-SE-STD-0001  | CSA Systems Engineering Technical Reviews Standard.            |
| AD-04  | CSA-ST-GDL-0001  | CSA Technology Readiness Levels and Assessment Guidelines.     |
| AD-05  | CSA-MFSP-RD-0002 | MFSP Product Assurance Requirements Document                   |
| AD-06  | CSA-MFSP-CO-0001 | Operational Concept Document for Commissioning Operations      |
| AD-07  | CSA-SE-PR-0001   | CSA Systems Engineering Methods and Practices                  |
| AD-08  | SSP 57057        | ISS Payload Integration Template                               |
| AD-09  | CSA-FORM-0001    | CSA Technology Readiness and Risk Assessment Worksheet         |
| AD-10  | CSA-FORM-0003    | CSA Critical Technologies Elements Identification Criteria     |

### **3 WORK REQUIREMENTS**

The subsequent sections 3 through 8, describe the Work requirements that the Contractor must meet. Some requirements are driven by NASA. As stated in Section 2.1, the latest released versions of the documents identified are applicable. If requirements are conflicting between documents, the CSA must be consulted and the most stringent requirement must be used or as agreed with CSA.

#### **3.1 PROJECT MANAGEMENT**

The Contractor must manage the contract to achieve successful performance, scope, quality, 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 dedicate experienced personnel to the project in all the disciplines required to carry out the work.

The Contractor personnel must establish and maintain a close management and technical interface with the CSA to assure a coordinated program effort to meet or exceed the project objectives.

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.

The Contractor must implement and maintain the Project Management Plan (PMP) provided with the proposal as per Contract Data Requirements List (CDRL 1).

##### **3.1.1 Scope Planning (Work Breakdown Structure and Work Packages)**

The project must be planned, controlled and directed according to the Work Breakdown Structure (WBS) and associated WBS Dictionary to be provided with the proposal as per CDRL 2.

The WBS, which describes all the project elements that organise and define the total work scope of the project, must be deliverable-oriented and must include, at the minimum, the major deliverables which represent the main functions of the platform.

The WBS Dictionary defines the work to be done against each WBS element identified in the WBS, by means of a Work Package Description (WPD) for each such element.

##### **3.1.2 Project Schedule**

The schedule must be provided with the proposal. Table 3-1 shows the Project Milestones Schedule, as planned by CSA. Contractor may propose different due date for specific milestone, if the CDR meeting is maintained at 24 months after contract award. The proposed schedule presented in the proposal may replace the CSA planned project milestone schedule of table 3-1 and be used for contractual milestone definition. The Contractor must maintain and deliver the Project Schedule each month as per CDRL 3. The schedule must be based on the WBS. The contract monthly schedule will have precedence over the project schedule in the SOW.

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**TABLE 3-1 – KEY PROJECT MILESTONES SCHEDULE**

| <b>Phases</b>               | <b>Milestones</b>  | <b>Proposed Due Date</b>            |
|-----------------------------|--|-------------------------------------|
| Phase A                     | Interface Definition Review (IDR)  | Contract Award + 3 months           |
|                             | System Requirement Review (SRR)  | Contract Award + 6 months           |
| Phase B                     | Preliminary Design Review (PDR)  | Contract Award + 12 months          |
|                             | Cartridge & Rotor interface demonstration  | Contract Award + 12 months          |
| Phase C                     | EQM Manufacturing Readiness Review (MRR)   | Contract Award + 18 months          |
|                             | <b>Critical Design Review (CDR)</b>  | <b>Contract Award + 24 months</b>   |
|                             | EQM Delivery including Maintenance Kit, Ground Support Equipment (GSE) and GCTS  | Contract Award + 24 months          |
| Phase C2                    | Phase C closure: <ul style="list-style-type: none"> <li>• CDR action items closure</li> <li>• Flight Safety PSRP phase III</li> <li>• FM Manufacturing Readiness Review (MRR)</li> </ul> | Contract Award + 26 months          |
| Optional Phase D (D1 & D2)* | GM Deliveries including Maintenance Kit, GSE and GCTS  | Phase D option exercised + 4 months |
|                             | EQM with FM characteristics  | Phase D option exercised + 4 months |
|                             | FM Delivery including Commissioning and Maintenance Kits   | Phase D option exercised + 4 months |
|                             | Launch   | FM delivery + 4 months (indicative) |
|                             | Commissioning Review   | Launch + 1 month (indicative)       |

*\*Phase D consists of two phases: D1 and D2. Phase D1 includes the manufacturing, testing, acceptance and delivery of the EQM, FM and two GM hardware and associated software to CSA. Phase D2 includes all the subsequent work including support to launch, support to FM installation in the ISS and commissioning. The Phase D2 schedule will be driven by the launch date.*

*Note: the contractor may suggest a faster schedule than the indicated timelines, but not slower (with no impact on proposal evaluation).*

### **3.1.3 Project Management Control**

The Contractor must provide a management function for the monitoring, control, and reporting of the Work. The Contractor must demonstrate that it has an established project management control System and that it is used to provide timely visibility of the Work's status of costs, schedule, technical, performance and risk issues, in order to allow proactive problem solving in concert with

the TA. The management control system must provide for cost effective and timely re-planning of activities to support workarounds. The management control system must track the total costs on a monthly basis. This is in addition to cost management required at the contract level. The Contractor must maintain and provide CDRLs as per the due dates defined in Appendix A.

The management control system must track, control and report project costs on a monthly basis through the Monthly Progress Report (CDRL 4).

#### **3.1.4 Progress Reporting**

The Contractor must provide Monthly Progress Reports (CDRL 4) to the CSA Authority, no later than seven (7) working days after the end of the month covered by the report.

#### **3.1.5 Risk Management**

The Contractor must have a risk management process to control hardware, software, and documentation. The Contractor must continuously identify and monitor areas of cost, schedule, programmatic and technical risk and must identify and implement risk reduction/resolution/mitigation activities. The Contractor must assess and report the status of each risk element in the Monthly Progress Report (CDRL 4) and at all technical reviews.

#### **3.1.6 Export Control**

The Contractor must obtain and manage, as applicable, all the necessary Export Control permits and documentation as well as any Technical Assistance Agreements related to the International Traffic in Arms Regulations (ITAR) for hardware, software and documentation resulting from the Work.

#### **3.1.7 Intellectual Property**

The Contractor must deliver with his proposal the disclosure of Background Intellectual Property (BIP) (CDRL 13) planned to incorporate in the Foreground Intellectual Property (FIP) to be developed. The Contractor must explicitly define the Foreground Intellectual Property (FIP) generated during the execution of the contract and report this in the Intellectual Property (IP) Disclosure Report (CDRL 13). This document must also identify the Background Intellectual Property (BIP) that is required to use the FIP.

All documents containing proprietary information must identify this on the front cover per DID-000.

##### **3.1.7.1 Government Furnished Information (GFI)**

The Contractor must utilize the GFI identified in the section applicable documents (AD) in the conduct of the contract. The Contractor must implement GFI in the development of the platform for usage on the ISS. Canada will also provide access technical expertise from NRC during the contract duration. The Contractor must consider technical recommendation from NRC-CSA in the development of the MFSP Platform System and must justify deviation from the recommendation. The Contractor must document any concern and request decision approval when GFI creates consequence (scope, cost, schedule) above normal design loop iteration process. The GFI includes

documents, minutes, access to prototype model and NRC technical expert in microfluidic. The Contractor will be granted limited access to information related to the internal design of the cartridges.

### **3.2 PLATFORM MODELS**

The Platform must meet the requirements detailed in the Platform Functional and Performance Requirements Document (AD-01) as well as all the NASA Interface Requirements required for flight included in AD-08.

The Contractor must prepare and deliver the hardware and software as requested in the Appendix A.

#### **3.2.1 Development Model (DM)**

The DM is to be built in Phase B and used to demonstrate the interface of cartridges to the platform rotor. It must replicate the planned physical interface between cartridge and rotor. This demonstration must include all steps for installation, retention and removal of cartridges. A fit-check of the alignment of the cartridge pneumatic ports to the platform ports must also be performed and pneumatic commanding demonstrated. The model must also demonstrate platform rotation and temperature control of the cartridge interfacing active heating zones.

CSA will provide development model cartridges to the Contractor for interface development. The Contractor will manufacture a rotor representative for cartridge interface development. A few models could be required to iterate between different methods to retain the cartridge on the rotor. All interface mechanical aspects are to be defined with the DM. The DM must include complete control of the sample preparation process. The DM must be able to accept software control of the process and be usable in Phase C for testing of EQM cartridges. The DM software must be updated by the Contractor during Phase C related to user interface and cartridges processing. It is not planned to use the DM in Phase D.

#### **3.2.2 Virtual Machine (VM)**

A VM is the digital representation of the physical MFSP Platform unit providing the functionality needed to execute the entire MFSP Platform operating system. The VM is to be delivered in Phase C to the CSA PTOC and the Marshall Space Flight Center (MSFC) Huntsville Operations Support Center (HOSC). The VM is to be used to support early integration activities to test and debug the C&DH functions of the MFSP Platform with the PTOC and HOSC ground support systems prior to final verification with the EQM with the Space Systems Integration and Test Facility (SSITF).

#### **3.2.3 Engineering Qualification Model**

An EQM is fully representative of the FM and built to full flight standards (i.e., form, fit and function) in accordance with the PA and CADM requirements. The EQM is to be used for all functional, performance and interface verification activities and subjected to qualification level environmental testing. The EQM is also to be used for MFSP System science and operations validation. The GSE to be used for verification and validation activities must include a fully functioning GCTS software released and under CADM control. The EQM must be upgradable and deliverable as an FM within a 4-month notice, to be launched and to serve as the FM backup in

the case that the FM fails in orbit. At the end of the contract, the EQM has the characteristic and performance of the FM and GMs. The EQM is used to demonstrate the MFSP System has achieved Technology Readiness Level (TRL) 7/8.

#### **3.2.4 Ground Model**

The GM is form, fit and function/performance equivalent to the FM but is not necessarily built with flight grade parts and is not subjected to environmental testing. In addition, the mechanical, structural and thermal interface requirements to the ISS EXPRESS rack are not required; instead the GM housing unit must be designed for stand-alone operations and facilitate shipping. The GM is to be subjected to full functional and performance and scientific verification tests. Each GM will include GSE that includes the GCTS for operation. Any ancillary items to allow the GM to operate in a stand-alone mode (i.e. power supply, Ethernet and power cables, etc.) are also to be delivered with the unit.

One GM is to be located at NASA for training and other uses, and a second GM is to be located at CSA/NRC for cartridge development in support of the Principal Investigator (PI).

#### **3.2.5 Flight Model**

The FM is built to full flight standards in accordance with PA and CADM requirements. FMs are subjected to full functional and performance, integration and scientific verification, acceptance level environmental testing and operational procedures validation

### **3.3 COMMISSIONING APPROACH**

The Contractor is responsible for commissioning the MFSP Platform System as per the verification requirements outlined in AD-01, AD-05 and to be developed as part of CDRL 18 and 19. The Contractor must procure any commissioning items not furnished by the GoC as GFE/GFM/GFI and their spares in sufficient quantities to ensure that the commissioning of the FM is completed.

The commissioning activity is defined as a Contractor-designed demonstration of all Platform requirements that can be verified on the ISS, and their ground equivalents for the other models. Flight commissioning items (FM, Cartridges, consumables and spiked commissioning samples) must be packaged in the launch-ready configuration. The Contractor must support, in coordination with CSA, the NASA required documentation for manifesting the MFSP Platform System. The Contractor must support live in-flight MFSP System commissioning including the Science Verification Test (SVT) defined by CSA/NRC as well as the ground portion of the SVT. The Contractor must perform commissioning data analysis and debugging until successfully completed. All commissioning-related activities will be led by CSA personnel. The Contractor will act as support position to CSA operators. The Contractor must provide a Commissioning Plan (CDRL 38).

The Contractor must provide a Commissioning report (CDRL 41).

### **3.4 TRAINING AND PROCEDURE APPROACH**

The Contractor must provide support to CSA to generate, update, submit and obtain approval for ground and/or in-flight Crew training materials (i.e. On-orBit Training (OBT)) and procedures;

supplying the text, figures, instructions, diagrams, photographs and video-clips (CDRL 25) as required and determined by NASA.

The Contractor must provide and conduct operator training to designated CSA and NRC personnel.

### **3.5 PHASE E LOGISTIC AND SUSTAINING ENGINEERING PLAN**

The Contractor must produce a Phase E L&SE support plan (CDRL 37) including cost estimate in support of the planning and implementation of future post-commissioning activities. A concept of this support plan and Rough Order of Magnitude (ROM) cost estimate must be produced at Preliminary Design Review (PDR). The plan and cost must be updated and refined through CDR and Acceptance Review (AR). The final version must be delivered after Commissioning Review (CR). Pricing must be on a cost reimbursement basis.

The Phase E L&SE support plan must also include and outline a sparing approach.

The Contractor must include planning for spares in sufficient quantities to ensure that all GMs (including the EQM) are maintained in fully operational condition to support a minimum of five (5) years of operations (hereafter called the “operational period”). Any repairs, replacement, or refurbishment activities must not impose a downtime greater than four (4) weeks or as negotiated with CSA on a case by case basis. The sparing approach must take into account the criticality of the pieces and the lead time for procurement (less critical pieces do not require sparing while long-lead items must be considered). The EQM is considered to be a spare FM; in which case it must be refurbished to match FM configuration and successfully pass its FM acceptance tests.

The models planned to remain on ground (one (1) EQM and two (2) GMs) will exceed the ISS FM usage. These are necessary for various activities such as assay development, protocols tests and validations, baseline data collection and training for ground personnel etc. Units remaining on the ground must meet the same availability requirement as the ISS FM, based on a usage five times higher than the ISS FM usage described in AD-01.

### 3.6 MEETINGS AND REVIEWS

The Contractor must lead and/or support a series of meetings and reviews. Table 3-2 provides a summary:

**TABLE 3-2 – MEETINGS AND REVIEWS**

| Meetings/Reviews                        | Lead       | Date  | Location       | Participants                         |
|---|------------|---|----------------|--------------------------------------|
| Kick-Off Meeting                        | CSA        | Within 1 month of Contract Award                      | CSA            | CSA/NRC, Contractor, Sub-contractors |
| System Requirements Review (SRR)        | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, Contractor                  |
| Interface Definition Review (IDR)       | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, Contractor                  |
| Preliminary Design Review (PDR)         | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, Contractor                  |
| Critical Design Review (CDR)            | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, Contractor                  |
| Phase 0/I Safety Reviews                | NASA       | As per proposed schedule and NASA process (Phase B)   | NASA           | CSA/NRC, NASA, Contractor            |
| Phase II Safety Reviews                 | NASA       | As per proposed schedule and NASA process (Phase C)   | NASA           | CSA/NRC, NASA, Contractor            |
| EQM Manufacturing Readiness Review      | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, Contractor                  |
| Test Readiness Reviews (TRR)            | Contractor | As per proposed schedule                              | Teleconference | CSA/NRC, Contractor                  |
| CDR action items closure                | Contractor | As per proposed schedule                              | Teleconference | CSA/NRC, Contractor                  |
| Phase III Safety Review                 | NASA       | As per proposed schedule and NASA process, (Phase C2) | NASA           | CSA/NRC, NASA, Contractor            |
| FM Manufacturing Readiness Review (MRR) | Contractor | As per proposed schedule                              | Teleconference | CSA/NRC, Contractor                  |
| Acceptance Review (AR)                  | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, NASA, Contractor            |
| Pre-Ship Review                         | Contractor | As per proposed schedule                              | CSA            | CSA/NRC, NASA, Contractor            |

## ISS MFSP Platform SOW

| Meetings/Reviews  | Lead                 | Date  | Location       | Participants                                |
|---|----------------------|---|----------------|---|
| Bench Review/<br>Handover to NASA   | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| Commissioning Review  | Contractor           | As per proposed<br>schedule                     | CSA            | CSA/NRC,<br>Contractor, Sub-<br>contractors |
| Operational<br>Assessment Review  | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| Structures &<br>Mechanical Review<br>Board  | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| Human Factor Interface<br>Team (HFIT)   | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| ISS Program Label<br>Assessment Team<br>(IPLAT)                                   | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| Operations Training<br>Strategy Team  | NASA                 | As per proposed<br>schedule and NASA<br>process | Teleconference | CSA/NRC, NASA,<br>Contractor                |
| ISS integration<br>verification   | NASA                 | As per proposed<br>schedule and NASA<br>process | NASA           | CSA/NRC, NASA,<br>Contractor                |
| Project Monthly<br>Review   | Contractor           | Monthly   | Teleconference | CSA/NRC,<br>Contractor                      |
| Project Status Meetings   | Contractor           | Weekly  | Teleconference | CSA/NRC,<br>Contractor                      |
| Technical interchange<br>meetings with NASA<br>(e.g. interfaces, safety,<br>etc.) | Subject<br>dependant | Ad-hoc  | Teleconference | CSA/NRC, NASA,<br>Contractor                |

For Contractor-led meetings and reviews the Contractor must provide Meeting Agendas (CDRL 6) and Meeting Minutes (CDRL 7). Minutes will primarily report decisions.

The Contractor must maintain a detailed Action Item Log (AIL), (CDRL 8) throughout the Work to track actions and decisions resulting from meetings and reviews.

For NASA-led meetings and reviews, the Contractor must provide the necessary contributions, which may include documentation, oral presentation, and supporting visual media. The Contractor must assume that agendas, meeting minutes and action items will be provided by NASA.

If acceptable to CSA, the requirement for any of the above mentioned reviews/meetings could be waived when it coincides with other review meetings.

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

The Contractor must produce and deliver to CSA the Meeting/Review Presentation (CDRL 9) before each meeting or review. The Review Data Package (CDRL 10) must be delivered to the CSA prior to each review.

For major reviews, the Contractor must provide written responses to Review Item Discrepancies (RIDs) within ten (10) working days of receipt or as agreed with CSA. The review is considered complete when RID dispositions are provided and agreed upon to the satisfaction of CSA.

### **3.6.1 Weekly Project Status Meetings**

The Contractor must conduct weekly project status meetings with CSA to review the project status and to resolve unforeseen and urgent issues. The selection of participants will depend on the nature of the issue. These meetings must be held by teleconference.

### **3.6.2 Monthly Project Review Meetings**

The Contractor must conduct monthly project review meetings with CSA and NRC to review the project status.

### **3.6.3 Kick Off Meeting (KOM)**

The Contractor must support a KOM at the CSA in the first month after Contract award. The Work must start when the contract starts, not waiting for the KOM to occur. The purpose of the KOM is to introduce the Contractor and CSA teams including NRC, review the scope of work, the schedule, the basis of payment and discuss any other topics as required. All key participants under the contract, including representative from each major subcontractor, must attend.

### **3.6.4 Interface Definition Review (IDR)**

During Phase A, the Contractor must prepare interface requirements documents (in accordance with AD-02 and CDRL 42) and conduct an IDR meeting at the MFSP Platform System level. The purpose of the IDR is to finalize and approve the Interface Requirements between the Contractor and the cartridge developer (NRC) and to establish the Interface Requirements Baseline (IRB) document with the NASA Payloads Integration Requirements Engineer (PIRE), (CDRL 15). This definition includes details of the hardware and software to be delivered for the DM.

### **3.6.5 System Requirement Review (SRR)**

The Contractor must prepare and conduct an SRR meeting at the MFSP Platform System level. The purpose of the SRR is to demonstrate that the MFSP System requirements are mature and that the system conceptual design will provide a system that meets all system requirements within an acceptable level of risk, that the Concept of Operations and the system requirements are compatible and the project readiness to proceed with the preliminary design.

The SRR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

The SRR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version in the CDRL in appendix A.

**3.6.6 Preliminary Design Review (PDR)**

The Contractor must prepare and conduct a PDR meeting at the MFSP Platform System level which includes the completion of system requirements definition activities, the initial design activities and initial verification activities. The purpose of the PDR is to demonstrate that the preliminary design and analysis (e.g. thermal, structural, etc.) meets all the requirements and is feasible within the cost and schedule constraints, and that the project is ready to proceed with the detailed design. A demonstration during this phase will be performed on the DM unit with an initial software release and a Proto-Cartridge provided by CSA/NRC. This demonstration unit will be used by the contractor for further development in support and up to the EQM build. A second DM unit will be made and delivered to CSA/NRC in support of cartridge development and lab testing.

The PDR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

The PDR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version in Appendix A.

**3.6.7 EQM Manufacturing Readiness Review (EQM MRR)**

The Contractor must prepare and conduct a formal MRR on the EQM unit prior to manufacturing the unit. This includes the completion and release of all subsystem requirements and unit specifications, design documents and manufacturing processes. All analysis reports are to be updated and used to predict performance during environmental qualification. The verification and qualification planning activities must also be mature; this includes the Verification Plan, Manufacturing Plan, Verification Compliance Matrix, Test Plans and Procedures, and Science and Operational Validation Procedures.

The EQM MRR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version in Appendix A.

**3.6.8 Critical Design Review (CDR)**

The Contractor must prepare and conduct a CDR meeting at the MFSP Platform System level. The purpose of the CDR is to present the EQM verification results, demonstrating that this design is final and has met all requirements and is feasible within the cost and schedule constraints, and that the project is ready to proceed with the FM unit manufacturing, assembly, integration and test. Final analysis is to be updated and correlated to actual verification and qualification test results. Science verification and validation activities must be performed with the EQM and presented at CDR.

The CDR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

The CDR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version in Appendix A.

**3.6.9 Other Meeting or Review Requested by CSA, Related to BDC or Other**

The Contractor must prepare and participate to meeting at the MFSP Platform System level for the purpose of planning and executing BDC, operational procedures development, PTOC integration activities. Meetings with NRC may also be required to resolve any interface questions or issues between the MFSP Platform and MSFP cartridges.

**3.6.10 Phase 0/II Safety Reviews**

The purpose of the Safety reviews is to demonstrate to NASA that the safety requirements are met, knowing that safety to the crew and vehicle are the highest-level requirement of the ISS. The Contractor must prepare a Flight Safety Data Package (FSDP) (CDRL 11) and must deliver it to CSA and then to the Payload Safety Review Panel (PSRP), after which the Contractor must schedule, via the PIM, and present at the actual Flight Safety Review (FSR) meeting, which is usually held at Johnson Space Center (JSC).

The CSA-NRC is responsible to prepare a FSDP for the cartridges.

**3.6.11 Test Readiness Review (TRR)**

Before the start of test of each unit the Contractor must conduct a TRR to authorize the start of testing. The TRR must be held at the completion of assembly and integration and prior to the start of testing. The Contractor must notify the CSA of the TRR in advance and provide the TRR data package (CDRL 10) including checklist at the TRR.

The Contractor will be provided with Cartridges (GFM) required to conduct the test.

The purpose of a TRR is to demonstrate that the test article hardware or software, test facility, ground support personnel, and test procedures are ready for testing, and for data acquisition, reduction, and control.

The TRR must meet the objectives; entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

**3.6.12 CDR action items closure**

The contractor must update the documentation following the CDR. Final versions of documents to be delivered at phase C closure.

**3.6.13 FM Manufacturing Readiness Review (MRR)**

The Contractor must prepare and conduct an MRR on the FM unit prior to manufacturing the unit. Final versions of design documents to be delivered. The FM MRR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version (see Appendix A).

**3.6.14 Phase III Safety Review**

After successful completion of all verification tests, the Contractor must schedule (via the PIM) and present the Phase III Safety Review with the goal of obtaining flight safety certification. The Contractor must prepare a FSDP (CDRL 11) according to the PSRP requirements as closure milestone of phase C2. When the package is ready, it must be delivered to CSA and then to the

PSRP, after which the Contractor must schedule, via the PIM, and present the actual FSR presentation at NASA. The CSA-NRC is responsible to prepare a Flight Safety Data Package for the cartridges

### **3.6.15 Acceptance Review (AR)**

For the EQM, the FM and the GM, the Contractor must hold an AR to demonstrate to CSA that the MFSP System has been finalized, can be accepted as built and as tested.

The Contractor will be provided with Cartridges (GFM) required to conduct the acceptance review.

The AR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

The AR Data Package (CDRL 10) must include as a minimum the CDRLs as per the due date and version in Appendix A.

### **3.6.16 Pre-Shipment Review (PSR)**

The Contractor must hold a Pre-Ship Review (PSR) prior to shipment of the MFSP System to the NASA integration facility. The PSR may be combined with the AR.

The Contractor will be provided with Cartridges (GFM), as required. Conditioned stowage related to the GFM Cartridges (heated, cooled or frozen components and reagents) during transportation or on-board the ISS, must be less than 500 mL volume and 100 g mass required per Cartridge Device.

If fluids are to be stored and/or handled at temperatures colder than ambient, then the hardware used to store the fluids must meet the ISS Cold stowage Interface Requirements Document (AD-02). The provisions for cold stowage will be defined and verified by the NRC. For the purpose of commissioning only, the Contractor must submit the appropriate documentation and requests to NASA for manifest launch and stowage on orbit.

The PSR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

### **3.6.17 Delivery, Bench Review and Handover to CSA/NASA**

The Contractor must provide resources, logistics and transport to deliver the MFSP system to CSA, NRC or NASA for bench review and/or final on-dock delivery. This includes performing post-shipping functional checkout of the system at the specified delivery location. The Contractor must be responsible for obtaining access clearance to the necessary NASA facilities. The Contractor must advise and coordinate with CSA accordingly. The Contractor will be provided with Cartridges (GFM) required for commissioning.

### **3.6.18 Commissioning Review (CR)**

After the successful commissioning, the CR demonstrates that ground and flight hardware, ground and flight software, personnel, ground and flight procedures, ground and flight databases, ground

and flight documentation are operationally ready. If this review is successful, CSA will declare the MFSP System operational.

The CR must meet the objectives, entry and exit criteria detailed in the Systems Engineering Technical Reviews Standard (AD-03).

The Contractor must deliver the Commissioning Report as per CDRL 41.

### **3.6.19 Other Reviews and Meetings**

Other reviews and meetings, that may be of less importance from a resources point of view, but nevertheless part of the review cycle or ISS Payload Integration process, must be supported at NASA. These typically include the Operational Assessment Review, HFIT, IPLAT, and the Operations Training Strategy Team (TST) as outlined in SSP57057, AD-08. The list of required meetings and reviews will be established by NASA-assigned PIM through the PIM Schedule.

## **3.7 LIAISON AND COMMUNICATION REQUIREMENTS**

The Contractor must establish channels of communication with the CSA for monitoring of the Work and performance and therefore must provide access to its facility and personnel, at mutually agreeable dates, by representatives of the CSA or other organizations nominated by the TA. The Contractor must provide access to their office facilities and equipment on a temporary basis for the use of the CSA representatives (and the nominated attendees) visiting the Contractor's premises for reviews, meetings, audits, liaison, etc. Office facilities include desk space, telephone access and Internet access. The Contractor must also undertake to arrange at the TA's request for such facilities to be available at the major subcontractors. All documentation and data generated by the Contractor and its major subcontractors for the Work must be accessible to the TA for review.

### **3.7.1 External Communications**

The Contractor communications external to the project Team must be coordinated and approved by CSA per contract clauses. This includes with the public, other companies or government entities, and conferences.

## **3.8 PRODUCT ASSURANCE, QUALITY, SAFETY AND MISSION ASSURANCE**

### **3.8.1 Quality Assurance System**

The Contractor must have in place and maintain throughout execution of the work a Quality Assurance (QA) System compliant to ISO 9001.

### **3.8.2 Product Assurance Implementation Plan**

The Contractor must implement the Product Assurance Implementation Plan (PAIP) (CDRL 5) which must be compliant to the MFSP Product Assurance Requirements (PAR) (AD-05) to support all tasks under the Contract and subject to periodic review or audit by CSA or its designated representative(s). The approved PAIP must be used as the basis for determining compliance to PA requirements during any audits.

The Contractor must assure the overall MFSP System safety of the design that eliminates, reduces, or minimizes safety risk to an acceptable level. The Contractor must support all reviews of this safety documentation. The Contractor must meet as well the requirements for ground safety operations, as specified by the launch site or worksite used for hardware testing and/or processing. The PAIP, including the requirements compliance matrix, must be provided with the proposal as per CDRL 5.

### **3.8.3 Right of Access**

A CSA PA representative must be provided the right of access, on a non-interference basis, to the Contractor and subcontractor facilities and information, documents and records related to deliverable items. The CSA representative must be provided reasonable facilities and equipment normally available to the Contractor's PA and engineering personnel and any other basic assistance so that CSA personnel can perform their duties with safety and convenience.

### **3.8.4 Audits**

The CSA must have the right to perform audits of the Contractor and subcontractors to assess conformance to the expected PA for such Work. Data and documentation generated by the Contractor and subcontractor, including design and test data and PA program documentation, are subject to review, evaluation and inspection by the TA. The Contractor must notify the TA of any audits of subcontractors or suppliers. The CSA reserves the right to be represented at subcontractor and supplier audits performed by the Contractor.

### **3.8.5 Flight Safety Data Package (FSDP)**

The contract must prepare and submit to the NASA ISS Hazard System (IHS) the FSDP (CDRL 11) which includes as required, Hazard Reports, Hazardous Materials Summary Tables (HMST), Flammability Assessments and other presentations, analyses and reports related to the mitigation and control of hazards as defined in the MFSP PAR (AD-05).

### **3.8.6 Failure Modes Effect and Critical Assessment (FMECA)**

The Contractor must prepare the FMECA report (CDRL 27) in accordance with the PAR (AD-05).

### **3.8.7 Parts Derating and Stress Analysis Report**

The contract must perform and deliver a Parts Derating and Stress Analysis Report (CDRL 31) in accordance with the PAR (AD-05).

### **3.8.8 Worst Case Analysis**

The Contractor must perform and deliver a Worst Case Analysis Report (CDRL 32) in accordance with the PAR (AD-05).

### **3.8.9 Material Identification and Usage List (MIUL)**

The Contractor must generate the MIUL (CDRL 28) in NASA format.

### **3.8.10 Declared EEE Parts List**

The Contractor must generate Declared Electrical Electromechanical Electronic (EEE) Parts List (CDRL 29). The intent can be met by providing a manufacturing parts list, e.g., electronics parts Bill of Material (BOM).

**3.8.11 Declared Mechanical Parts List**

The Contractor must generate a Declared Mechanical Parts List (CDRL 30). The intent can be met by providing a manufacturing parts list, e.g., mechanical parts BOM.

**3.8.12 Non-Conformance Review Board and Reporting**

The Contractor must maintain non-conformance review board minutes and non-conformance reports in accordance with MFSP PAR (AD-05) and (CDRL 39).

**3.8.13 Request for Deviation and Waiver**

In the event that a requirement cannot be complied with, the Contractor must submit a Request for Deviation (RFD) or a Request for Waiver (RFW) (CDRL 40).

**3.8.14 Configuration Change and Data Management**

The Contractor must maintain a CADM process that:

- a) Uniquely Identifies all of the functional and physical characteristics of the MFSP System;
- b) Controls changes to those characteristics;
- c) Provides status on change activity; and
- d) Controls audits.

This process must be documented in the PAIP (CDRL 5).

**3.8.15 Configuration Change Control**

The CADM process must also include provisions for comprehensively evaluating proposed or requested changes and variances and of assessing the total impact (technical, cost, schedule, risk, safety, etc.) of each change or variance. The Contractor must request approval from the Project Management (PM) before the implementation of any changes that affect requirements, safety, interface, form, fit, or function of the flight hardware or software.

**3.8.16 Software Product Assurance**

The Contractor must perform the required software product assurance process tasks on all on-orbit and ground command and control software per the PAR (AD-05). This process must be documented in the PAIP (CDRL 5).

**3.8.17 End Item Data Package (EIDP)**

The Contractor must deliver an EIDP with each unit delivered (EQM, GM and FM) in accordance with the PAR (AD-05). This process must be documented in the PAIP (CDRL 5).

**3.9 ENGINEERING****3.9.1 Verification Process**

The Contractor must produce a Test Plan (CDRL 21) describing how requirements will be verified. AD-01 and AD-02 contain MFSP Platform System Verification Matrices, which identify the method to be used for each requirement's verification.

Verification of requirements must be through one, or a combination of the following:

- a) Review of design;
- b) Similarity;
- c) Analysis;
- d) Simulation;
- e) Demonstration/fit-check;
- f) Inspection
- g) Test (functional and performance)
- h) Environmental Qualification or Acceptance Test

### **3.9.1.1 Review of Design**

Verification by review of design is the process of reviewing the design against the requirements which cannot be demonstrated by test or analysis. This method is often used in conjunction with a demonstration.

### **3.9.1.2 Similarity**

Verification by similarity is the process of assessing by review of prior test data that a unit is similar or identical in design and manufacturing to another unit that has been previously qualified to equivalent or more stringent specifications.

### **3.9.1.3 Analysis**

As part of the design process, the Contractor must undertake analyses of technical aspects of the design as specified below.

#### ***3.9.1.3.1 Environmental Analysis***

The MFSP Platform System must be designed and show by analyses to withstand the environments for launch and on-orbit operations for vibration, shock, EMC/EMI, acoustic and thermal, etc. as identified in AD-01, AD-02 and AD-05.

#### ***3.9.1.3.2 Structural Analysis***

The MFSP Platform System mechanical and structural performance must be analyzed by means of Structural Mathematical Models (SMM), (CDRL 26) and calculate structural margins of safety with appropriate factors of safety. Individual critical components must be analyzed for margins of safety

#### ***3.9.1.3.3 Thermal Analysis***

The MFSP Platform System thermal performance must be analyzed to ensure unit performance within the EXPRESS rack during operations as per AD-02. The analysis must also demonstrate touch temperatures of key crew interfaces within appropriate levels with margin.

#### ***3.9.1.3.4 Parameter Budget Analysis***

The Contractor must perform analysis to provide key parameters, including but not limited to mass, center of gravity, power (inrush, average and peak), heat dissipation, telemetry uplink/downlink rates and packet sizes, etc.

#### **3.9.1.4 Demonstration**

Verification by demonstration is the use of actual demonstration techniques in conjunction with requirements such as, serviceability, accessibility, transportability and human engineering features. In general, demonstration is specified as the method of verification for physical attributes which have no numerical requirements associated with them. Demonstration may also be used for compatibility with shipping containers, interface fittings, handling features, etc.

#### **3.9.1.5 Test**

Functional and performance testing exercises the electrical and mechanical elements of a unit to establish that the unit under test performs in accordance with the specifications. Functional testing is generally performed at ambient conditions and before and after each environmental test or major shipment to confirm performance prior to the next test or operation.

At the completion of testing, a report or TN must be provided capturing each units baseline (start of life) performance parameters.

#### **3.9.1.6 Environmental Qualification and Acceptance Test**

Environmental testing is conducted on hardware units to ensure they perform satisfactorily in an analog environment. Examples of environmental tests are vibration, acoustic, shock, thermal and EMC. Environmental testing may or may not be combined with functional testing depending on the objectives of the test.

#### **3.9.1.7 Validation Activities**

The Contractor must validate all MFSP System science objectives, ground operations (PTOC) and PI BDC activities using the EQM. Science objectives validation must also be performed on the FM and GM units to capture any deltas in unit performances. A report or Technical Note (TN) must be provided capturing each units baseline (start of life) performance parameters.

#### **3.9.2 Requirements Traceability and Verification Compliance Matrix**

The Contractor must prepare a Verification Compliance Matrix (VCM) (CDRL 19) that identifies and traces each requirement identified in documents AD-01 and AD-02 to the Systems Requirements Documents (CDRL 16). In addition, the VCM must identify the verification method(s) to be used to satisfy the respective requirement. At AR, the VCM must be final and identify all evidence delivered and approved for each respective requirement.

This matrix is a living document and may be updated incrementally as the project evolves from requirements through design manufacturing and testing.

## **4 SYSTEM REQUIREMENTS PHASE (PHASE A)**

### **4.1 REQUIREMENTS DEVELOPMENT**

The Contractor must develop and deliver the MFSP Platform System (hardware and software) Requirements Documents (SRD) (CDRL 16), demonstrating compliance with AD-01 and AD-02 and that the system concept design will meet requirements within an acceptable level of risk. The Contractor must produce the Interface Control Document (ICD) (CDRL 34) for the hardware and software, including internal and external interfaces.

The Contractor must incorporate the cartridge ICD from NRC information, provided and approved at the IDR. Any updates to the ICDs after the IDR, must be approved by NRC and CSA and incorporated into the Contractor's documentation, which will be used to present the MFSP Platform System to NASA.

The Contractor must hold an IDR and present the ICD with support from the NRC for CSA approval. Following the IDR, the ICD will be released and under CM control; further updates must be coordinated with NRC and CSA.

In support of developing the MFSP platform system requirements, conceptual designs of the interface may be presented for discussion. The selection of a concept for design must be coordinated with NRC and approved by CSA. The Contractor must develop the interface between the rotor and the cartridge from the GFI specify in section 2.1. The Contractor must perform initial integration and analysis of the interface.

In addition, the Contractor must present any trade-offs, analysis or prototype testing used to address any risks in the system and demonstrate the designs intended compliance with the requirements.

The Contractor must hold an SRR and deliver CDRL per table A-3 in appendix A.

### **4.2 NASA PAYLOAD INTERFACE CONTROL DOCUMENT (ICD)**

NASA payload interface requirements are documented in AD-02 and define the MFSP Platform System hardware and software interfaces with the ISS, including the interface verification requirements. The Contractor must provide support to the NASA PIRE by supplying inputs (CDRL 15) such as payload description, drawings, schematics, diagrams, parts lists, analysis and test reports, etc. Rational for non-applicable requirements must be approved by CSA and NASA. Exceptions, deviations and waivers must be processed in accordance with the PAR (AD-05). etc. as required for the development of the payload unique ICD

## **5 PRELIMINARY DESIGN PHASE (PHASE B)**

The Contractor must develop an initial design of the MFSP Platform that will demonstrate that the verification of requirements is feasible. The design documents include drawings, schematics, architectural diagrams, ICDs, CAD models, preliminary analysis reports and verification and test plans, as identified in the Data Deliverables Table A.3.

The Contractor must develop the Software Development Plan (SDP) (CDRL 35) and the Software Version Descriptions (SVD) (CDRL 36) documents to reflect the SW development process implemented. This must include GCTS as well as unit and ground test software.

### **5.1 MFSP PLATFORM AND CARTRIDGES INTEGRATION DEMONSTRATION**

#### ***5.1.1 Integration Demonstration Model***

The Contractor must build a DM to demonstrate the functionality of the interface between the MFSP Platform rotor and a GFM dummy cartridge provided by NRC. A report of the demonstration results must be provided as per CDRL 23.

#### ***5.1.2 Development Cartridges***

The NRC will define, as a minimum two (2) generic cartridges which will represent the maximum and minimum physical (mass, volume, center of gravity) characteristics of the cartridge envelope. This information will be provided to the Contractor for incorporation into the Contractor's test and verification plans and activities. Cartridge's quantity to be provided by NRC are defined in Appendix B.2

#### ***5.1.3 Instrumented Validation Tool***

The Contractor must provide a GSE Tool to record telemetry data in support of the Platform verification activities. A telemetry cartridge with the same fit and interfaces as the NRC cartridge (as defined in the ICD) and compliant with AD-01, should be used as a GSE tool to record sufficient parameters to demonstrate the platform's function and performance. The recorded telemetry must be extractable from the tool after the process cycle is terminated. At a minimum, the recorded telemetry must include air pressure at each pneumatic port, rotor speed and acceleration, and temperature of the thermal interfaces. The recorded data from the tool must be in a format that permits easy comparison with the telemetry generated by the platform.

Quantity to be delivered are defined in Appendix A.1.

### **5.2 TECHNOLOGY READINESS AND RISK ASSESSMENT**

The Contractor must perform a Technology Readiness and Risk Assessment (TRRA) in accordance with the requirements of the CSA Technology Readiness and Risk Assessment Guidelines (AD-04) to formally document the MFSP Platform System technology status. The Contractor must produce CDRL 14 for the TRRA using the Critical Technologies Elements Identification Criteria Worksheet (AD-10) as well as the Technology Readiness and Risks Assessment Worksheet (AD-09) for each Critical Technology Element (CTE).

### **5.3 NASA PAYLOAD INTERFACE CONTROL DOCUMENT (ICD)**

NASA payload interface requirements defined in Phase A may be updated throughout Phase B based on NASA evaluations of the design. The Contractor must provide support to the NASA PIRE to review these updates and incorporate them into the ICDs, as required.

#### **5.4 OPERATING PROCEDURES AND USERS GUIDE**

The Contractor must develop the Operating Procedures and User Guide (CDRL 24), in collaboration with the CSA.

#### **5.5 PHASE B PDR**

The Contractor must conduct a PDR of the MFSP System, in accordance with AD-03. The Contractor must integrate into the PDR data package the information related to the cartridge interfaces. The NRC will prepare and present the PDR package for each cartridge design. The Contractor must integrate in the agenda a portion of the PDR meeting duration for the NRC portion. NRC will deliver to CSA the Cartridge data package for PDR.

## **6 DETAILED DESIGN PHASE (PHASE C)**

The Contractor is to update and finalize the detailed design and analysis of the MFSP Platform System and demonstrate compliance to requirements. All hardware and software design documents, models, drawings, schematics, ICDs and analysis reports, as identified in the Data Deliverables Table A.3, must be final and under CM control. Manufacturing plans and processes must be completed and released.

### **6.1 SOFTWARE DETAILED DESIGN**

The Contractor must update and finalize all MFSP Platform, GCTS and GSE software and provide Version Description Documents (VDDs) to CSA for approval.

### **6.2 DETAILED DESIGN VERIFICATION**

The Contractor must perform verification activities of the detailed design to demonstrate that it complies with the requirements. The Contractor must update the Requirements Traceability Verification and Compliance Matrix (CDRL19) to include evidence (e.g. test reports, analysis, demonstration) for each requirement as it becomes available.

### **6.3 ENGINEERING QUALIFICATION MODEL DESIGN AND TESTING**

An MFSP Platform EQM must be used to verify and demonstrate the system has met or exceeded all functional and performance requirements. This includes integrated testing with the MFSP cartridges, GCTS and Ground Support and Testing equipment. The EQM must also be tested to environmental qualification levels.

The Contractor must prepare and conduct an EQM MRR as identified in section 3.6.7.

The Contractor must prepare and conduct an EQM TRR as identified in section 3.6.11.

The Contractor must deliver test reports as defined in CDRL 23.

### **6.4 PRE-VERIFICATION VM INTEGRATION TESTING**

The Contractor must provide to CSA PTOC and NASA HOSC a VM in accordance with section 3.2.2. The Contractor must provide C&DH test procedures to be used with the VM to ensure payload to ISS interfaces are working properly prior to integrating the MFSP EQM with the SSIFT equipment for formal verification activities. The Contractor must perform the tests, in conjunction with the CSA operator at the PTOC and the NASA HOSC support team.

### **6.5 VERIFICATION PLAN (VP)**

The Contractor must undertake a review of all the requirements and ensure that all have been captured in the VP (CDRL 18), which must be prepared and submitted to CSA for approval.

The Contractor must perform verification activities on the detailed design to demonstrate that it complies with the requirements. The VP must be developed for the purposes of assessment and ultimately the validation leading to the acceptance and flight qualification of the MFSP Platform System as defined in section 3.9.1.

The Contractor must also develop a Verification Compliance Matrix (VCM) (CDRL 19). It provides the detailed linkage of verification activities to the specific requirements they address. Additionally the VCM must be augmented with a compliance statement for each requirement, along with references to the applicable documentation, as well as the verification methods associated with the closure of each requirement. In addition, the Contractor must submit

verification evidence into the NASA Veritas database for approval. All applicable documentation must be provided to the CSA. The Contractor must provide the initial release of the VCM with the proposal as per CDRL 19. The initial release only includes the compliance statement for each requirement whereas updated versions to be provided at technical reviews must also include the verification activities.

## **6.6 EXPRESS PAYLOAD HARDWARE INTEGRATED TESTS**

The Contractor must support the EXPRESS payload hardware integrated tests. The EXPRESS payload hardware will be integrated at NASA and tested to obtain acoustics and Electromagnetic Interference/Compatibility (EMI/EMC), power, data, thermal, mechanical, and human factors interface verification data. The SSITF contains a Flight Equivalent Unit (FEU) of the EXPRESS rack, interfacing through the Payload Operations Integration Center (POIC) ground data systems. A Telescience Resource Kit (TReK) workstation is used to issue commands and view payload telemetry. The opportunity exists to review ground commands and simple crew procedures while interacting with the payload at the SSITF.

## **6.7 GROUND COMMANDING AND TELEMETRY STATION INTEGRATED TESTS**

The Contractor must develop the Ground Commanding and Telemetry Software (GCTS-SWs) and deliver Ground Commanding and Telemetry Stations (GCTSs). CSA will support the Contractor to obtain from NASA, the necessary accounts/licenses and/or SW package for Trek and Ku-Forward.

## **6.8 GROUND COMMANDING AND TELEMETRY FROM CSA**

The Contractor must develop and deliver the GCTS-SW to CSA for installation on a CSA PTOC workstation for Commanding and Telemetry from CSA.

## **6.9 NASA PAYLOAD INTERFACE CONTROL DOCUMENT (ICD)**

NASA payload interface requirements defined in Phase A and B may be updated throughout Phase C based on NASA evaluations of the design. The Contractor must provide support to the NASA PIRE to review these updates and incorporate them into the ICDs, as required.

In addition, as EQM verification is completed and approved by CSA, evidence must be entered into the NASA VERITAS database for NASA IRB verification closure.

## **6.10 MFSP SYSTEM INTEGRATION**

The Contractor must qualify the MFSP Platform System. The EQM must be tested per the requirements specified in AD-01 and AD-02. Contractor to deliver test report per CDRL 23.

The Contractor must prepare final integration and analysis of the MFSP System.

The Contractor must conduct a CDR after qualification tests are completed.

The NRC will prepare the CDR package for the cartridge internal design

## **6.11 CARTRIDGE MANUFACTURE AND DELIVERY**

The NRC will manufacture the cartridges to meet the generic procurement specification. Specific cartridges will be delivered to the Contractor per the project schedule.

The NRC will provide cartridges per Appendix B. For each batch of each type delivered to the Contractor, NRC must deliver reports and documentation, including certificate of compliance. For internal aspect of the cartridge, details will not be provided to the Contractor.

#### **6.12 OPERATING PROCEDURES AND USERS GUIDE**

The Contractor must develop the Operating Procedures and User Guide (CDRL 24), in collaboration with the CSA.

The Contractor must train the CSA ground operators and science team on the use of the MFSP Platform System.

## **7 FM MANUFACTURE, ASSEMBLY, INTEGRATION AND TEST, PHASE D (OPTION)**

The Contractor must manufacture and assemble the MFSP Platform System FM in accordance with the verified design presented at the CDR. CSA must have the right to witness any tests or inspection conducted on the MFSP Platform System. Availability of invitees must not delay the execution of the tests per the Contractor schedule. The CSA will not provide testing facilities or any GFE/Services.

### **7.1 VERIFICATIONS**

The Contractor must perform all required verification activities specified in Verification Plan (CDRL 18). The Contractor must perform the SVT, to ensure that the MFSP Platform System can generate science data with representative subjects.

### **7.2 FLIGHT ACCEPTANCE/CERTIFICATION TESTS**

The Contractor must undertake all the necessary tests to obtain the required flight Qualifications and Certifications for the FM. Test reports must be issued following each test (CDRL 23).

### **7.3 GROUND SUPPORT FOR TESTS AFTER DELIVERIES**

The Contractor must provide GSE and personnel support to perform a functional checkout at the required locations (e.g. NASA, NRC, etc.) after delivery of units to ensure performance has not been affected during transport.

### **7.4 TEST PROCEDURES AND TEST REPORTS**

The Contractor must prepare the Test Procedures (CDRL 22).

The Contractor must prepare the Test Reports (CDRL 23).

### **7.5 NASA PAYLOAD INTERFACE CONTROL DOCUMENT (ICD)**

As FM verification is completed and approved by CSA, evidence must be entered into the NASA VERITAS database for NASA IRB verification closure.

### **7.6 PAYLOAD PREPARATION, LATE LOAD, PACKAGING AND LAUNCH**

#### **7.6.1 Launch Package**

The Contractor must prepare the Launch package for delivery and hand over to NASA on the agreed upon Hardware on Dock (HW/OD) date. The launch package is comprised of the FM unit, including any maintenance items (developed and manufactured by the Contractor), the commissioning cartridges including any consumables items (developed and manufacture by NRC) and provided to the Contractor as GFM. The HW/OD date is not applicable to Late load items of the Launch package. The HW/OD is determined and agreed upon through the Payload Integration schedule (i.e. PIM Schedule).

If it is determined that some of the launch package or commissioning items require stowage at cold temperatures, then the cold-stowed hardware will need to be appropriately identified to NASA and cold stowage requirements integrated into the IRB and verified as to its compatibility with NASA-provided cold stowage refrigeration and transportation equipment.

### **7.6.2 Launch Campaign**

The Contractor must support the launch activities at the launch site for any late-load items of the launch package.

Items are considered late-load when they have a short life before being used, and cannot survive the time period between non late-load item delivery to NASA and the launch, which is several months. An example of a late-load item is a set of biological samples that must be kept colder than ambient temperature and have a life of only a few weeks. Late-load items must be delivered to NASA 48 hours before launch, are logistically much more demanding than the non-late-load deliveries, require on-site launch support. Late-load versus non late-load decisions are Contractor/NRC recommended and must be approved by CSA.

## **8 DOCUMENT DELIVERABLES**

The Contractor must prepare and deliver the documents as requested in the Appendix A.

### **8.1 DOCUMENT DELIVERABLES, FORMAT AND CONTENT**

The Contractor must ensure that documents delivered comply with the general preparation instructions and applicable Data Item Description (DID) or Contractor format (Cont. Format) which meets or exceeds the intent of the applicable DID.

Documents must be delivered in the original software application format, plus in Portable Document Format (PDF). One electronic copy of each deliverable document must be transferred to the CSA at the address and in the format specified in DID-0000. No paper copy is to be delivered, except when requested by the TA.

### **8.2 DOCUMENTS APPROVAL**

The term “Approval”, as used in this document and in other documents referred to herein, means written approval by the PM, of documents submitted by the Contractor. Once approved, the document is authorized for further use by the 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 PM’s approval. No request or document for which approval is required may be acted upon or implemented by the Contractor until such approval is provided. Such requests and documents will be reviewed promptly by the PM and the necessary written approval or disapproval will be provided after their receipt by CSA. In the event of a failure by the PM to approve or disapprove the document within fifteen (15) working days, the documents may be deemed approved.

In the event that a request or document is disapproved, the PM will advise the Contractor in writing as to the reasons for such disapproval and will define the additions, deletions or corrections that the PM 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 PM. Approval or disapproval of resubmitted requests or documents will be based solely on those points that were not previously deemed to be acceptable.

### **8.3 DOCUMENTS 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 PM of a document for review implies 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 PM does not concur with a document submitted for review, the PM will so notify the Contractor within fifteen (15) working days of the document submission. Such notification will include a full explanation of the reasons for the lack of concurrence and will recommend the additions, deletions and/or corrections, which the PM deems are beneficial to 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 and this SOW. If written notification of concurrence is not provided by the TA within fifteen (15) working days of the receipt of the document, the document must be deemed to have been reviewed and accepted by the PM without comment.



## **APPENDICES**

## A DELIVERABLES AND CONTRACT DATA REQUIREMENTS LIST (CDRL)

The section describes the hardware, software and the data deliverables.

### A.1 HARDWARE DELIVERABLES

These deliverables must be delivered, on-dock at NASA unless otherwise noted, in their Contractor-provided shipping containers and in launch configurations as follows:

**TABLE A-1 – HARDWARE DELIVERABLES**

| Deliverable   | Due Date  | Quantity                                   | Delivery On-Dock Location  | Notes  |
|---|---|--|--|--|
| Development Model (DM)                                  | PDR<br>CDR  | 2<br>1 updated                             | CSA  | At the end of phase B, 1 DM is delivered to CSA/NRC, 1 DM remains with and is used by the Contractor.<br><br>In phase C, the Contractor DM is updated to simulate the EQM and delivered to CSA/NRC.  |
| Instrumented Validation Tool                            | EQM TRR   | 2  | CSA  | One for the EQM, and one for the GM.   |
| EQM + Maintenance Kit                                   | CDR<br>Phase D  | 1<br>1 updated                             | CSA  | EQM Maintenance Kit includes equipment such as tools, spares and consumables required to meet the EQM maintainability, serviceability and availability requirements.<br><br>In phase D, the EQM is updated to simulate the FM if required and delivered to CSA/NRC to test FM cartridges.<br><br>After FM & GM delivery the EQM will be located at the Contractor. |
| FM and GM +Maintenance Kits                             | AR  | 1 FM<br>2 GM                               | 1 FM to NASA<br>1GM to NASA**<br>1GM to CSA/NRC                      | 1 FM for flight<br>2 GM for ground activities<br>Maintenance Kits include equipment such as tools, spares and consumables required to meet the maintainability, serviceability and availability requirements.  |
| Commissioning Kits (non late-load and late-load if any) | Same as FM for non late-load items.<br>48 hours before launch for late-load items | 1 non late-load items<br>1 late-load items | 1 non late-load items and 1 late-load items to NASA                  | The FM is commissioned on the ISS (with its commissioning kit delivered to NASA).  |
| Ground Support Equipment (GSE)                          | Same as GM and EQM  | 3  | 1 for GM to NASA**<br>1 for EQM to Contractor<br>1 for GM to CSA/NRC | A GSE must contain all equipment and interconnecting items to completely operate one MFSP System on the ground, like if it was connected and operated from an EXPRESS rack.<br>A GSE must be delivered in its shipping container.  |

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|   |                    |   |  |   |
|---|--------------------|---|--|---|
| Ground Commanding and Telemetry Stations (GCTS) | Same as GM and EQM | 3 | 1 for GM to NASA**<br>1 for EQM to Contractor<br>1 for GM at CSA/NRC | This support equipment is for command and telemetry monitoring, through the CSA infrastructure or the Contractor. |
|---|--------------------|---|--|---|

**Legend:**

\*\*These hardware deliveries to NASA might have to be reshipped back to CSA after use at NASA.

**A.2 SOFTWARE DELIVERABLES**

The Contractor must package and deliver the software listed in Table A-2 and the Software EIDP (CDRL 12).

**TABLE A-2 – SOFTWARE DELIVERABLES**

| No. | Deliverable   | Due Date                           | Quantity                               | Location                               |
|-----|---|------------------------------------|--|--|
| 1   | Virtual Machine   | EQM TRR                            | 2                                      | PTOC<br>HOSC                           |
| 2   | MFSP Systems software and firmware and GCTS-SW installed on the delivered hardware  | Same date as hardware deliverables | Same quantity as hardware deliverables | Same location as hardware deliverables |
| 3   | Systems software and firmware (GCTS-SW) to be installed in CSA PTOC   | Same date as hardware deliverables | 1                                      | CSA                                    |
| 4   | All software (source code, graphic models, CAD models, engineering drawings, system definition files, initialization files, scripts, libraries etc.) required for the delivery of the MFSP system | AR (part of EIDP)                  | 1 of each final version                | CSA                                    |

All delivered non-Commercial-Off-The-Shelf (non-COTS) software must include executable code, the source listings and source files, compiled files, configuration and parameter files, reloadable Field Programmable Gate Array (FPGA) configuration files, test scripts, design documentation, users' manuals, test results and associated plans and procedures.

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All third party software must be accompanied by a license (free of charge) that allows the software to be archived and copied as necessary for all future CSA operations.

All software (i.e., non-COTS and COTS) must be accompanied by a license (free of charge) that allows CSA to use the software for the operational period after completion of commissioning.

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**A.3 DATA DELIVERABLES**

These Data Deliverables must be delivered as per Table A-3. CSA review of advanced draft encouraged, unless otherwise indicated, as follows:

**TABLE A-3 – CONTRACT DATA REQUIREMENTS LIST (CDRL)**

| CDRL No. | Cat. | Deliverable  | Due Date   | Version               | Approval / Review | DID No. or Cont. Format ***   |
|----------|------|--|--|-----------------------|-------------------|-------------------------------|
| 1.       | PM   | Project Management Plan  | Proposal,<br>Update as required                                      | IR<br>Final           | A                 | 0001 or Cont. format          |
| 2.       | PM   | WBS and Work Package Description   | Proposal,<br>Update as required                                      | IR<br>Final           | A                 | 0002 or Cont. format          |
| 3.       | PM   | Project Schedule   | Proposal,<br>Monthly   | IR<br>Update          | R                 | 0004 or Cont. format          |
| 4.       | PM   | Monthly Progress Reports   | End of month + 5 working days  | Final                 | R                 | 0003 or Cont. format          |
| 5.       | PA   | Product Assurance Implementation Plan (PAIP) including PA Requirements Compliance Matrix   | Proposal,<br>Update as required                                      | IR<br>Final           | A                 | 0029 or Cont. format          |
| 6.       | PM   | Meeting Agendas  | Meeting – 5 working days   | Final                 | R                 | 0005 or Cont. format          |
| 7.       | PM   | Meeting Minutes  | Meeting + 5 working days   | Final                 | R                 | 0006 or Cont. format          |
| 8.       | PM   | Action Items Log (AIL)   | Monthly  | Final                 | R                 | 0007 or Cont. format          |
| 9.       | PM   | Meeting/Review Presentations   | Meeting – 5 working days   | Final                 | R                 | Cont. format                  |
| 10.      | PM   | Review Data Package  | Review – 10 working days   | IR                    | R                 | 0008                          |
| 11.      | PA   | Flight Safety Data Package (FSDP) I, II and presentation<br>FSDP III and presentation  | As per NASA process<br><br>Phase C closure                           | Final<br><br>Final    | A<br><br>A        | As per NASA format            |
| 12.      | PA   | End Item Data Package (hardware and software)  | AR – 10 working days<br>Update as required                           | IR<br>Final           | A                 | 0010 and 0011 or Cont. Format |
| 13.      | PM   | BIP/FIP Disclosure Report  | Proposal (BIP)<br>CDR – 10 working days<br>End of Contract (BIP/FIP) | IR<br>update<br>Final | A                 | 0013                          |
| 14.      | SE   | Critical Technologies Elements Identification Criteria Worksheet, Technology Readiness and Risk Assessment Worksheets and Rollup | Proposal<br>PDR– 10 working days                                     | IR<br>Update          | R                 | 0014                          |

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| CDRL No. | Cat. | Deliverable  | Due Date  | Version  | Approval / Review | DID No. or Cont. Format ***  |
|----------|------|--|---|--|-------------------|------------------------------|
| 15.      | SE   | Inputs to the NASA Payload Interface Requirements Baseline (IRB)             | IDR<br>As requested by NASA   | IR<br>Final  | A                 | As per NASA format (VERITAS) |
| 16.      | SE   | System Requirements Document (hardware and software)                         | SRR – 10 working days<br>Update as required   | Final  | A                 | 0017 or Cont. format         |
| 17.      | SE   | Design Documents (hardware and software)                                     | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure – 10 working days<br>AR – 10 working days  | IR<br>Update<br>Update<br>Final<br><br>Update if required                                    | R                 | 0018 or Cont. Format         |
| 18.      | SE   | Verification Plan  | SRR– 10 working days<br>PDR– 10 working days<br>EQM MRR – 10 working days<br>TRR– 10 working days   | IR<br>Update<br>Update<br><br>Final  | A                 | 0019 or Cont. format         |
| 19.      | SE   | Verification Compliance Matrix   | Proposal<br>SRR– 10 working days<br>PDR– 10 working days<br>CDR– 10 working days<br>AR – 10 working days<br>End of Contract   | IR<br>Update<br>Update<br>Update<br>Update<br>Final  | A                 | 0020                         |
| 20.      | SE   | Design, Assembly and Interface Control Drawings (mechanical and electrical). | IDR – 10 working days<br>PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days<br><br>End of Contract | Draft<br>IR<br>Update<br><br>Update<br>Final<br><br>Update if required<br>Update if required | R                 | Cont. Format                 |

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| CDRL No. | Cat. | Deliverable  | Due Date   | Version  | Approval / Review | DID No. or Cont. Format ***         |
|----------|------|--|--|--|-------------------|-------------------------------------|
| 21.      | SE   | Test Plan (hardware and Software)  | SRR– 10 working days<br>PDR– 10 working days<br>EQM TRR – 10 working days<br><br>CDR– 10 working days<br><br>CDR closure– 10 working days<br>AR – 10 working days        | IR<br>Update<br>Final<br>Update if required<br><br>Update if required<br><br>Updates if required | A                 | 0021 or Cont. Format                |
| 22.      | SE   | Test Procedure (hardware and software)   | EQM MRR – 10 working days<br>TRR UUT – 10 working days   | IR<br><br>Final  | A                 | 0022 or Cont. Format                |
| 23.      | SE   | Test Reports (hardware and Software)   | Test + 10 working days   | Final  | R                 | 0023 or Cont. Format                |
| 24.      | Ops  | Operating Procedures and Users Guide   | PDR -10 working days<br>CDR– 10 working days<br>Phase C closure – 10 working days<br>AR – 10 working days<br><br>CR – 10 working days                                    | IR<br>Update<br>Final<br><br>Update if required<br>Update if required                            | R                 | 0024 or Cont. Format                |
| 25.      | Ops  | Crew and Ground Operator Training and Procedures, figures, instructions, diagram and video-clips | As required by CSA and NASA<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days<br><br>CR – 10 working days | IR<br>Update<br><br>Update<br>Final<br>Update if required<br>Update if required                  | R                 | As per required format by CSA/ NASA |

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| CDRL No. | Cat. | Deliverable   | Due Date  | Version  | Approval / Review                  | DID No. or Cont. Format ***                  |
|----------|------|---|---|--|------------------------------------|--|
| 26.      | SE   | CAD Models & Analyses                                     | IDR – 10 working days<br>SRR– 10 working days<br>PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR– 10 working days | Draft<br>IR<br>Update<br>Update<br><br>Update<br>Final<br><br>Update if required | A for analyses<br><br>R for Models | 0025 or Cont. Format                         |
| 27.      | PA   | Failure Modes, Effects and Criticality Assessment (FMECA) | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days   | IR<br>Update<br><br>Update<br>Final<br><br>Update if required                    | A                                  | Cont. Format                                 |
| 28.      | PA   | Material Identification and Usage List (MIUL)             | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days   | IR<br>Update<br><br>Update<br>Final<br><br>Update if required                    | A                                  | NASA format                                  |
| 29.      | PA   | Declared EEE Parts List                                   | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br><br>AR – 10 working days   | IR<br>Update<br><br>Update<br>Final<br><br>Update if required                    | R                                  | Cont. Format (i.e. manufacturing parts list) |

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| CDRL No. | Cat. | Deliverable  | Due Date   | Version   | Approval / Review | DID No. or Cont. Format *** |
|----------|------|--|--|---|-------------------|-----------------------------|
| 30.      | PA   | Declared Mechanical Parts List                           | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days  | IR<br>Update<br>Update<br>Final<br>Update if required   | R                 | Cont. Format                |
| 31.      | PA   | Parts Derating and Stress Analysis                       | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days  | IR<br>Update<br>Update<br>Final<br>Update if required   | R                 | Cont. Format                |
| 32.      | PA   | Worst Case Analysis                                      | PDR– 10 working days<br>EQM MRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days  | IR<br>Update<br>Update<br>Final<br>Update if required   | R                 | Cont. Format                |
| 33.      | SE   | Product Tree   | SRR– 10 working days<br>PDR– 10 working days<br>CDR– 10 working days<br>AR – 10 working days   | IR<br>Update<br>Update<br>Final   | R                 | Cont. Format                |
| 34.      | SE   | Interface Control Document (ICD) (Hardware and Software) | IDR – 10 working days<br>SRR – 10 working days<br>PDR– 10 working days<br>TRR– 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days | IR<br>Update<br>Update<br>Final<br>Update if required<br>Update if required<br>Update if required | A                 | Cont. Format                |

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| CDRL No. | Cat. | Deliverable                           | Due Date   | Version   | Approval / Review | DID No. or Cont. Format *** |
|----------|------|---------------------------------------|--|---|-------------------|-----------------------------|
| 35.      | SE   | Software Development Plan             | SRR– 10 working days<br>PDR– 10 working days<br>CDR– 10 working days   | IR<br>Update<br>Final   | A                 | 0026 or Cont. Format        |
| 36.      | SE   | Software Version Description Document | EQM TRR – 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br><br>AR – 10 working days                    | IR<br><br>update<br>Final<br><br>Update if required                   | R                 | 0027 or Cont. Format        |
| 37.      | SE   | Phase E Plan                          | PDR– 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days<br><br>CR + 10 working days | IR<br>Update<br>Final<br><br>Update if required<br>Update if required | R                 | 0028 or Cont. Format        |
| 38.      | SE   | Commissioning Plan                    | PDR– 10 working days<br>CDR– 10 working days<br>Phase C closure– 10 working days<br>AR – 10 working days<br><br>CR– 10 working days  | IR<br>Update<br>Final<br><br>Update if required<br>Update if required | R                 | Cont. Format                |
| 39.      | PA   | Non-Conformance Reports               | Non-Conformance<br>As required<br>AR – 10 working days   | IR<br>Update<br>Final   | A                 | 0030 or Cont. Format        |
| 40.      | PA   | Request for Deviation/Waiver          | As required  | Final   | A                 | 0031 or Cont. Format        |
| 41.      | Ops  | Commissioning Report                  | CR+10 working days   | Final   | R                 | Cont. Format                |
| 42.      | SE   | Interface Requirements Document       | IDR – 10 working days  | Final   | A                 | 0032                        |

\*\*\* Cont. format = format chosen by the Contractor which meets or exceeds the intent of the applicable DID if provided.

## B GOVERNMENT FURNISHED

### B.1 GOVERNMENT FURNISHED INFORMATION (GFI)

See section 2.1, applicable documents

### B.2 GOVERNMENT FURNISHED MATERIAL (GFM)

Cartridges will be provided to the Contractor per this table or per agreement between CSA-NRC-Contractor.

| Deliverable                     | Due Date                   | Quantity | Delivery On-Dock Location | Notes   |
|---------------------------------|----------------------------|----------|---------------------------|---|
| Sample Cartridges               | KOM + 1 month              | 2        | Contractor                | A minimum size and a maximum size cartridges.<br>Upon request by the Contractor and approval by CSA, additional cartridges will be provided                 |
| Development Models              | Start of phase B + 6 weeks | 6        | Contractor                | For platform-cartridge interface testing on platform development model (DM). Cartridges models to be decided at SRR.  |
| EQM                             | EQM TRR - 1 month          | 8        | Contractor                | For verification and qualification: 1 for each of at least 2 out of the 4 cartridge types to be developed by NRC<br>Cartridges models to be decided at PDR. |
| FM                              | FM TRR - 1 month           | 8        | Contractor                | For verification and acceptance: 1 +1 spare for each of the 4 cartridge types to be developed by NRC<br>Cartridges models to be decided at CDR.             |
| GMs (FM based model)            | GMs TRR - 1 month          | 8        | CSA                       | For verification and acceptance: 1 +1 spare for each of the 4 cartridge types to be developed by NRC<br>Cartridges models to be decided at CDR.             |
| Commissioning (post-acceptance) | AR - 1 month               | 8        | CSA                       | For commissioning: 1 +1 spare for each of the 4 cartridge types to be developed by NRC<br>Cartridges models to be decided at CDR.                           |

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## C DATA ITEM DESCRIPTIONS

|   |            |
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## DID-0000 - General Preparation Instructions

### PURPOSE:

This DID specifies

- a) format requirements for project documents and data delivered by the supplier in compliance with the Contract Data Requirements List (CDRL)
  - b) document and data delivery methods and communication of submission and receipt
- 

### INSTRUCTIONS:

#### 1. GENERAL REQUIREMENTS:

- 1.1. All documents and data must be written in the English language. The term “Documents” includes change requests, change notices and requests for deviations and waivers.
- 1.2. All documents must include the following notification at the bottom of the cover page:

© GOVERNMENT OF CANADA [YEAR]

*RESTRICTION ON USE, PUBLICATION OR DISCLOSURE OF PROPRIETARY INFORMATION*

*This document is a deliverable under contract no. \_\_\_\_\_. This document contains information proprietary to the Crown, or to a third party to which the Crown may have legal obligation to protect such information from unauthorized disclosure, use or duplication. Any disclosure, use or duplication of this document or any of the information contained herein for other than the specific purpose for which it was disclosed is expressly prohibited except as the Crown may otherwise determine.*

- 1.3. Documents and data must be released by the supplier and submitted in native electronic format (Microsoft Word, Excel, MS Project, etc.) and in PDF format. Schedules must be submitted in Microsoft Project format (or equivalent) and PDF format.

#### 2. DELIVERY METHODS:

- 2.1. The method of document and data submission and receipt will be coordinated by CSA and the Contractor:
  - 2.1.1. Documents and data may be delivered via
    - a. e-mail attachments;
    - b. direct transfer (FTP);
    - c. retrieval from the Contractor’s repository, once CSA has received a notification of the document’s release and its location in the repository; or
    - d. DVD or CD-ROM media.
  - 2.1.2. Electronic documents and data or notifications of their availability must be sent to the CSA CM Receipt Desk: [CM\\_Receipt@asc-csa.gc.ca](mailto:CM_Receipt@asc-csa.gc.ca)

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- 2.1.3. If deliverables contain ITAR content, notifications of their availability on Contractor repositories must be sent to: [CSA-CM-ITAR@asc-csa.gc.ca](mailto:CSA-CM-ITAR@asc-csa.gc.ca)
- 2.1.4. Emails are to contain:
- a. in the "Subject" line, the MFSP acronym and the CDRL number.
  - b. in the email text:
    - 1) Document Number & Title;
    - 2) Document Revision;
    - 3) CDRL Identifier;
    - 4) Security Designation of the contents. Indicate if contents are subject to ITAR, when applicable.
- 2.1.5. Media or hard copy deliverables are to be addressed to:
- CM Library, 6A-100  
Attention: CSA <<Project Name>> Project  
Canadian Space Agency  
6767, Route de l'Aéroport  
Saint-Hubert, QC, J3Y 8Y9  
CANADA
- 2.1.6. The DVD/CD-ROM labels must include the following information:
- a. Contractor Name
  - b. Contractor CAGE Code
  - c. Document Title
  - d. Document Number
  - e. Document Revision
  - f. Document Release Date
  - g. Contract Number
  - h. CDRL Identifier
  - i. Security Designation of the contents. Indicate if contents are subject to ITAR, when applicable.
- 2.1.7. Media or hard copy deliverables containing classified information, protected information or ITAR information are to be in compliance with the Canadian Government Security Policy, Access to Information Act and the Privacy Act.

## **DID-0001 - Project Management Plan**

### **PURPOSE:**

The Project Management Plan (PMP) is used to guide both project execution and project control.

The PMP is used by the Government to assess the adequacy of the Contractor's plan for management of the work and to provide a basis on which to monitor and assess the progress of the work.

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### **PREPARATION INSTRUCTIONS:**

The PMP is used to:

- Guide the project execution;
- Document project planning assumptions;
- Document project planning decisions regarding alternatives chosen;
- Facilitate communications amongst shareholders;
- Define key management reviews as to content, extent and timing; and
- Provide a baseline for progress measurement and project control.

When the Contract has specified delivery of another document that contains aspects of the required information, the PMP should summarize these aspects and refer to the other document.

The PMP must contain the following information, as a minimum:

#### **1. Introduction**

- a) Project Objectives;
- b) Scope of the Plan; and
- c) Applicable and Reference Documents.

#### **2. Project Integration Management**

This section must describe the processes planned to be used to ensure that the various elements of the project are properly coordinated. It must describe:

- a) The overall project management strategy, including the subcontractor roles and responsibilities;
- b) How the plan will be executed; and
- c) Overall change control mechanisms.

#### **3. Project Scope Management**

This section must describe the processes planned to be used to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It must address:

- a) Initiation;
- b) Scope Planning;
- c) Scope Definition;

- d) Scope Verification; and
- e) Scope Change Control.

#### **4. Project Time Management**

This section must describe the processes planned to be used to ensure timely completion of the project. It must address:

- a) Activity Definition;
- b) Activity Sequencing;
- c) Activity Duration Estimating
- d) Schedule Development; and
- e) Schedule Control.

This section must include the detailed project baseline schedule down to the activity level. The baseline schedule must include all elements of the WBS and must depict all linkages and dependencies.

#### **5. Project Cost Management**

This section must describe the processes planned to be used to ensure that the project is completed within the approved budget. It must address:

- a) Resource Planning;
- b) Cost Estimating;
- c) Cost Budgeting; and
- d) Cost Control.

#### **6. Project Quality Management**

This section must describe the processes planned to be used to ensure that the project will satisfy the needs for which it was undertaken. It must address:

- a) Quality Planning;
- b) Quality Assurance; and
- c) Quality Control.

#### **7. Project Human Resources Management**

This section must describe the processes planned to be used to make the most effective use of the people involved with the project. It must address:

- a) Organisational Planning;
- b) Staff Acquisition; and
- c) Team Development.

#### **8. Project Communications Management**

This section must describe the processes planned to be used to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. It must address:

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- a) Communications Planning;
- b) Information Distribution;
- c) Performance Reporting; and
- d) Administrative Closure.

**9. Project Risk Management**

This section must describe the processes planned to be used to identify, analyze and respond to projects risks. It must address:

- a) Risk Identification;
- b) Risk Quantification;
- c) Risk Response Development; and
- d) Risk Response Control.

**10. Project Procurement Management**

This section must describe the processes planned to be used to acquire goods and services ("products") from outside the Contractor's organisation. It must address:

- a) Procurement Planning;
- b) Solicitation Planning;
- c) Solicitation;
- d) Source Selection;
- e) Contract Administration; and
- f) Contract Closeout.

## **DID-0002 – WBS and Work Package Descriptions**

### **PURPOSE:**

The Work Breakdown Structure (WBS) is used for estimating resources and scheduling the work, and for reporting and controlling costs and schedule.

---

### **PREPARATION INSTRUCTIONS:**

The Contractor must provide an integrated Work Breakdown Structure (WBS) describing all the project elements that organise 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 the work covered by the WPD;
- h) Assumptions;
- i) Output & Deliverables;
- j) Issue date;
- k) Version number.

## DID-0003 – Progress Report

### PURPOSE:

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

---

### PREPARATION INSTRUCTIONS:

The Progress Report must comprise, but not limited to, the following sections:

1) *Summary of progress this month: must provide a summary of main activities accomplished during the month.*

2) *Discussion of planned activities not accomplished: must provide a summary of main activities not accomplished during the month, the reasons why and the potential impact on the project plan.*

3) *Planned work next month: must provide a summary of the planned important accomplishments for the following month, and must be limited to half a page.*

4) *Technical/Design status: must provide a summary of the status and description of the design, manufacturing, assembly, integration and testing activities accomplished during the month covering the following items, as required:*

- a) Key requirements;
- b) Major trade off studies;
- c) Design verification activities;
- d) Interface definition and development;
- e) Procurement status and issues;
- f) Major internal technical issues;
- g) Summary of waivers & Engineering Change Requests (ECRs);
- h) Problem/failure reports;

5) *Long-lead items: must describe the hardware and software long lead items (including need dates) that are required for the production of models;*

6) *Brief discussion of problems/concerns: must provide a summary of the current problems/concerns, their impact on the current plan, the plan to mitigate them and expected support from CSA to help resolve the situation.*

7) *Schedule status: must be in the form of a table showing, for each milestone, the baseline date, the planned completion date and the variance. A short narrative must provide a rationale for any variance.*

8) *Financial status: must provide an updated milestone payment schedule.*

9) *Risk posture analysis: Risk status report including previous issues resolved, status on on-going risks (changes and impacts), and identification of new risks, their impact and proposed mitigation action.*

*Each progress report must answer the following three 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.

**DID-0004 – Project Schedule****PURPOSE:**

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

---

**PREPARATION INSTRUCTIONS:**

The project schedule must be based on the WBS, in the form of a Gantt chart. The project schedule must be detailed enough to show each WBS task to be performed, and must provide the following information:

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

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 Quality Assurance activities, must be grouped separately from the groups of deliverables, and must be shown at the top of the chart. The schedule must be provided in MS project format or equivalent.

**DID-0005 – Meeting Agenda****PURPOSE:**

To clarify the purpose and content of a meeting.

---

**PREPARATION INSTRUCTIONS:**

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

**1. DOCUMENT HEADER:**

- c) Title;
- d) Type of meeting;
- e) Project title, project number, and contract number;
- f) Date, time, and place;
- g) Chairperson;
- h) Mandatory and desirable attendance; and
- i) Expected duration.

**2. DOCUMENT BODY:**

- a) Introduction, purpose, objective;
- b) Opening Remarks: CSA;
- c) Opening Remarks: Contractor;
- d) Review of previous minutes and all open action items;
- e) Project technical issues;
- f) Project management issues;
- g) Other topics;
- h) Review of newly created/closed action items, decisions, agreements and minutes; and
- i) Set or confirm dates of future meetings.

**DID-0006 – Minutes of Meetings****PURPOSE:**

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

---

**PREPARATION INSTRUCTIONS:**

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

- 1) Title page containing the following:
  - a) Title, type of meeting, date, time and duration.
  - b) Project title, project number, and contract number,
  - c) Space for signatures of the designated representatives of the Contractor, the CSA and the Public Works and Government Services Canada (PWGSC), and
  - d) Name and address of the Contractor;
- 2) Purpose and objective of the meeting;
- 3) Location;
- 4) Agenda (DID-0005 );
- 5) Summary of the discussions, decisions and agreements reached;
- 6) List of the attendees by name, position, phone numbers and e-mail addresses as appropriate;
- 7) Listing of open action items and responsibility for each action to be implemented as a result of the review;
- 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-0007 – Action Items Log****PURPOSE:**

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

---

**PREPARATION INSTRUCTIONS:**

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

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

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

**DID-0008 – Review Data Packages****PURPOSE:**

The Review Data Package is a collection of all documents to be presented by the Contractor for all formal Technical Reviews:

---

**PREPARATION INSTRUCTIONS:**

Each Review Data Package must contain the documents identified in the CDRL table in appendix A as due for that review, plus the presentations made at the meeting, the agenda, the minutes, and the AI list.

The Review Data Package must also contain a self-assessment by the Contractor with respect to the entry and exit criteria as defined in AD-03.

## **DID-0010 – End Item Data Package (EIDP)**

### **PURPOSE:**

Data to document the design, fabrication, assembly, integration and testing of the deliverable hardware.

---

### **PREPARATION INSTRUCTIONS:**

An EIDP must be prepared for each deliverable assembly. The EIDP must be delivered in electronic format with a search function or interface. Upgrade changes performed as a result of the first phase deployment must be clearly identified. The contents of the package must include, but not be limited to, the following information:

- 1) All hardware prototype and GSE including cables
- 2) As-Built data: "As-Built" hardware documentation is a compilation of items describing exactly the configuration of a fabricated serialized assembly including:
  - a) Part number and revision letter of each item
  - b) Part description (title) of each item
  - c) Electronic part reference designation
  - d) Manufacturer
  - e) Procurement specification or Source Control Drawing (SCD) number and SCD revision letter.
- 3) A complete list of the tests performed including a compilation of test data and test results for each test.
- 4) A list of open work/tests
- 5) Listing of the As-Designed drawings & parts list, with reconciliation of As-Designed vs. As-Built for any deltas between them, for each indentured line item of the end item deliverable.
- 6) A summary and copies of all deviations and waivers applicable to the deliverable items.
- 7) A one time delivery, with updates as required:
  - a) A complete and up-to-date top assembly drawing of each type of delivery.
  - b) Complete and up-to-date mechanical and electrical Interface Control Documents (ICDs) (interface drawings and specifications), for each delivery.
  - c) For electronic assemblies, a complete set of circuit schematics and circuit data sheets available for review at the Contractor's premises.
- 8) Certificate of Compliance
- 9) A summary and copies of all Class 1 Non-Conformance.

## **DID-0011 – Software End Item Data Package**

### **PURPOSE:**

Data to document the design, development, integration and testing of the deliverable software.

---

### **PREPARATION INSTRUCTIONS:**

An EIDP must be prepared for each deliverable software. The contents of the package must include, but not be limited to, the following information:

- 1) As-built product identification, including:
  - a) Identification of software release by program ID, phase, version, date, and build,
  - b) Operating system name and version,
  - c) Programming language name, compiler name, and version,
  - d) Supporting development environment name and version (if any);
- 2) Final VDD;
- 3) List all required software related documentation (under CM control), including the software design documentation, users' manuals, test procedures, scripts and test results;
- 4) All software source codes, executables, configuration and parameter files, reloadable FPGA configuration files;
- 5) All third party software; third party software must be accompanied by a license that allows the software to be archived and copied as necessary for all future CSA operations;
- 6) A list of all COTS software and computers purchased under this contract;
- 7) All COTS software purchased under this contract (original disk or file with license to CSA), GSE software etc.; and
- 8) A list of all open/closed anomalies or liens against this delivery. All flagged or major anomalies should be closed prior to the delivery.

All software must be delivered on media that is directly compatible with the delivered hardware. One set of software must be installed on the delivered hardware. A second set must be supplied on a CD-ROM or DVD disk.

## DID-0013 – Background and Foreground Intellectual Property (BIP/FIP) Disclosure Report

**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.

**PREPARATION INSTRUCTIONS:**

The Contractor must complete Table 1 for the report to be provided with the proposal (BIP). The report to be provided must include Tables 1, 2 and 3 (BIP/FIP).

**Background Intellectual Property (BIP)**

**Table 1 - Disclosure of Background Intellectual Property (BIP) brought to the project**

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

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**Foreground Intellectual Property (FIP)**

**Table 2 - Disclosure of the Foreground Intellectual Property (FIP) developed under the Contract**

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

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**Table 3 - Canada's Owned FIP Additional Information**

| <b>FIP ID #</b>  | <b>Title of FIP</b>   | <b>Aspects of FIP that are novel, useful and non obvious</b>  | <b>Limitations or drawback of the FIP</b>                                | <b>References in literature or patents pertaining to the FIP</b>  | <b>Has the FIP been prototyped, tested or demonstrated? (e.g. analytically, simulation, hardware)? Provide results</b>  | <b>Inventor(s)</b>   | <b>Was the FIP disclosed to other parties?</b>   |
|--|---|---|--|---|---|--|--|
| <i>ID# should be same as corresponding FIP element in Table2</i> | <i>Title of FIP should be same as corresponding FIP element in Table2</i> | <i>How is the FIP addressing a problem (useful) and what is thought to be novel in this solution (novel)?</i> | <i>Describe the limitations of present apparatus, product or process</i> | <i>Provide references in published literature or patents relating to the problem or subject if any.</i> | <i>Describe briefly how the process, product or apparatus performed during testing or simulation. Provide reference document # where the performance is compiled if applicable.</i> | <i>Provide name and coordinates of the person(s) who created the FIP</i> | <i>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.</i> |
|  |   |   |  |   |   |  |  |
|  |   |   |  |   |   |  |  |

**DID-0014 – Technology Readiness with TRRA Worksheets and Rollup****PURPOSE:**

The Technology Readiness and Risk Assessment (TRRA) describes in a systematic and objective fashion the technological readiness of a system for a particular spaceflight mission or environment, the criticality of the constituent technologies, and the expected degree of difficulty to achieve the remaining technology development steps.

The TRRA provides for all the Critical Technology Elements (CTE) 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.

Agreement on the appropriate PBS level and identification of the CTE is required prior to the TRRA.

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**PREPARATION INSTRUCTIONS:**

The Contractor must perform a Technology Readiness and Risk Assessment (TRRA) in accordance with the requirements of the CSA Technology Readiness and Risk Assessment Guidelines (AD-04) to formally document the system technology status.

## **DID-0017 – System Requirement Document**

### **PURPOSE:**

To define the functional, performance, environmental and other requirements for a given system, subsystem, unit, module or assembly.

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### **PREPARATION INSTRUCTIONS:**

The requirements documents must define the requirements on the subject item.

The Requirements Document must comprise a number of sections, each defining a specific set of requirements. The document must address all of the following requirement areas, as a minimum:

- 1) Functional Requirements;
- 2) Performance Requirements;
- 3) External Interface Requirements (unless done in a separate document);
- 4) Design Requirements;
- 5) Construction Requirements;
- 6) Qualification and/or Verification Requirements;
- 7) Packaging Requirements, if any;
- 8) External Stowage Requirements, if any;
- 9) Operational Requirements, if any;
- 10) Ground Support Equipment Requirements, if any (unless done in a separate document); and
- 11) Other applicable requirements types.

Environmental requirements should address the following, as appropriate:

- 1) Environmental test factors;
- 2) Environmental Design and Test Requirements:
  - a) Structural/Mechanical Design Requirements;
  - b) Electrostatic and EMC Design requirements;
  - c) Transport and Ground Environments.

Requirements must conform to the following standards for quality:

- a) They must be unambiguously clear to the intended readership;
- b) Each requirement must have a unique identifier (e.g. An id number or paragraph number);
- c) They must not define design solutions;

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- d) They must be verifiable, preferably by tests or demonstrations;
- e) They must specify the conditions under which they apply; and
- f) Performance requirements must be quantified.

Requirements documents must cite applicable standards and parent requirements, and must make clear the priority sequence of the applicable documents.

## **DID-0018 – Design Document**

### **PURPOSE:**

To describe the features and capabilities of the item as designed. The item could be a system or subsystem.

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### **PREPARATION INSTRUCTIONS:**

The Design Document acts as an “answer” to the Requirements Document for the system or subsystem: the requirements state what is needed, and the Design Document describes what is provided to meet these needs. The Design Document serves as the main reference text for users after delivery of the item, describing the full range of performance and functional capabilities of the item, as verified during the test/verification program.<sup>1</sup>

Each document must contain, as a minimum:

- 1) Scope:
  - a) System Overview
  - b) Document Overview
- 2) System Design:
  - a) Functional Block Diagram
  - b) External Interfaces
  - c) Subsystems descriptions
  - d) Internal Interfaces
  - e) Functional description
- 3) Mechanical description
- 4) Electrical description
- 5) Operating modes and states
- 6) Environmental considerations derived from the environment requirements as specified in this SOW.
- 7) Acronyms

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

## **DID-0019 – Verification Plan**

### **PURPOSE:**

The verification process is defined by the Verification Plan. The plan also defines the planning policies, methods of controls, and organizational responsibilities. From the Verification Plan, the verification procedures are developed. The procedures provide the instruction, including configurations, constraints, and prerequisites, for obtaining data that show compliance with the requirements.

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### **PREPARATION INSTRUCTIONS:**

The Verification Plan must:

- 1) define the verification activities that will prove that the system and subsystems meet the all the imposed requirements including functional, performance, interface, environmental, etc.,
- 2) define all verification activities at each phase of the project, including test, analysis, and inspection,
- 3) describe the methods and techniques to be used to measure, evaluate, and verify the system. This is to include characterization of the system behaviour that is not controlled by requirements but is important for understanding of the system, and establishing the actual values of parameters that exceed requirements,
- 4) use an appropriate combination of simulation and analytical tools, mock-ups, laboratory models, engineering models and prototype models,
- 5) define the requirements for supporting facilities, analysis tools and test equipment, both existing and needing to be constructed, including:
  - a) the specific equipment and materials needed;
  - b) the configuration of the equipment to be used;
  - c) the location in which it is to be used;
- 6) define the schedule for verification activities.

For each defined test and analysis activity, the plan must contain:

- 1) a description of the activity;
- 2) the objective, including requirements to be verified;
- 3) supporting hardware and software;
- 4) assumptions and constraints that apply to the activity;
- 5) plans to install, setup, and maintain items in the test or analysis environment;
- 6) a description of the data recording, reduction, and analysis activities to be carried out during and after the activity.

## **VERIFICATION METHODS DEFINITIONS**

The verification program must be accomplished by employing one or more of the methods described in the following sub-sections.

### **Test**

Verification by test is the actual operation of the system, in clearly defined environmental conditions, to evaluate its performance.

### **Functional Tests**

Functional testing is an individual test or series of electrical or mechanical performance test(s) conducted on the system's hardware and/or software at conditions equal to or less than design specifications. Its purpose is to establish that the system performs satisfactorily in accordance with design and performance specifications. Functional testing is generally performed at ambient conditions. Functional testing is performed before and after each environmental test or major move in order to verify system performance prior to the next test/operation.

### **Environmental Tests**

Environmental testing is an individual or series of test(s) conducted on the system's hardware to ensure that the platform hardware must perform satisfactorily in an analog environment. Examples of environmental tests are vibration, acoustic, thermal, vacuum and EMC. Environmental testing may or may not be combined with functional testing depending on the objectives of the test.

### **Analysis**

Verification by analysis is a process used in lieu of, or in addition to, testing to verify compliance to specification requirements. (e.g. stress, thermal, materials). The selected techniques may include systems engineering analysis (structural, environmental, electrical, etc.), statistics and qualitative analysis, computer and hardware simulations, and analog modelling.

Analysis may be used when it can be determined that:

- a) Rigorous and accurate analysis is possible;
- b) Test is not feasible or cost-effective;
- c) Similarity is not applicable; and
- d) Verification by inspection is not adequate.

## Demonstration

Verification by demonstration is the use of actual demonstration techniques in conjunction with requirements such as serviceability, accessibility, transportability and human engineering features. In general, demonstration is specified as the method of verification for physical attributes which have no numerical requirements associated with them. This includes qualitative features such as comfort, accessibility, suitability and adequacy. Demonstration may also be specified for presence or compatibility of shipping containers, handling fixtures, etc.

## Inspection

Verification by inspection is the physical evaluation of equipment and associated documentation to verify design features. Inspection is used to verify construction features, workmanship, dimensions and physical condition, such as cleanliness, surface finish and locking hardware. Often inspections are conducted in conjunction with a test or as part of assembly operations documented by manufacturing instructions (MIS).

## Validation of Records

Validation of records is the process of using manufacturing records at end-item acceptance to verify construction features and processes for the system hardware. Verification of records is specified whenever it is necessary to compare two or more documents to each other in order to assess compliance with a requirement. Common examples of the way verification of records is used include:

- a) Examining drawings for features required by specifications;
- b) Examining parts lists for ESD sensitive components;
- c) Comparing two or more drawings to assess a mechanical interface;
- d) Checking personnel records for proper training;
- e) Checking facilities records for environmental exposure;
- f) Examining vendor data supplied with parts or materials; and
- g) Verification that analyses meet safety specifications.

## Similarity

Verification by similarity is the process of assessing by review of prior test data or hardware configuration and applications that the article is similar or identical in design and manufacturing process to another article that has previously been qualified to equivalent or more stringent specifications.

## Review of Design Documentation

Verification by review of design documentation is the process of reviewing the design against the requirements, which as stated may or may not contain specifics to be met by a test, analysis, etc. but must be present in the design. This method is used during the preliminary design and critical design reviews of the development phase.

## **DID-0020 – Verification and Compliance Matrices**

### **PURPOSE:**

The Verification and Compliance Matrix shows the details of the compliance of the system and the verification thereof through the life of the project with respect to each system requirement. It is a living document that is updated at each review with new data. The matrix is tightly coupled with the Verification Plan because it provides the detailed linkage of verification activities to the specific requirements they address. However, it is a separate document from the Verification Plan.

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### **PREPARATION INSTRUCTIONS:**

The Requirements Verification and Compliance Matrices must contain, for each requirement:

- 1) The requirement document number and requirement identifier;
- 2) The requirement description;
- 3) Other relevant requirement references;
- 4) Verification method. For the verification methods definition refer to DID 0019;
- 5) Requirement compliance based on verification data presented at the current phase;
- 6) For quantitative requirements, the actual predicted or achieved performance and the margin over the requirement, including statistical analysis when applicable;
- 7) Link to the verification data that justifies the compliance and the quantitative value (document, page and paragraph);
- 8) Comments, for example on plans to rectify non-compliances.

**DID-0021 – Test Plan****PURPOSE:**

To describe the formal qualification end-to-end test plans for the system, to identify and describe the individual tests that must be performed during validation, and to identify the test resources required.

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**PREPARATION INSTRUCTIONS:****1. SCOPE**

This DID establishes the content, format, and submittal requirements for all test activities. The Contractor must describe the nature and extent of the specific tests proposed for each unit, in accordance with SOW requirements, and as per the Verification Plan.

**2. CONTENTS**

The Test Plan (TP) may be prepared in the Contractor's format and must, contain the following information, as a minimum:

**2.1. General**

- 1) Identification number, title, and brief overview of the system to which the TP applies;
- 2) A description of the relationship of this plan to other project management plans;
- 3) Identification and description of general test requirements applicable to all system tests or group of system tests; and
- 4) A schedule of tests.

**2.2. Test-specific**

- 1) Description of each test to be conducted on the system including:
  - a. Test objective;
  - b. Qualification method as specified in the SRD or ICD or
  - c. Reference to the corresponding SRD or ICD requirement;
  - d. Identification and type of data to be recorded, and
  - e. All assumptions and constraints associated with each test;
- 2) Identification and description of all hardware and software items required to perform validation testing, including identification of the proprietary nature and Government rights associated with each item;
- 3) A description of plans to install, setup, and maintain items in the system test environment; and
- 4) A description of the data recording, reduction, and analysis activities to be carried out during and after system tests.

## **DID-0022 – Test Procedure**

### **PURPOSE:**

To define the procedure to be followed for each test to be performed.

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### **PREPARATION INSTRUCTIONS:**

This DID is applicable to systems, hardware and software.

The test procedures must contain the following information, as a minimum:

#### **1. Scope**

This section must include a brief description of the test and the objectives of the test.

#### **2. Test Requirements**

This section must define the measurements and evaluations to be performed by the test.

#### **3. Test Article**

This section must define in detail the test article configuration that is to be tested.

#### **4. Test Facilities**

This section must identify the test facilities to be used, including their physical location, coordinates and contact points.

#### **5. Participants Required**

This section must provide a listing of the individuals (position titles, trade or profession) required to conduct or witness the test.

#### **6. Test Set-up and Conditions**

This section must include description/sketches of test articles in test configuration illustrating all interfacing test/support equipment. Instrumentation/functional logic must be shown where applicable. The section must include any environmental and cleanliness requirements.

#### **7. Instrumentation, Test Equipment and Test Software**

This section must provide a listing of the instrumentation, test equipment and software that is to be used during the test.

#### **8. Procedure**

This section must define the step-by-step procedure to be followed, starting with the inspection of the test article, and describing the conduct of the test up to and including post-test inspection. Each test activity must be defined in sequence and task-by-task, including test levels to be used and measurements/recordings to be made. It must include any necessary malfunction and abort procedure.

#### **9. Data Analysis**

This section must define the methods to be used in the analysis of the results, along with the uncertainty range in the results. Data presentation format must be defined.

**10. Acceptance/Rejection Criteria Table**

This section must provide data sheets needed during execution of the test specifying acceptance/rejection criteria, including identification of the associated requirements from the Requirements Documents or Specifications. These sheets will be in a tabular form allowing columns for measured values and deviations to be recorded. A computer printout generated by test software is acceptable provided it supplies the same information; however the test criteria must be stated in the Test Procedure.

## DID-0023 – Test Report

### **PURPOSE:**

To document the results of all tests done on a hardware unit or software CSCI.

### **PREPARATION INSTRUCTIONS:**

This DID is applicable to systems, hardware and software.

The test report must document all tests performed to verify that the unit or software will meet the functional and operational requirements specified in the Requirements Documents or Specifications applicable to the unit.

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

#### **1. Applicable Documents**

This section must include test procedures and system requirements/specifications being tested.

#### **2. Test Article or System Under Test:**

This section must define in detail the test article configuration tested.

#### **3. Purpose:**

This section must describe the purpose of the test and the specific requirements/specifications that it is intended to verify.

#### **4. Summary of Test Results**

This section must present a summary of test results, including non-conformances, where applicable.

#### **5. Test Facilities**

This section must identify the test facilities used, including their physical location, coordinates and contact points.

#### **6. Test Set-up and Conditions:**

This section must include descriptions/photos/sketches of test articles in test configuration illustrating all interfacing test/support equipment. Instrumentation/functional logic must be shown where applicable. The section must describe the environmental and cleanliness conditions present, as well as operating conditions (e.g. supply voltage).

#### **7. Instrumentation, Test Equipment and Test Software:**

This section must provide a listing of the instrumentation, test equipment and software used during the test.

#### **8. Detailed Test Results:**

This section must record actual test data obtained on tabular sheets prepared in the Test Procedure (or software-generated) during the test performance, and deviations from the criteria.

#### **9. Test Data Analysis:**

This section must document analyses required to relate the detailed results to the requirements to be verified.

**10. Non-conformances:**

This section will provide all Non-Conformance Reports generated during the tests. The Non-Conformance Reports will be dated and stipulate the latest dispositions.

**11. Conclusions and Recommendations:**

This section must identify deficiencies, limitations or constraints and propose alternative design solutions to be evaluated in order to resolve problems encountered in testing.

## **DID-0024 – Operating Procedures and Users Guide**

### **PURPOSE:**

To provide detailed step-by-step procedures and guidance for the operation of the system in a comprehensive and useful user manual, supporting the familiarization of Crew, Pls, and any other personnel involved with the regular use, maintenance, repair or disposal of the in-flight System.

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### **PREPARATION INSTRUCTIONS:**

#### **General Requirements**

The Operating Procedures and Users Guide must be provided in Microsoft Word. Drawings and pictures must be included in these Word documents, not in separate documents.

The Operating Procedures and Users Guide must contain an appendix that analyses End-to-End Operations Workflow, including the real-time operations as well as the offline pre-and post-missions analysis work and the operator training process, including training session preparation, execution and the use of tools to evaluate operator performance and achieve their certification.

The Users' Guide(s) must contain the following information:

- 1) Introduction
- 2) Purpose and scope
- 3) Reference documentation
- 4) Overall System Description
- 5) Detailed System Description
- 6) Description and principles of operation, including configuration for:
  - a. Transportation
  - b. Deployments (if different)
- 7) Assembly procedure:
  - a. Mechanical Interfaces (including cooling/heating connections)
  - b. Electrical Interfaces
  - c. Command and Data Handling (C&DH) Interfaces
- 8) Disassembly procedure
- 9) Operational modes
- 10) Operational procedures (philosophy and detailed instructions):
  - a. Identification of all operations for which the system was designed
  - b. Specification of all constraints pertinent to each procedure, with references to technical documents for justification
  - c. Power On/Off and initiation of the software and termination of system operation

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- d. Calibration
- e. Routine operating procedures
- f. Monitoring of the operation of the system including: fault identification, evaluation, and conditions requiring computer shutdown
- g. Detection, analysis and correction of anomalous behaviour
- h. References to baseline configuration database for each parameter used in each procedure
- i. Operating rules

## 11) C&amp;DH Procedures

- a. Methods of commanding the system and/or experiment (computer, manual, other)
- b. Methods of collecting and disposing of H&S data
- c. A listing of all available commands with a description and any expected feedback

## 12) Software User Procedure (philosophy and detailed instructions):

- a. information and user instructions necessary for user interaction with the CSCI(s) including:
  - (1) step-by-step operating procedures, including the use of all pre and post missions analyses tools, and operator training, evaluation and certification tools,
  - (2) identification of all options available to the user,
  - (3) initialization procedures,
  - (4) required user inputs and options,
  - (5) identification and description of system inputs and effects on user interface,
  - (6) termination methods and indicators,
  - (7) restart procedures, and
  - (8) expected outputs.
- b. a listing of all error messages including definition and action to be taken.
- c. Installation instructions

## 13) Maintenance Procedures and Troubleshooting (philosophy and detailed instructions):

- a. Recovery from faults or interrupts including restart and the collection of information concerning the fault
- b. Description of diagnostic features available to the operator of the system including: available tools, and step-by-step diagnostic procedures
- c. Trouble-shooting table
- d. Periodic maintenance required, including tasks and frequencies
- e. Test equipment and special tools required

## 14) Repair Procedures (philosophy and detailed instructions)

## 15) Disposal Procedures (philosophy and detailed instructions)

- 16) Detailed Mechanical Drawings.
- 17) Detailed Electrical Drawings.
- 18) Detailed Software Description.
- 19) Complete Drawing list.
- 20) Complete Parts List.

### **Operational Data Base**

The Operational Data Base (ODB) must contain definitions for the following data:

- 1) Telemetry database format;
- 2) Telecommand database format;
- 3) System Baseline Configuration:
  - a. Definition of all parameters determining on-board database configuration at any time, including conversions and constraints, as installed in real-time, planning, and analysis platforms;
- 4) Remote Control Station (RCS) Baseline Configuration:
  - a. Definition of all parameters determining the RCS database configuration at any time, including conversions and constraints;
  - b. Values of all system related parameters in the ODB pertinent to procedure execution and on-board system maintenance;
  - c. Constraints on telemetry values for status and health verification; and
  - d. Software configuration status for the system and the RCS.

## **DID-0025 – CAD Models & Analyses**

### **PURPOSE:**

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

### **PREPARATION INSTRUCTIONS:**

All CAD models developed must be delivered:

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

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 designs made up of a large number of CAD models, a drawing tree or indented drawing list or equivalent shall be provided to facilitate review of design. For generic modeling and analyses that don't use a specialty tool, CSA will accept Matlab, Excel and MathCad format data. Where a highly specialized tool is used, the delivery format must be negotiated with the TA. Translation from the Contractor's tool to the required format is only acceptable where the results can be repeated in CSA's tool. Translation that corrupts the model, loses data, or produces data that is interpreted differently, is not acceptable.

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

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

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

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

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

## DID-0026 – Software Development Plan

### PURPOSE:

To describe the management and technical approaches that govern the software development process. It describes what products and materials are received and delivered, how requirements are determined, and important aspects of the provider's relationship with the customer. It applies to whole system software or to the software used in any constituent subsystem.

Software includes all software and firmware (*software embedded in hardware*) to be developed, acquired, or incorporated into the system.

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### PREPARATION INSTRUCTIONS:

The Software Development Plan must cover all deliverable software. The Software Development Plan must address the following:

Brief project overview

Brief functional characterization of the product and identification of project software life-cycle phases, milestones, and deliverables

A WBS for organizing and managing the development of software products consistent with the higher-level WBS

Organisational structure, boundaries and interfaces

Project staffing and assignment of roles and responsibilities

Technical approach to the following activities:

- a) Articulation and elaboration of software requirements;
- b) Design and implementation of the product (including the development environment, tools, methodology and standards);
- c) Adaptation of inherited software, including the verification of functionality and the definition of necessary modifications;
- d) Identification of work products to be verified and verification methods to be used;
- e) Integration and test, including design, acquisition, and validation of test environment;
- f) Review of the intermediate work products, including detailed technical review;
- g) Delivery and operations support;
- h) Configuration management of build process, code, documentation, and other work products.

Approach to managing the software development risk.

An implementation schedule at a level of detail that facilitates tracking the progress.

Approach to the development, review, approval, release, revision, and control of documentation.

Identification of documents applicable to the software plan and their relationship (document tree).

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Approach to monitoring development progress, utilizing product and process metrics.

Approach to identifying, managing and verifying safety critical software.

## **DID-0027 – Software Version Description Document (VDD)**

### **PURPOSE:**

To identify the contents of a software Configuration Software Configuration Item (CSCI) release and to record the details of all aspects of the system, support software and hardware required to regenerate this CSCI.

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### **PREPARATION INSTRUCTIONS:**

The VDD must contain the following information, as a minimum:

- 1) Version Description
  - a) Inventory
    - a. CSCI Source File Listing
    - b. Documentation. This section must list all relevant documents revisions associated with this build version (requirements, ICDs,...)
  - b) Changes Incorporated. This section must list all new functionalities that were added, and/or all problems that were corrected in this version. A list of all modified and created files with the rationale must be included.
- 2 ) Version Description - Support Items
  - a) Hardware Tools
  - b) Development Platform Hardware Requirements
  - c) Software Tools
  - d) Build Procedures and Development Environment Setup Information. The procedure must provide step-by-step actions with screen shots whereas appropriate to document the complete build process.
  - e) Installation Procedures
  - f) Validation Test Scripts, Data and Results
- 3) Known Errors and Possible Problems
- 4) Notes

## **DID-0028 – Phase E Logistic and Sustaining Engineering Plan**

### **PURPOSE:**

To describe the approach, timing and detailed pricing for ground and in-flight operation, maintenance, repair and disposal, with the goal of providing planning information for the operations phase.

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### **PREPARATION INSTRUCTIONS:**

The plan must address the following:

1. For the ground and in-flight operations:
  - a) Support for the regular CSA-led Canadian investigations (up to 2/year for 5 years), as well as for international partner's investigations (up to 2/year for 5 years).
  - b) Contribution to NASA required documentation.
  - c) Contractor provides training or updated training material to the Crew and CSA operator so that they know how to operate the System on-orbit and on ground.
  - d) Contractor provides all investigation ground and in-flight hardware/software and the personnel required to support these investigations. This includes hardware/software and personnel support to the EQM and the GM operations on the ground, as well as to support development/test of protocols and ensure that Baseline Data Collection (BDC) is done on the Crew, if required, before and after their flight on the ISS. Science consumable kit will be provided by the investigation.
  - e) For each investigation, the cost of hardware/software launch itself is covered by CSA or the related ISS international partner.
  - f) Each investigation procedure is a joint development by CSA, the NRC, the investigation PI and the Contractor.
  - g) Support for In-flight operations preparations (e.g. checkout or commissioning of newly developed cartridges).
  - h) Live support of in-flight operations, on-console at CSA on a request basis or on-call over the phone.
  - i) Health & status data monitoring and analysis for maintenance purposes.
  - j) Investigation's operations issues debugging until completed.
  - k) Separate estimates for training a third party in providing all the above support services.
  
2. For the ground and in-flight maintenance, repair and disposal:
  - a) This is for the regular maintenance (as defined by the Contractor) and repairs (on an as-needed basis) for a minimum of 5 years of regular operations.
  - b) Contribution to NASA documentation required.

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- c) Contractor provides all maintenance/repair/disposal to hardware/software and the personnel required to support these activities. This includes hardware/software and personnel support to the EQM and the GM maintenance/repair/disposal on the ground.
- d) For each maintenance/repair, the cost of hardware/software launch itself is covered by CSA.
- e) Each maintenance/repair procedure is a joint development by CSA, the NRC and the Contractor.
- f) Support for In-flight operations preparations (i.e. procedures, steps, etc...).
- g) Live support of in-flight maintenance, software updates, repairs and disposal, on-console at CSA.
- h) FM and GM systems monitoring through health and status data analysis and trending.
- i) Each maintenance/software update/repair data analysis.
- j) Maintenance/software update/repair issues debugging until completed.
- k) Separate estimates for training a third party in providing all the above support services.

## **DID-0029 - Product Assurance Implementation Plan (PAIP)**

### **PURPOSE**

The Product Assurance Implementation Plan (PAIP) describes the Product Assurance organisation, objectives, and activities planned for the project. The PAIP provides the Government with insight into the Contractor's PA organisation, tasks, and activities and allows the Government to assess compliance with the governing PA requirements specified in CSA-MFSP-RD-0002, CSA Life Sciences Research System Product Assurance Requirements for MFSP.

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### **PREPARATION INSTRUCTIONS**

#### **General Requirements**

The PAIP must, as a minimum, provide the following information as well as the processes to meet the requirements of CSA-MFSP-RD-0002:

- 1) An overview of the objectives to be achieved by the plan;
  - 2) Identification of the organisations in the company responsible for applying the provisions of the PAIP: organisational structure, relationships to other organisations within the project and company as with personnel identification and required skill levels;
  - 3) PA plans for monitoring the different phases of the program development, for problem reporting and for ensuring corrective actions are taken;
  - 4) Frequency, format, and content of reports submitted by PA to program management to report program progress as well as problems, risks, and proposed solutions;
  - 5) A list of applicable general standards and practices which will be followed in the implementation of the plan;
  - 6) A list of applicable in-house PA procedures, as well as PA procedures specific to the project and/or applicable to all project participants, with cross-reference to the compliance matrix below;
  - 7) A compliance matrix testifying to the compliance with the requirements of CSA-MFSP-RD-0002 which clearly states for each requirement whether the Contractor intends to comply with the requirement and rationale for partial or non-compliance.
  - 8) A Parts, Materials and Processes Control Plan that describe the approach, methods, procedures and organisation that will be implemented to assure compliance to the parts/materials/processes program requirements of the CSA-MFSP-RD-0002.
  - 9) Details on how government rights to access the premises and the program data will be implemented by the Contractor;
  - 10) Detail objectives and tasks to be performed to ensure reliability and availability requirements are adequately implemented.
  - 11) Detail the plan and tasks to be performed to ensure that Configuration and Data Management (CADM) is carried out according to the CADM requirements in CSA-MFSP-RD-0002.
  - 12) Detail plans for the implementation of the Safety Program and how the program will ensure compliance to the safety requirements of CSA-MFSP-RD-0002.
-

## **DID-0030 – Non-Conformance Reports**

### **PURPOSE:**

This DID contains the content preparation instruction for Non-Conformance Reports (NCRs) generated under the work described in this SOW.

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### **PREPARATION INSTRUCTIONS:**

The NCRs must contain the following information, as a minimum:

1. Originator;
2. Date;
3. Part Number of discrepant item;
4. Description;
5. Operation or test phase during which the discrepancy was observed;
6. Effectivity (SN or Lot number);
7. Description of Non-conformance;
8. Disposition;
9. NCR Board meeting minutes with attendees list;
10. Attachments required to support the disposition;
11. Root cause and corrective action;
12. Verification performed to closeout non-conformance;
13. Closeout summary report or statement;
14. NCR Board approval.

## ISS MFSP Platform SOW

**DID-0031 – Request for Deviation / Waiver****PURPOSE:**

A Request for Deviation/Waiver must be submitted for non-compliances to the program requirements and/or for equipment performance Class I non-compliances.

**PREPARATION INSTRUCTIONS:**

A Request for Deviation (RFD) or Request for Waiver (RFW) must contain the following information, as a minimum:

| ID  | Data                                       | Description  | Deviation | Waiver |
|---|--|--|-----------|--------|
| <b>RFD/RFW Identification</b>                                 |  |  |           |        |
| 1.  | Organization                               | Identification of the organization originating the RFD/RFW   | X         | X      |
| 2.  | Number                                     | Unique identification and register number  | X         | X      |
| 3.  | Revision                                   | Revision status of the RFD/RFW   | X         | X      |
| 4.  | Date                                       | Issue date of the RFD/RFW  | X         | X      |
| 5.  | Classification                             | Classification (i.e. major or minor)   | X         | X      |
| 6.  | Project                                    | Project under which the nonconforming item is supplied   | X         | X      |
| 7.  | Business agreement/<br>contract identifier | Business agreement / contract identification under which the nonconforming item is supplied (if applicable)  | X         | X      |
| 8.  | Order                                      | Order number under which the nonconforming item is supplied (if applicable)  | X         | X      |
| 9.  | Originator site                            | Location of the request for deviation originator (if applicable)   | X         | X      |
| <b>Identification of Affected Item and Affected Documents</b> |  |  |           |        |
| 1.  | Item designation                           | Identification of the nonconforming item per name, manufacturer, part number and serial number (for a waiver), according to its configuration item data list | X         | X      |
| 2.  | Affected item(s)                           | Identification of the CI(s) (number and name) affected by the deviation of waiver  | X         | X      |

## ISS MFSP Platform SOW

| ID   | Data                         | Description  | Deviation | Waiver |
|--|------------------------------|--|-----------|--------|
| 3.   | Effectivity                  | Model or serial number (or batch / lot number) of the deviating or non-conforming item   | X         | X      |
| 4.   | Affected document(s)         | Identification of the document(s) (specification, design drawing, etc.) to which the item does not conform (document number and revision/issue, paragraph or requirement ID)   | X         | X      |
| 5.   | Short description            | Title or short description of the RFD/RFW (consistent with the title of the related non-conformance report)  | X         | X      |
| 6.   | Detailed description         | Description of the deviation from the relevant requirement or design feature. / Description of the non-conformity, supported by sketches and attachments as appropriate. Include information on the origin of the deviation/waiver (design difficulties, non-conformance observed, procurement difficulties, ambiguous specifications, schedule constraints, etc.) | X         | X      |
| 7.   | Non-conformance Report       | Identification number of the Non-conformance Report related to the request for waiver  |           | X      |
| 8.   | NCRB                         | Identification of the minutes of meeting of the NCRB which decided to raise the RFW  |           | X      |
| <b>Technical and Programmatic Impact Assessment and Decision</b> |                              |  |           |        |
| 1.   | Impact Assessment            | Impact on cost, schedule, functionality, performance, reliability and safety   | X         | X      |
| 2.   | Consequences of non-approval | Project impact if the deviation/waiver is not approved (cost and schedule)   | X         | X      |
| 3.   | Rationale for acceptance     | Reason why the proposed deviation/non-conformity can be accepted (supporting analyses, drawings, etc.)   | X         | X      |
| 4.   | Adverse effects              | Item characteristics affected by the deviation or non-conformity   | X         | X      |
| 5.   | Limitation of use            | Regarding the intended use   |           | X      |
| 6.   | Approval                     | Decision (Approval or Disapproval), names, date and signatures of the relevant authorities (Project Manager, Systems Manager, S&MA Manager)  | X         | X      |

## **DID-0032 – Interface Requirements Documents (IRD)**

### **PURPOSE:**

To define requirements on each of the two or more nodes sharing an interface to ensure that when connected physically or virtually they are compatible and together achieve their combined functions. The IRD serves as the parent for the Interface Control Document.

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### **PREPARATION INSTRUCTIONS:**

Interface requirements typically cover the following interface characteristics:

- 1) Electrical: power supply levels and consumption digital and analogue signals, EMC;
- 2) Mechanical: loads, attachment locations, attachment methods, volume constraints;
- 3) Thermal transmission: heat loads and lifts, radiative properties, especially for enclosures;
- 4) Data: data to passed and standards, including NASA C&DH requirements;
- 5) Synchronization: timing and delay requirements;

All requirements applicable at the interface between the subject items must be documented. Requirements documents must define the requirements on the subject item (segment, subsystem, etc.) as a whole and must not contain specific requirements on sub-items. All requirements must be testable on the item as integrated. Requirements must conform to Systems Engineering standards for quality.

## ISS MFSP Platform SOW

**D ACRONYMS**

|         |  |
|---------|--|
| AIL     | Action Item Log  |
| AO      | Announcement of Opportunity                              |
| AR      | Acceptance Review  |
| BDC     | Baseline Data Collection                                 |
| BIP     | Background Intellectual Property                         |
| BOM     | Bill of Material   |
| CAD     | Computer Aided Design                                    |
| CADM    | Configuration and Data Management                        |
| C&DH    | Commanding and Data Handling                             |
| CDR     | Critical Design Review                                   |
| CDRL    | Contract Data Requirements List                          |
| CoFR    | Certification of Flight Readiness                        |
| COTS    | Commercial-Off-The-Shelf                                 |
| CR      | Commissioning Review                                     |
| CSA     | Canadian Space Agency                                    |
| CSCI    | Computer Software Contractual Item                       |
| CSSP    | Canadian Space Station Program                           |
| CTB     | Cargo Transfer Bag                                       |
| CTE     | Critical Technology Element                              |
| DID     | Data Item Description                                    |
| DM      | Development Model  |
| DNA     | Deoxyribonucleic Acid                                    |
| EEE     | Electrical Electromechanical Electronic                  |
| EM      | Engineering Model  |
| EoC     | End of Contract  |
| EMI/EMC | Electromagnetic Interference/Compatibility               |
| EQM     | Engineering and Qualification Model                      |
| EXPRESS | Expedite the Processing of Experiments for Space Station |
| FEU     | Flight Equivalent Unit                                   |
| FIP     | Foreground Intellectual Property                         |
| FM      | Flight Model   |
| FMECA   | Failure Modes Effect and Critical Assessment             |
| FPGA    | Field Programmable Gate Array                            |

## ISS MFSP Platform SOW

|       |   |
|-------|---|
| FRR   | Flight Readiness Review                           |
| FSDP  | Flight Safety Data Package                        |
| FSR   | Flight Safety Review                              |
| GCTS  | Ground Commanding and Telemetry Station           |
| GFI   | Government Furnished Information                  |
| GFM   | Government Furnished Material                     |
| GM    | Ground Model                                      |
| GoC   | Government of Canada                              |
| GSE   | Ground Support Equipment                          |
| HERO  | Human Exploration Research Opportunities          |
| HFIT  | Human Factor Interface Team                       |
| HMST  | Hazardous Materials Summary Tables                |
| HOSC  | Huntsville Operations Support Center              |
| ICD   | Interface Control Document                        |
| IDR   | Interface Definition Review                       |
| IHS   | ISS Hazard System                                 |
| IPLAT | ISS Program Label Assessment Team                 |
| ILSRA | International Life Science Research Announcements |
| IP    | International Partner                             |
| IP    | Intellectual Property                             |
| IPLAT | ISS Program Label Assessment Team                 |
| ICD   | Interface Control Drawing                         |
| IDR   | Interface Definition Review                       |
| IRB   | Interface Requirements Baseline                   |
| IRD   | Interface Requirements Document                   |
| ISS   | International Space Station                       |
| ITAR  | International Traffic in Arms Regulations         |
| JSC   | Johnson Space Center                              |
| KOM   | Kick Off Meeting                                  |
| KPP   | Key Performance Parameters                        |
| L&SE  | Logistic and Sustaining Engineering               |
| LSRS  | Life Science Research Systems                     |
| MDL   | Middeck Locker                                    |
| MIUL  | Material Identification Usage List                |
| MfRR  | Manufacturing Readiness Review (MfRR)             |

## ISS MFSP Platform SOW

|       |   |
|-------|---|
| MFSP  | MicroFluidic Sample Preparation               |
| MRA   | Microgravity Research Analog                  |
| MSFC  | Marshall Space Flight Center                  |
| NASA  | National Aeronautics and Space Administration |
| NRC   | National Research Council                     |
| OBT   | On-orBit Training                             |
| PA    | Product Assurance                             |
| PAR   | Product Assurance Requirements                |
| PAIP  | Product Assurance Implementation Plan         |
| PD    | Payload Developer                             |
| PDF   | Portable Document Format                      |
| PDR   | Preliminary Design Review                     |
| PEC   | Performance Evaluation Criteria               |
| PI    | Principal Investigator                        |
| PIM   | Payload Integration Manager                   |
| PIRE  | Payloads Integration Requirements Engineer    |
| PM    | Project Management                            |
| PMP   | Project Management Plan                       |
| POIC  | Payload Operations Integration Center         |
| ProRR | Production readiness Review                   |
| PSR   | Pre-Ship Review                               |
| PSRP  | Payload Safety Review Panel                   |
| PTOC  | Payload Telescience Operations Center         |
| PVT   | Payload Verification Test                     |
| PWGSC | Public Works and Government Services Canada   |
| QA    | Quality Assurance                             |
| RFD   | Request for Deviation                         |
| RFW   | Request for Waiver                            |
| RID   | Review Item Discrepancy                       |
| ROM   | Rough Order of Magnitude                      |
| SCD   | Source Control Drawing                        |
| SDP   | Software Development Plan                     |
| S&MA  | Safety and Mission Assurance                  |
| SE    | System Engineering                            |
| SI    | System International                          |

## ISS MFSP Platform SOW

|       |  |
|-------|--|
| SOW   | Statement of Work                          |
| SPR   | System Performance Report                  |
| SRD   | System Requirements Document               |
| SRR   | System Requirement Review                  |
| SSITF | Space Station Integration Testing Facility |
| SVD   | Software Version Description               |
| SVT   | Science Verification Test                  |
| SW    | Software                                   |
| TA    | Technical Authority                        |
| TPM   |  |
| TRL   | Technology Readiness Level                 |
| TRR   | Test Readiness Review                      |
| TRRA  | Technology Readiness and Risk Assessment   |
| TST   | Training Strategy Team                     |
| TreK  | Telescience Resource Kit                   |
| UUT   | Unit Under Test                            |
| VCM   | Verification Compliance Matrix             |
| VDD   | Verification Description Document          |
| VM    | Virtual Machine                            |
| VP    | Verification Plan                          |
| WBS   | Work Breakdown Structure                   |
| WP    | Work Package                               |
| WPD   | Work Package Description                   |

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**ANNEX B**

**BASIS OF PAYMENT**

**PHASE A**

**SCHEDULE OF MILESTONES**

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

| <b>Milestone No.</b> | <b>Description of Deliverable</b> | <b>Firm Amount</b> | <b>Delivery Date</b> |
|----------------------|-----------------------------------|--------------------|----------------------|
| 1                    | Specify                           |                    |                      |
| 2                    | Specify                           |                    |                      |
| 3                    | Specify                           |                    |                      |
| Etc                  |                                   |                    |                      |

**Phase A Total Firm Price \$ \_\_\_\_\_ (All taxes applicable Extra)**

**PHASE B**

**SCHEDULE OF MILESTONES**

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

| <b>Milestone No.</b> | <b>Description of Deliverable</b> | <b>Firm Amount</b> | <b>Delivery Date</b> |
|----------------------|-----------------------------------|--------------------|----------------------|
| 1                    | Specify                           |                    |                      |
| 2                    | Specify                           |                    |                      |
| 3                    | Specify                           |                    |                      |
| Etc                  |                                   |                    |                      |

**Phase B Total Firm Price \$ \_\_\_\_\_ (All taxes applicable Extra)**

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### PHASE C

#### 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 C Total Firm Price \$ \_\_\_\_\_ (All taxes applicable Extra)

### PHASE D-1 (Optional)

#### 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 D-1 Total Firm Price \$ \_\_\_\_\_ (All taxes applicable Extra)

**PHASE D-2 (Optional)**

**LIMITATION OF EXPENDITURE**

1. **LABOUR:** at the following firm hourly rates, excluding overhead and profit

| Labour Category | Estimated Hours | Firm Hourly Rate |
|-----------------|-----------------|------------------|
|                 |                 |                  |
|                 |                 |                  |
|                 |                 |                  |

Est.: \$ \_\_\_\_\_

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

3. **MATERIALS AND SUPPLIES:** at laid down cost without markup (Specify what categories of materials and supplies.) Est.: \$ \_\_\_\_\_

4. **TRAVEL AND LIVING EXPENSES:** Est.: \$ \_\_\_\_\_

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal and private vehicle expenses provided in Appendices B, C and D of the Treasury Board Travel Directive (<http://www.njc-cnm.gc.ca/directive/travel-voyage/index-eng.php>), and with the other provisions of the directive referring to "travellers", rather than those referring to "employees". All travel must have prior authorization of the Project Authority. All payments are subject to government audit.

Canada will not pay the Contractor any incidental expense allowance for authorized travel.

5. **SUBCONTRACTS:** at actual cost without markup (Identify subcontractors, if applicable.) Est.: \$ \_\_\_\_\_

6. **OTHER DIRECT CHARGES:** at actual cost without markup (Specify what categories of direct charges.) Est.: \$ \_\_\_\_\_

**Estimated Cost to a Limitation of Expenditure: \$ \_\_\_\_\_  
(Applicable Taxes extra)**

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

**ATTACHMENT 1 TO PART 2  
MANDATORY NON-DISCLOSURE AGREEMENT**

**MANDATORY NON-DISCLOSURE AGREEMENT (NDA) FOR  
MICROFLUIDIC SAMPLE PREPARATION (MSFP) PLATFORM**

**REQUEST FOR PROPOSAL (RFP)**

**PUBLIC WORKS GOVERNMENT SERVICES CANADA (PWGSC)  
FILE # 9F052-180576/A**

**BY:**

\_\_\_\_\_, a body corporate duly incorporated under the laws of \_\_\_\_\_, having its Head Office located at \_\_\_\_\_;  
Hereinafter referred to as the ("Supplier")

**TO:**

HER MAJESTY THE QUEEN IN RIGHT OF CANADA, as represented by the Minister of Public Works and Government Services;  
Hereinafter referred to as ("Canada")

The Supplier agrees that, for the purpose of preparing a response to PWGSC for the RFP (the "Purpose") is being giving access to Confidential Information or proprietary to Canada or to third party and agrees to comply with the obligations referred to under this NDA;

1. The Supplier acknowledges that the documents in the table below must be treated as confidential and must not be disclosed or used in any way except in relation with the Purpose of this RFP.

| Ref | Document identification                   | Document title   |
|-----|---|--|
| 1   | CSA-MFSP-RD-0001                          | Functional and Performance Requirements Document, Platform   |
| 2   | CSA-MFSP-RD-0002                          | Product Assurance Requirements, Platform   |
| 3   | CSA-MFSP-ID-0001                          | Interface Requirements Document, Platform  |
| 3   | SSP 57000                                 | Pressurized Payloads Interface Requirements Document, International Space Station Program  |
| 4   | SSP 51700                                 | Payload Safety and Requirements for ISS  |
| 5   | 3190 –Deep Space Gateway Science Workshop | Microfluidic Based Platform for Universal sample Preparation and Biological assays Automation for Life-Science research and Remote Medical Application |
| 6   | CSA-MFSP-CO-0001                          | Operational Concept Document for Commissioning Operations  |
| 7   | SSP 57057                                 | ISS Payload Integration Template   |
| 8   | CSA-SE-STD-0001                           | CSA Systems Engineering Technical Reviews Standard.  |
| 9   | CSA-ST-GDL-0001                           | CSA Technology Readiness Levels and Assessment Guidelines.   |
| 10  | CSA-SE-PR-0001                            | CSA Systems Engineering Methods and Practices  |
| 11  | CSA-FORM-0001                             | CSA Technology Readiness and Risk Assessment Worksheet   |
| 12  | CSA-FORM-0003                             | CSA Critical Technologies Elements Identification Criteria   |

2. For the purpose of this NDA, Confidential Information includes, but not limited to the documents listed in paragraph 1 above and any documents, Instructions, guidelines, data, material, advice or another information whether received orally, in printed form or recorded electronically or otherwise and whether or not labeled as proprietary, that is disclosed to a person or entity or that person or entity becomes aware of for the purpose of this RFP. The bidders' conference meets this definition.

3. The Supplier agrees that the documents listed in paragraph 1 above will not be reproduced, copied, divulged, released or disclosed, in whole or in part, in whatever way or form any Confidential Information to any person or entity other than a person employed by the Supplier without the prior written consent of the PWGSC's Contracting Authority and for any purpose other than for the preparation of a response to this RFP.

4. The Supplier agrees to immediately notify the PWGSC's Contracting Authority if any person, other than the Supplier's current employees accesses the Confidential Information at any time.

5. Also, regardless of whether it is Confidential Information, the Supplier must at all times treat the information designated as Confidential Information and ensure it cannot be accessed by anyone excepting the Supplier's current employees, which have a legitimate "need to know" for the Purpose of presenting a RFP.

6. The Supplier shall at all times use the same degree of care as it uses to protect its own confidential information of like importance to prevent the unauthorized use or disclosure of Confidential Information, but in no event less than a reasonable degree of care. The Supplier shall not, nor shall it permit its employees to, remove any copyright, confidential, proprietary rights, or intellectual property notices attached to or included in any Confidential Information and shall reproduce all such notices on any copies of the Confidential Information.

7. The Supplier is responsible for any breach of this NDA by any of its employees, and the Supplier shall not, nor shall permit its employees to, modify, disassemble, decompile, or reverse engineer any Confidential Information even if it relates to the Purpose.

8. All the Information contained in the document listed in paragraph 1 above and all other Confidential Information disclosed under this NDA shall remain the property of Canada or a third party, or of any other person or entity to whom it lawfully belongs, as applicable.

9. Without restricting the generality of the foregoing, the Supplier recognizes that no license or conveyance of any rights to the Supplier under any discoveries, inventions, patents, trade secrets, copyrights, or other form of intellectual property is granted or implied by the disclosure of Confidential Information under this NDA.

10. The Supplier must require any proposed subcontractor with a "need to know", to execute a NDA on the same conditions as those contained in this NDA prior to disclosure of the Confidential Information. Copy of subcontractor NDA must be provided to the contracting authority.

11. All Confidential Information will remain the property of Canada and must be destroyed within thirty (30) days following that request by the Contracting Authority.

12. The NDA remains in force indefinitely.

13. Nothing in this NDA should be construed as preventing the disclosure or use of any confidential information to the extent that such information:

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(a) is or becomes in the public domain through no fault of the Supplier or any proposed subcontractor;  
(b) is or becomes known to the Supplier from a source other than Canada, except any source that is known to the Supplier to be under an obligation to Canada not to disclose the information; or  
(c) is disclosed under compulsion of a legislative requirement or any order of a Court or other tribunal having jurisdiction.

14. The Supplier agrees that a breach of this NDA may result in disqualification of a Supplier or a Qualified Supplier at any time, or immediate termination of the resulting Contract. The Qualified Respondent also acknowledges that a breach of this NDA may result in a review of the Qualified Supplier's security clearance and review of the Qualified Supplier's status as an eligible Supplier for other requirements.

15. The Supplier acknowledges and agrees that it will be liable for any and all claims, loss, damages, costs, or expenses incurred or suffered by Canada caused by the failure of the Supplier, or by anyone to whom the Supplier discloses the Confidential Information to comply with these conditions.

16. At close or early termination of the bid period, it must immediately deliver the Confidential Information to the Contracting Authority as well as every draft, working paper and note that contains any information related to the Confidential Information. The supplier must not keep any documents, either soft or hard copies, once he has submitted his bid.

17. Canada reserves the right to refuse the request for access to documents.

IN WITNESS WHEREOF, this Non-Disclosure Agreement has been duly signed this day of MMMM DD, YYYY, by an authorized representative of the

\_\_\_\_\_  
Name of Supplier

\_\_\_\_\_  
Name of authorized representative (print)

\_\_\_\_\_  
Signature  
(I have authority to bind the corporation)  
Signed by its authorized representative

Witness:

\_\_\_\_\_  
Name of the Witness

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## **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);

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## ATTACHMENT 1 to PART 4 OF THE BID SOLICITATION

### MFSP EVALUATION CRITERIA

The evaluation is based on a combination of mandatory and point-rated criteria.

#### 1. Mandatory Criteria

These criteria are deemed mandatory by CSA as the minimum necessary competence and capability for undertaking the work. Mandatory requirements are evaluated on a pass/fail basis. They will be evaluated very strictly as to compliancy, therefore, no rating is associated with them. Proposals not meeting all mandatory criteria will be deemed non-responsive.

**M1: The Bidder must have demonstrated experience in design, manufacture and test of at least one (1) system of similar or greater complexity (i.e. aisle deployed, Express Rack inserted payload) that meet NASA requirements for ISS payloads, over the last fifteen (15) years.**

This system must be rated for operations in the crew compartment of the International Space Station (ISS), a human rated space platform. This criterion assesses the Bidder's experience and expertise in producing, qualifying, and delivering a system of similar complexity. This criterion evaluates a specific company unique experience (the Bidder) and not the higher corporate experience or a major subcontractor. The Bidder must provide a description of a previous or current, similar or related system along with references to demonstrate that the system and related experience is relevant to that associated to the MicroFluidic Sample Preparation (MFSP) Work. As a minimum, the Bidder must include in the description: the system name, the customer name, the start and end dates of development period, a summary of the development, manufacturing and testing activities, a summary of activities & review with NASA, and the launch date (actual or planned). References to publications flowing from the use/operation of the system shall be provided, if available.

**M2: The Bidder must be ISO 9001 certified and must provide a copy of the certificate with their bid.**

Certificate must be valid for the duration of the contract. If expiry of the certificate is within the period of the contract, the Bidder must demonstrate or provide a statement that it will be renewed.

**M3: The Bidder must demonstrate that the proposed solution will meet all mandatory product assurance requirements provided in document MFSP PAR CSA-MFSP-RD-0002**

For each of the mandatory requirements identified in the following table, the Bidder must provide a compliance statement supported by a detailed substantiation demonstrating compliance along with references in the proposal, or a detailed description of how the Bidder intends to comply. The definitions of "detailed substantiation" and "intent to comply" are available hereunder. Each set of requirements corresponds to specific sections of the Product Assurance Requirements Document (CSA-MFSP-RD-0002).

| Product Assurance Requirements for MicroFluidic Sample Preparation<br>(CSA-MFSP-RD-0002) |                  |   |   |
|--|------------------|---|---|
| Set  | Document section | Requirements                                      | Compliance:<br>Intent to Comply (IC)<br>or<br>Detailed Substantiation<br>(DETSUBST) |
| 1  | 3                | Product Assurance Program                         | IC  |
| 2  | 4                | Qualification Program                             | <b>DETSUBST</b>   |
| 3  | 5                | EEE Parts Program                                 | <b>DETSUBST</b>   |
| 4  | 6                | Reliability                                       | <b>DETSUBST</b>   |
| 5  | 7                | Mechanical Parts, Materials and Processes Program | IC  |
| 6  | 8                | Quality Assurance Program                         | <b>DETSUBST</b>   |
| 7  | 9                | Software Product Assurance Program                | IC  |
| 8  | 10               | FPGA Development                                  | IC  |
| 9  | 11               | Safety Program                                    | IC  |

**Detailed substantiation (DET SUBST)**

When a detailed substantiation is required, Bidders are requested to provide a detailed description which clearly demonstrates how it complies with the requirements. Cross-references to appropriate sections of the proposal should be provided when applicable and the essence of the referenced information should be summarized in the substantiation.

**Intent to comply (IC)**

Bidders must confirm their intention to comply with the mandatory requirement. As the mandatory requirement will be a requirement of the Contract, any failure to comply with the requirement of the Contract will result in the Contractor being in Default.

**2. Point-Rated Criteria**

The proposal will be evaluated according to the point-rated criteria as specified in Table 1.

Proposals must achieve 50% of the maximum score required for each rated criterion to be assessed as responsive under the point-rated criteria section; proposals not meeting the minimum required score will be deemed non-responsive. Only those proposals which are responsive (compliant) with all of the mandatory criteria and achieve or exceed the stated minimum scores required for each point-rated criterion will be further considered for award of a contract.

| Point-Rated Evaluation Criteria  | Max Score | Min Score |
|--|-----------|-----------|
| R1. Understanding the Platform Functional and Performance Requirements | 30        | 15        |
| R2. Project Management and proposed approach                           | 12        | 6         |
| R3. Project Team expertise and experience                              | 12        | 6         |
| <b>Maximum Score</b>   | <b>54</b> | <b>27</b> |

Table 1: Point-Rated Evaluation Criteria and Associated Ratings

The following provides definitions of the expressions employed herein which are used as benchmark statements for the different point-rated technical evaluation criteria:

- **“Qualified reader”:**

Means a representative of Canada, which in the opinion of Canada, has all the proper expertise and experience to make an informed judgement about the assertions found in the Bidder’s bid. Several “qualified readers” will compose Canada’s evaluation team, which team will regroup subject-matter experts tasked to evaluate some (or all) of the individual technical selection criteria based on their individual skillsets or responsibilities in relation to this project.

- **“Fail to demonstrate an understanding”:**

Means that a qualified reader, using his/her expertise and experience, is of the opinion that the description provided would most likely not demonstrate that the proposed solution will achieve the performance requirements. Significant problem or issue or error was identified that will prevent compliance to requirements.

- **“Partial understanding”:**

Means that a qualified reader, using his/her expertise and experience, is of the opinion that the description provided in the bid contains significant flaws or limitations in the adequacy of the proposed solution, technology, methodology.

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- ***“Demonstrating an understanding with weakness”:***

Means that a qualified reader, using his/her expertise and experience, is of the opinion that the description provided in the bid has weakness but shows an understanding of the requirements. Weakness was identified by the qualified reader but compliance to requirements is not questioned.

- ***“Demonstrating an understanding”:***

Means that a qualified reader, using his/her expertise and experience, is of the opinion that the description provided in the bid has a credible substantiation and is sufficient to make an informed judgment on the adequacy of the proposed solution, technology, and methodology in relation to the MFSP work and its performance requirements.

- ***“Credible substantiation”:***

Means that the information provided in the bid clearly demonstrates, through clear rationales, descriptions, examples or verifiable assertions, that the requirements is understood.

Statement that repeat the requirements and intent to comply with vague wording will likely be evaluated as partial understanding if ambiguous to qualified reader.

#### R1: Understanding of the Platform Functional and Performance Requirements

The Bidder must demonstrate that the requirements are understood. The Bidder must show that the proposed solution will meet the MFSP Functional and Performance Requirements as defined in the applicable CSA document: CSA-MFSP-RD-0001.

The Bidder must provide a requirement compliance substantiation for each set of requirements as listed in Table 2. Each set of requirements corresponds to specific sections of the Functional and Performance Requirements Document (FPRD). Although some sets include multiple “shall”, the Bidder is not requested to address each “shall”. The Bidder must rather address each set as a whole. Table 2 must be used as a template for a summary.

The Bidder must describe the proposed conceptual design. The Bidder must present a credible conceptual design that demonstrates an understanding of critical issues to operate on the ISS. The conceptual design is evaluated against specific requirements identified in each set.

| Microfluidic Sample Preparation Functional and Performance Requirements<br>(CSA-MFSP-RD-0001) |  |  |                           |
|---|--|--|---------------------------|
| Set   | Document section                                     | Requirements   | Compliance Substantiation |
| 1   | 3.2  | General & ISS Requirements<br>(separate matrix for PAR, see R2)  |                           |
| 2   | 3.3.1<br>3.3.2<br>3.3.3<br>3.3.4                     | General System Requirements<br>Rotary Module Requirements<br>Cartridge Loading Requirements<br>Cartridge Interface |                           |
| 3   | 3.3.5  | Image Capture Module Requirements  |                           |
| 4   | 3.3.6<br>3.3.7                                       | Pump and Manifold Modules<br>Requirements  |                           |
| 5   | 3.3.8<br>3.3.9<br>3.3.10<br>3.3.11<br>3.8<br>3.16    | Software, Control, User interface  |                           |
| 6   | 3.4<br>3.5<br>3.6<br>3.7<br>3.9                      | EXPRESS Rack and launch<br>Requirements  |                           |
| 7   | 3.10   | Operations   |                           |
| 8   | 3.11<br>3.12<br>3.13<br>3.14<br>3.15<br>3.17<br>3.18 | Others, Modularity, Upgrades and<br>Expansion, Maintainability, Availability                                       |                           |
| 9   | 3.19<br>3.20   | Packaging and Identification   |                           |
| 10  | 3.21   | Instrumented Validation Tool   |                           |

Table 2: Functional and Performance Requirements Compliance Substantiation

Score Benchmark Statements

**30 points:** An understanding of all ten (10) sets of requirements is demonstrated and a credible substantiation is provided.

The score is based on demonstrating an understanding of each set of requirements and a credible substantiation is provided. For each set where understanding is demonstrated, three (3) points are allocated. Two (2) points are allocated for a demonstrated understanding that has weakness. For partial understanding, one (1) point is allocated for the set. Zero (0) point is allocated if demonstration for understanding of a set is deemed failed. .

**0 point:** No understanding of requirements is demonstrated.

## R2: Project Management and Proposed Approach

This criterion assesses the methodology of the Bidder to perform the required work for the contract. This criterion examines the following elements

### **The credibility of the Project Management Plan**

The Bidder must provide a Project Management Plan (PMP) with his proposal. The PMP must comply with the preparation instructions contained in the Statement of Work (SOW). The Bidder must prepare the PMP by following the Data Item Description 001 (DID-001) contained in the SOW. The Bidder must describe the processes planned to be used to ensure adequate management of the project. Bidder will receive the score of partial compliance if significant flaws or limitations are identified in the management plan.

### **The credibility of the Work Breakdown Structure (WBS)**

The Bidder must provide a Work Breakdown Structure and Work Package Description (WBS) with his proposal. The WBS must comply with the preparation instructions contained in the Statement of Work (SOW). The Bidder must prepare the WBS by following the Data Item Description 002 (DID-002) contained in the SOW. The Bidder must demonstrate how the WBS organizes and defines the total work scope of the project, for the following elements: work package scope, required inputs/dependencies, activity description and deliverables. Bidder will receive the score of partial compliance if significant flaws or limitations are identified in the WBS.

### **The credibility of the Product Assurance Implementation Plan (PAIP)**

The Bidder must provide a Product Assurance Implementation Plan (PAIP) with his proposal. The PAIP must comply with the preparation instructions contained in the Statement of Work (SOW). The Bidder must prepare the PAIP by following the Data Item Description 029 (DID-0029) contained in the SOW. The Bidder must describe the processes planned to be used to ensure compliance to Product Assurance Requirements. Bidder will receive the score of partial compliance if significant flaws or limitations are identified in the PAIP.

### **The risks assessment**

The Bidder must provide an assessment of management and technical risks/uncertainties perceived as well as major assumptions upon which the MFSP System contract is based. The Bidder must, for each identified programmatic and technical risk, document the following: probability, consequence/impact to contract, mitigation plan, and response plan if risk materialized. Bidder will receive the score of partial compliance if risk assessment shows limited understanding of management and technical challenges related to ISS payload.

### The Technology Readiness Level (TRL) Assessment

The Bidder must provide a Technology Readiness Level Assessment with Technology Readiness and Risk assessment (TRRA) worksheets and rollup with his proposal. It is expected that the assessment will be a low TRL due the fact that the Bidder is unfamiliar with microfluidic technology. The TRL assessment must comply with the preparation instructions contained in the Statement of Work (SOW). The Bidder must prepare the TRL assessment by following the Data Item Description 014 (DID-0014) contained in the SOW. The Bidder must address Technology Risk Assessment/Analysis: (1) Critical Technology Element identification, (2) Critical Technology Element technical maturity, (3) Critical Technology Element technical risk and mitigation, (4) Critical Technology Element development to increase maturity. Bidder will receive the score of partial compliance if significant flaws or limitations is identified in the TRL assessment. Bidder will receive the full score if the TRL assessment consists of a thorough and in-depth analysis.

### Project Schedule

The Bidder must provide a detailed project Schedule from start of contract to end of Phase D. This criterion assesses if the schedule provided in the Bidder's proposal is feasible and realistic (activity durations and activity flow are feasible, level of details in the project schedule is adequate, adequate margins are identified). The project schedule must be detailed, well substantiated, realistic and demonstrate that the Bidder can meet the proposed project milestone schedule provided in the SOW. Proposal exceeding the proposed 30 months by more than 2 months will be deemed non-compliant. Bidder will receive the full score if a credible solution is proposed to deliver at least 2 months earlier than the suggested 30 months. Bidders will receive partial compliance if a credible solution is proposed to deliver within the suggested 30 months.

The Bidders must provide a project timetable that sets out tasks, milestones and deliverables. A Gantt chart and/or PERT chart should be used to illustrate the schedule. The bidder must describe the processes planned to be used to ensure timely completion of the project's milestones and this description must include activity definition, activity sequencing, estimate of activity duration, dependencies and schedule control.

| Set | Requirements  | Compliance Substantiation |
|-----|---|---------------------------|
| 1   | Project Management assessment, PMP (DID-001)                |                           |
| 2   | Work Breakdown Structure assessment WBS (DID-002)           |                           |
| 3   | Product Assurance management assessment PAIP (DID-029)      |                           |
| 4   | Risks assessment<br>Credibility of described risks          |                           |
| 5   | Technology Readiness Level (TRL) Assessment TRRA (DID-0014) |                           |
| 6   | Project Schedule (DID-0004)                                 |                           |

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Table 3: Project Management and Proposed approach Compliance Substantiation

#### Score Benchmark Statements

**12 points:** A compliance to all six (6) sets of requirements is demonstrated and a credible substantiation is provided.

The score is based on demonstrating compliance with each set of requirements and a credible substantiation is provided. For each set with a pass evaluation, two (2) points are allocated. If a set fails to demonstrate compliance, zero (0) points are allocated. For partial compliance, one (1) point is allocated for the set.

**0 point:** fails to demonstrate compliance on six (6) sets of requirements.

#### R3: Project Team expertise and experience

This criterion assesses the expertise and experience of team assembled to perform the required work for the contract. This criterion examines the following elements.

##### **The Project Manager assessment**

The Bidder must identify his Project Manager and outline his/her qualifications. The Bidder's proposed Project Manager must have experience in the management of projects requiring design, manufacture and test of systems and software. To receive full score, the Project Manager must have at least three years (over the last 15 years) of demonstrated Project Management experience, and must have managed at least one project in design, manufacture and test of systems and software rated for operations on a human space flight platform. To receive partial compliance score, the Project Manager must have at least one year (over the last 15 years) of demonstrated Project Management experience, and must have at least one year (over the last 15 years) experience in design, manufacture and test of systems and software rated for operations on a space flight platform.

##### **The Prime System Engineer assessment**

The Bidder must identify his System Engineer and outline his/her qualifications. To receive full score, the System Engineer must have:

1. worked with NASA delivering projects for human space flight
2. integrated and verified hardware with ISS systems
3. work experience with NASA databases (ex: Veritas)
4. supported as System Engineer at least one project in design, manufacture and test of systems and software rated for operations on a human space flight platform.
5. at least three years (over the last 15 years) of demonstrated System Engineering experience on a human space flight platform.

To receive partial compliance score, the System Engineer must have:

1. worked with NASA delivering projects for human space flight
2. integrated and verified hardware with ISS systems
3. at least two (2) years (over the last 15 years) of demonstrated System Engineering experience, and must have at least one year experience in design, manufacture and test of systems and software rated for operations on a human space flight platform.

#### **The Prime Safety & Quality Assurance Engineer assessment**

The Bidder must identify his Safety & Quality Assurance Engineer and outline his/her qualifications. To receive full score, the Safety & Quality Assurance Engineer must have:

1. past experience with NASA safety requirements for ISS
2. worked with NASA databases (ex: International Space Station Hazard Database System (IHS))
3. at least two (2) years (over the last 10 years) of demonstrated Safety & Quality Assurance experience on space projects

To receive partial compliance score, the Safety & Quality Assurance Engineer must have:

1. past experience with NASA safety requirements for ISS
2. at least one (1) year (over the last 10 years) of demonstrated Safety & Quality Assurance experience on space project

#### **The key resources' assessment**

This criterion assesses the capability (education, knowledge, experience, expertise and complementarities) of the key resources (Project Manager, System Engineer, Safety & Quality Assurance Engineer, Technical Specialist Engineers, etc.) , including subcontractors, assembled to carry out the Work. The Bidder must identify the key members of the project's technical and management teams and state their specific qualifications and experience for the work involved. Résumés for each of the individual team members must be provided in appendix to allow a proper evaluation of this criterion. The Bidder must include an organizational chart that illustrates the structure of the proposed project team, including key members and subcontractors.

In the circumstances where subcontractors' resources are being proposed, the same requirements applicable to the prime contractor are applicable to the subcontractor's team(s). The bid must identify the name and location of each proposed subcontractor and their specific qualifications for the work involved.

To receive full score, at least 3 key members of the team must have past experience in at least one project involving the following areas: NASA safety requirements for ISS, programming of command and control Software for payloads including telemetry and user interface. To receive partial compliance score, at least 2 key members of the team must have past experience in at least one project involving the following areas: NASA safety requirements for ISS, programming of command and control Software for payloads including telemetry and user interface.

### The Key resources' allocation

Bidder must include an FTE table for key resources. To receive full score, Project Manager, System Engineer and Safety & Quality Assurance Engineer must be allocated for at least 75% each. To receive partial compliance score, Project Manager, System Engineer and Safety & Quality Assurance Engineer must be allocated for at least 50% each.

### The subcontractor assessment

This criterion assesses the capability of the Bidder to lead the work required including portions that are subcontracted. The Bidder must demonstrate that he has the expertise in house to perform the design work. This criterion does not examine subcontracting work for manufacturing. Bidder will receive full score if the core of the design including Assembly, Integration and Tests (AI&T) remains in house. Bidder will receive the score of partial compliance if more than 5% of work packages comprised in the core design (including AI&T) are subcontracted. Bidder will receive the score of zero if more than 15% of work packages comprised in the core design (including AI&T) are subcontracted.

| Set |                      | Requirements  | Compliance Substantiation |
|-----|----------------------|---|---------------------------|
| 1   | PM                   | PM experience & qualification   |                           |
| 2   | Sys. Eng.            | Sys. Eng. experience & qualification  |                           |
| 3   | S&QA                 | S&QA experience & qualification   |                           |
| 4   | Resources assessment | Résumés, qualification of key personnel   |                           |
| 5   | Resources allocation | FTE table   |                           |
| 6   | Subcontract          | No subcontractor or only a small portion of the design work is subcontracted.<br>Core expertise for MFSP system is with the Bidder. |                           |

Table 4: Project team expertise and experience Compliance Substantiation

#### Score Benchmark Statements

**12 points:** A compliance to all six (6) sets of requirements is demonstrated and a credible substantiation is provided.

The score is based on demonstrating a compliance to each set of requirements and a credible substantiation is provided. For each set with a pass evaluation, two (2) points is allocated. If a set fails to demonstrate compliance, zero (0) point is allocated. For partial compliance, one (1) point is allocated for the set.

**0 point:** fails to demonstrate compliance on six (6) sets of requirements

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**ATTACHMENT 1 to PART 5 OF THE BID SOLICITATION**

**FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY – CERTIFICATION**

I, the Bidder, by submitting the present information to the Contracting Authority, certify that the information provided is true as of the date indicated below. The certifications provided to Canada are subject to verification at all times. I understand that Canada will declare a bid non-responsive, or will declare a contractor in default, if a certification is found to be untrue, whether during the bid evaluation period or during the contract period. Canada will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply with any request or requirement imposed by Canada may render the bid non-responsive or constitute a default under the Contract.

For further information on the Federal Contractors Program for Employment Equity visit [Employment and Social Development Canada \(ESDC\) – Labour's](#) website.

Date: \_\_\_\_\_ (YYYY/MM/DD) (If left blank, the date will be deemed to be the bid solicitation closing date.)

Complete both A and B.

A. Check only one of the following:

- A1. The Bidder certifies having no work force in Canada.
- A2. The Bidder certifies being a public sector employer.
- A3. The Bidder certifies being a [federally regulated employer](#) being subject to the [Employment Equity Act](#).
- A4. The Bidder certifies having a combined work force in Canada of less than 100 permanent full-time and/or permanent part-time employees.

A5. The Bidder has a combined workforce in Canada of 100 or more employees; and

- A5.1. The Bidder certifies already having a valid and current [Agreement to Implement Employment Equity](#) (AIEE) in place with ESDC-Labour.
- OR**
- A5.2. The Bidder certifies having submitted the [Agreement to Implement Employment Equity \(LAB1168\)](#) to ESDC-Labour. As this is a condition to contract award, proceed to completing the form Agreement to Implement Employment Equity (LAB1168), duly signing it, and transmit it to ESDC-Labour.

B. Check only one of the following:

- B1. The Bidder is not a Joint Venture.

**OR**

- B2. The Bidder is a Joint venture and each member of the Joint Venture must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification. (Refer to the Joint Venture section of the Standard Instructions)