**RETURN BIDS TO:**
**RETOURNER LES SOUMISSIONS À:**

**Travaux publics et Services gouvernementaux Canada**
**Place Bonaventure,**
**800 rue de la Gauchetière Ouest**
**1er étage**
**Montréal**
**Québec**
**H5A 1L6**
**FAX pour soumissions: (514) 496-3822**

# REQUEST FOR PROPOSAL
# DEMANDE DE PROPOSITION

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

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

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

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

**Comments - Commentaires**

**Title - Sujet**
Space Exploration Robotics

| **Solicitation No. - N° de l'invitation** | **Date** |
|---|---|
| 9F050-160946/A | 2017-05-11 |

**Client Reference No. - N° de référence du client**
9F050-16-0946

**GETS Reference No. - N° de référence de SEAG**
PW-$MTB-690-14345

| **File No. - N° de dossier** | **CCC No./N° CCC - FMS No./N° VME** |
|---|---|
| MTB-7-40013 (690) | |

**Solicitation Closes - L'invitation prend fin**
**at - à 02:00 PM**
**on - le 2017-06-30**

**Time Zone**
**Fuseau horaire**
Heure Avancée de l'Est
HAE

**F.O.B. - F.A.B.**
**Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐

| **Address Enquiries to: - Adresser toutes questions à:** | **Buyer Id - Id de l'acheteur** |
|---|---|
| Paquin, Esther | mtb690 |

| **Telephone No. - N° de téléphone** | **FAX No. - N° de FAX** |
|---|---|
| (514) 496-3889 ( ) | (514) 496-3822 |

**Destination - of Goods, Services, and Construction:**
**Destination - des biens, services et construction:**
AGENCE SPATIALE CANADIENNE / CANADIAN SPACE AGENCY
EXPLORATION SPATIALE / SPACE EXPLORATION
6767 ROUTE DE L'AÉROPORT
SAINT-HUBERT
Québec
J3Y 8Y9

**Instructions: See Herein**

**Instructions: Voir aux présentes**

**Vendor/Firm Name and Address**
**Raison sociale et adresse du fournisseur/de l'entrepreneur**

| **Delivery Required - Livraison exigée** | **Delivery Offered - Livraison proposée** |
|---|---|
| | |

**Vendor/Firm Name and Address**
**Raison sociale et adresse du fournisseur/de l'entrepreneur**

**Telephone No. - N° de téléphone**
**Facsimile No. - N° de télécopieur**

**Name and title of person authorized to sign on behalf of Vendor/Firm (type or print)**
**Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)**

**Signature** **Date**

**Issuing Office - Bureau de distribution**
Travaux publics et Services gouvernementaux Canada
Place Bonaventure,
800 rue de la Gauchetière Ouest
Voir aux présentes - See herein
Montréal
Québec
H5A 1L6

| Item Article | Description | Dest. Code Dest. | Inv. Code Fact. | Qty Qté | U. of I. U. de D. | Unit Price/Prix unitaire FOB/FAM Destination | Plant/Usine | Delivery Req. Livraison Req. | Del. Offered Liv. offerte |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Space Exploration Robotics | Total | | 1 | EA | $ | XXXXXXXXXX | | |

Agence spatiale canadienne | Canadian Space Agency

CSA-DSXR-SOW-0001

# Canadian Space Agency

## ANNEX "A"

## DSXR – Deep Space Exploration Robotic System
## Phase 0
## Statement of Work (SOW)

**Initial Release**
**April 13, 2017**

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## APPROVALS

This document and all changes to it shall be approved by the undersigned. Proposed changes to the currently approved baselined version of this document shall be forwarded to the CSA Configuration Management Receipt Desk for evaluation and submission for approval. Approved changes shall be incorporated into this document.

Prepared by:

Glen Bilodeau — Date
Program Manager
Space Exploration, CSA

Reviewed by:

Daniel Lefebvre — Date
Technical Authority
Space Exploration, CSA

Approved by:

Daniel Rey — Date
Mission Manager
Space Exploration, CSA

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# 1 INTRODUCTION

Canada, as a partner in the International Space Station (ISS), has undertaken important discussions with the partnership to determine the next step for human exploration. A common long term goal is the human exploration of Mars. One step towards this long term goal is demonstrating and proving technologies beyond the ISS. The partnership is discussing a space platform, deep-space habitat, in a lunar orbit that will extend human presence and further demonstrate and prove technologies and operations at a larger distance from Earth (RD-06, **Erreur ! Source du renvoi introuvable.**), see Figure 1-1, Figure 1-2and Figure 1-3.

Like Canadarm2 on the International Space Station, a Deep-Space Exploration Robotic system (DSXR) will assure the logistics, maintenance, inspection, and assembly of this outpost. For the current planning concept, the system consists of the following:

1. Large robotic system and tools that will provide functions including remote inspection, free-flying vehicle capture, payload and On-orbit Replaceable Unit (ORU) handling and station maintenance.
2. Dexterous robotic system and tools that will perform servicing of the robotic elements, and possibly used internally and/or deployed to the lunar surface.
3. Robotic Interface Fixtures, Platforms and Receptacles that will be needed by the habitat vehicles, ORU providers, and the robotic system.
4. Ground segment that will provide planning, monitoring, commanding and visualization functions.

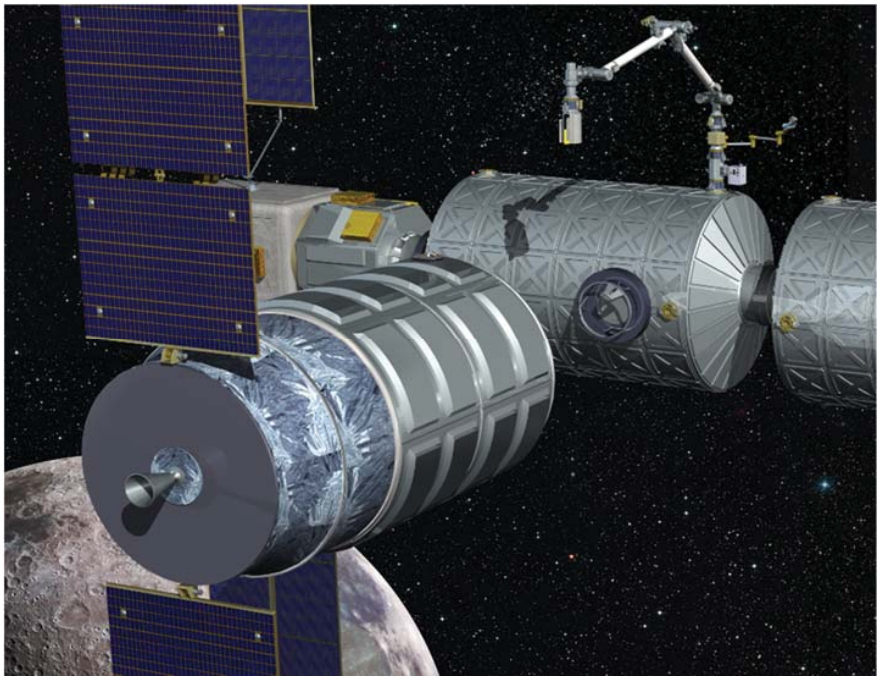

**FIGURE 1-1: CONCEPT OF DSXR SYSTEMS ON A DEEP-SPACE HABITAT**

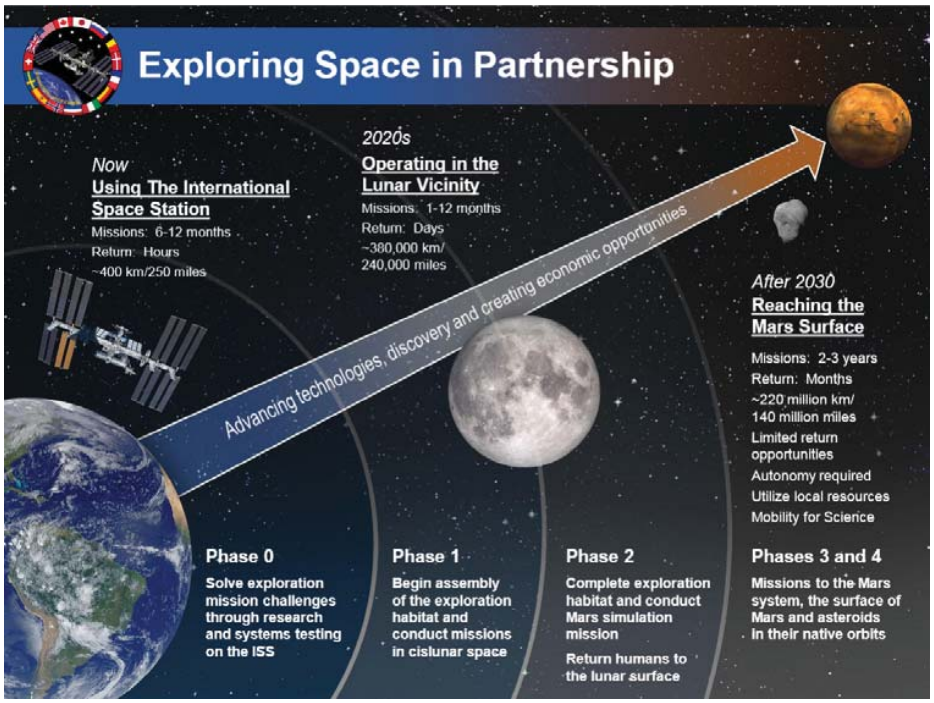


**FIGURE 1-2: NOTIONAL MOON-MARS HUMAN EXPLORATION PHASES**

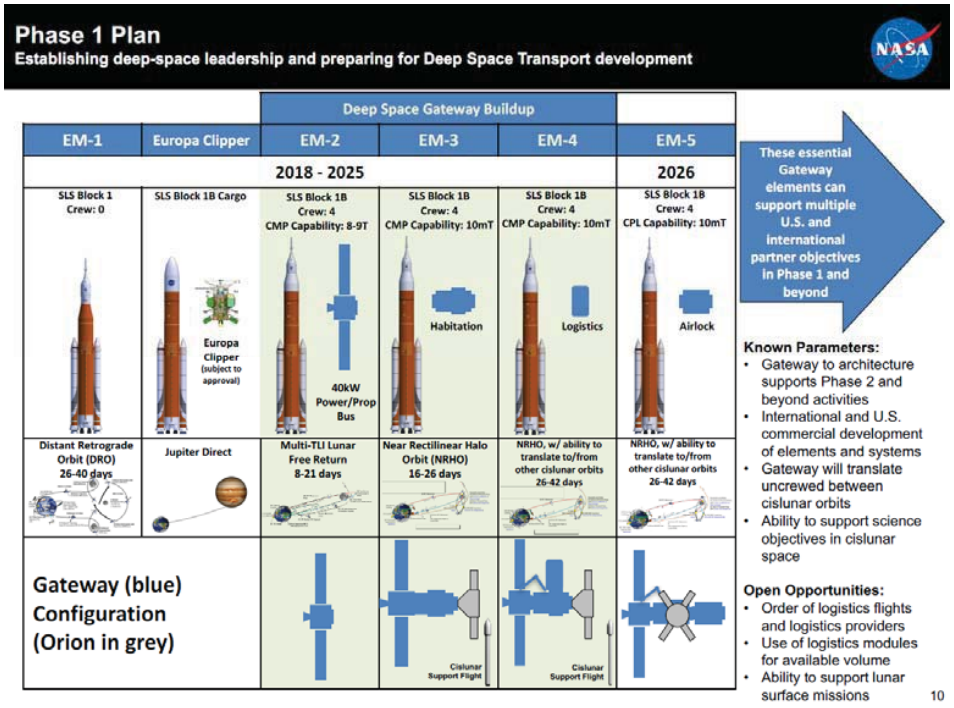


**FIGURE 1-3: NOTIONAL MOON-MARS HUMAN EXPLORATION PHASES**

## 1.1 SUMMARY

The Phase 0 will elaborate on four sub-systems of deep-space exploration robotic system:

**Large Robotic System and Essential tools:**

The large robotic system is a dual-ended manipulator with the ability to relocate to base locations on the habitat. This multi-purpose manipulator can be adapted to a variety of missions, and specialized functions such as free-flyer capture and other tasks. The large robotic system interfaces with a dexterous end-effector tool to access and perform external maintenance and inspection operations. Mission planning and execution take place through or supported by a ground segment. See Appendix D for the full list of robotic system mission level functions. The large robotic system also includes all required flight support equipment, as well as on-orbit centralized avionics and man-machine interfaces, leveraging any suitable assets provided by the Deep Space Gateway.

The essential tool set for the Large Robotic System includes the Tool Caddy, the Capture/Rigidize Tool, and the Dexterous Adaptor Tool, see Figure 1-4. Large Arm end-effectors also include a socket interface for a NASA supplied EVA portable foot restraint.

**Dexterous Robotic System, IVR Kit and Surface Kit:**

The dexterous robotic system allows self-maintenance of the large robotic system via operation from a separate station base location such as the extended science airlock platform. Maintenance of the Dexterous Robotic system is performed by crew inside the station via airlock transfer. This study will include the development and assessment of a concept to enable a dexterous robotic system which could be used for intravehicular servicing as well as external. This study will also assess the deltas associated with a lunar-surface compatible version of the dexterous robotic system for possible deployment onto a mobile rover platform.

**Robotic Interface Fixtures, Platforms and Receptacles:**

The interfaces include all robotic hardware attached to vehicles and ORUs to enable robotic operations and handling (e.g. low profile passive base, grapple fixture, and dexterous fixture), as well as ORU platforms and their receptacles (e.g. mate/demate wedge platform and receptacle). These elements will be under the greatest schedule pressure for a cislunar habitat program given the early definition and delivery required to support international partner schedules.

**Ground Segment:**

The ground segment portion of the DSXR allows for mission planning, rehearsal/validation, transfer of plan from the ground to the space segment, system monitoring, video monitoring, 3D visualization and manual commanding of the space segment.

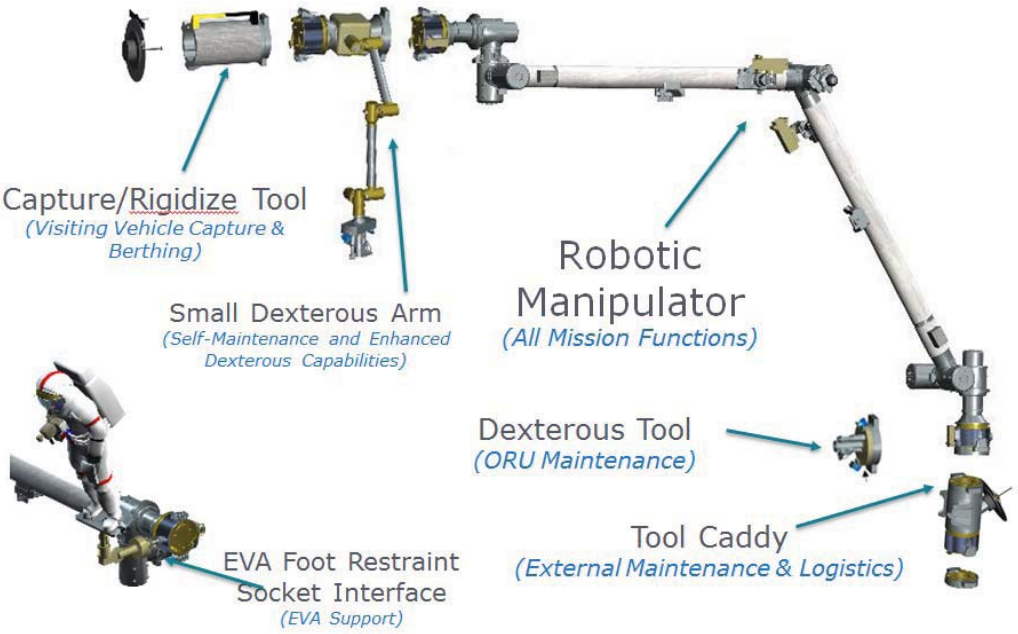


**FIGURE 1-4: CONCEPT OF ROBOTIC SYSTEM WITH TOOL CADDY, CAPTURE TOOL, DEXTEROUS TOOL, AND EVA SOCKET INTERFACE**

**FIGURE 1-5: CONCEPT OF SMALL DEXTEROUS ROBOTIC SYSTEM**

**FIGURE 1-6: NOTIONAL GROUND SEGMENT WORKSTATION CONCEPT**

## 1.2 SCOPE

This Statement of Work (SOW) defines activities for Phase 0, including system definitions and feasibility assessments, associated with the DSXR Beyond Low Earth Orbit (BLEO) habitat potential contributions.

These activities will also include a review of the robotic system concept to confirm the approach and mission's goals and high level requirements.

One key result of a Phase 0 is to provide information for CSA to clearly understand the options, costs, schedule, and risks associated with a DSXR mission. The sub-systems being studied in Phase 0 remain options subject to further down-selection, descope or staggered delivery. For that reason it is important to provide information for each element (Large Robotic System, Dexterous Robotic System, Robotic Interface Fixtures/Platforms/Receptacles, Ground Segment) separately. Details of the required information will be included in separate Contractual Data Requirements List (CDRL) and Data Item Descriptions (DIDs) (as described in Section 3 - Work Requirements).

It is expected that the international reference mission scenario and architecture will include options and the baseline is expected to evolve during the period of performance of this work. The Contractor will be called upon to support the evaluation of options, make recommendations and update the DSXR concept and architecture accordingly.

## 1.3 OBJECTIVE

The objectives of Phase 0 are to identify and consolidate users' needs, identify preliminary mission requirements, flow down mission level requirements to the systems level, validate concept definition and design, identify critical technologies, and prepare development plans for follow on phases of potential DSXR contributions to a BLEO habitat.

At the end of this Phase 0 Study, the CSA should have all the technical and programmatic information necessary to make an informed decision about the DSXR system contribution and for subsequent immediate programmatic steps.

## 1.4 DOCUMENT CONVENTIONS

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

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

# 2 DOCUMENTS

## 2.1 APPLICABLE DOCUMENTS (AD)

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

The following documents of the exact issue date and revision level shown are applicable and form an integral part of this document to the extent specified herein. AD-01, AD-02, AD-03 and AD-04 can be obtained from the following File Transfer Protocol (FTP) site:

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

**TABLE 2-1: APPLICABLE DOCUMENTS**

| AD No. | Document Number | Document Title | Rev. No. | Date |
|---|---|---|---|---|
| AD-01 | CSA-ST-GDL-0001 | CSA Technology Readiness Levels and Assessment Guidelines | C | March 2017 |
| AD-02 | CSA-ST-FORM-0003 | Critical Technology Element (CTE) Identification Criteria Worksheet | A | March, 2014 |
| AD-03 | CSA-ST-FORM-0001 | Technology Readiness and Risk Assessment (TRRA) Worksheet (PDF) | F | March 2017 |
| AD-04 | CSA-SE-STD-0001 | CSA Systems Engineering Technical Reviews Standard | A | Nov 7, 2008 |

## 2.2 REFERENCE DOCUMENTS (RD)

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

RD-02 can be obtained from the following File Transfer Protocol (FTP) site: ftp://ftp.asc-csa.gc.ca/users/TRP/pub/TRRA/.

**TABLE 2-2: REFERENCE DOCUMENTS**

| RD No. | Document Number | Document Title | Rev. No. | Date |
|---|---|---|---|---|
| RD-01 | PMBOK Guide | A Guide to the Project Management Body of Knowledge | 5th or latest edition | 2013 |
| RD-02 | CSA-SE-PR-0001 | CSA Systems Engineering Methods and Practices | Rev. B | Mar 10, 2010 |
| RD-03 | NASA GSFC-STD-7000 | Goddard Technical Standard: General Environmental Verification Standard (GEVS) For GSFC Flight Programs and Projects http://everyspec.com/NASA/NASA-GSFC/GSFC-STD/GSFC_STD_7000_170/ | A | April 22, 2013 |
| RD-04 | GSFC 320-MAR-1001 | Standard Mission Assurance Requirements https://ossmacm.gsfc.nasa.gov/index.cfm | E | November 2013 |
| RD-05 | ANSI/AIAA G-043-2012 | Guide to the Preparation of Operational Concept Documents. http://arc.aiaa.org/doi/abs/10.2514/4.869297 | | 2012 |
| RD-06 | N/A | The Global Exploration Roadmap http://www.globalspaceexploration.org/wordpress/wp-content/uploads/2013/10/GER_2013.pdf | | August 2013 |
| RD-07 | Apogy Website | https://projects.eclipse.org/proposals/apogy | | |
| RD-08 | Xcore Documentation | https://wiki.eclipse.org/Xcore | | |
| RD-09 | Guidelines on Costing (Treasury Board) | https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=30375 | | |
| RD-10 | Core Flight System Documentation and Opensource Code | https://cfs.gsfc.nasa.gov/ | | |
| RD-11 | NASA HEO Presentation to Advisory Council | Progress in Defining the Deep Space Gateway and Transport Plan www.nasa.gov/sites/default/files/atoms/files/nss_chart_v23.pdf | v.23 | March 2017 |
| RD-12 | ESD 30000 | Space Launch System (SLS) Mission Planner's Guide | Initial Baseline | April 2017 |
| RD-13 | SLS-SPEC-159 | Cross-Program Design Specification for Natural Environments http://ntrs.nasa.gov/search.jsp?R=20160004378 | Rev D or latest | November 2015 |

# 3 WORK REQUIREMENTS

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

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

## 3.1 MISSION ANALYSIS, PLANNING AND DEVELOPMENT

The Contractor must perform the following tasks:

- Collect/define User Requirements/Science Requirements /Demonstration or Commercial Requirements
- Parsing of requirements to distinguish essential from desirable. Requirements to be captured in a Mission Requirements Document and flowed down to preliminary Systems Requirement Document
- Initial Analysis comprising Concept Formulation, Feasibility Assessment, Analysis, Derivation of Mission and System Requirements.

Figure 3-1 illustrates the expected requirement flow down for the DSXR System.

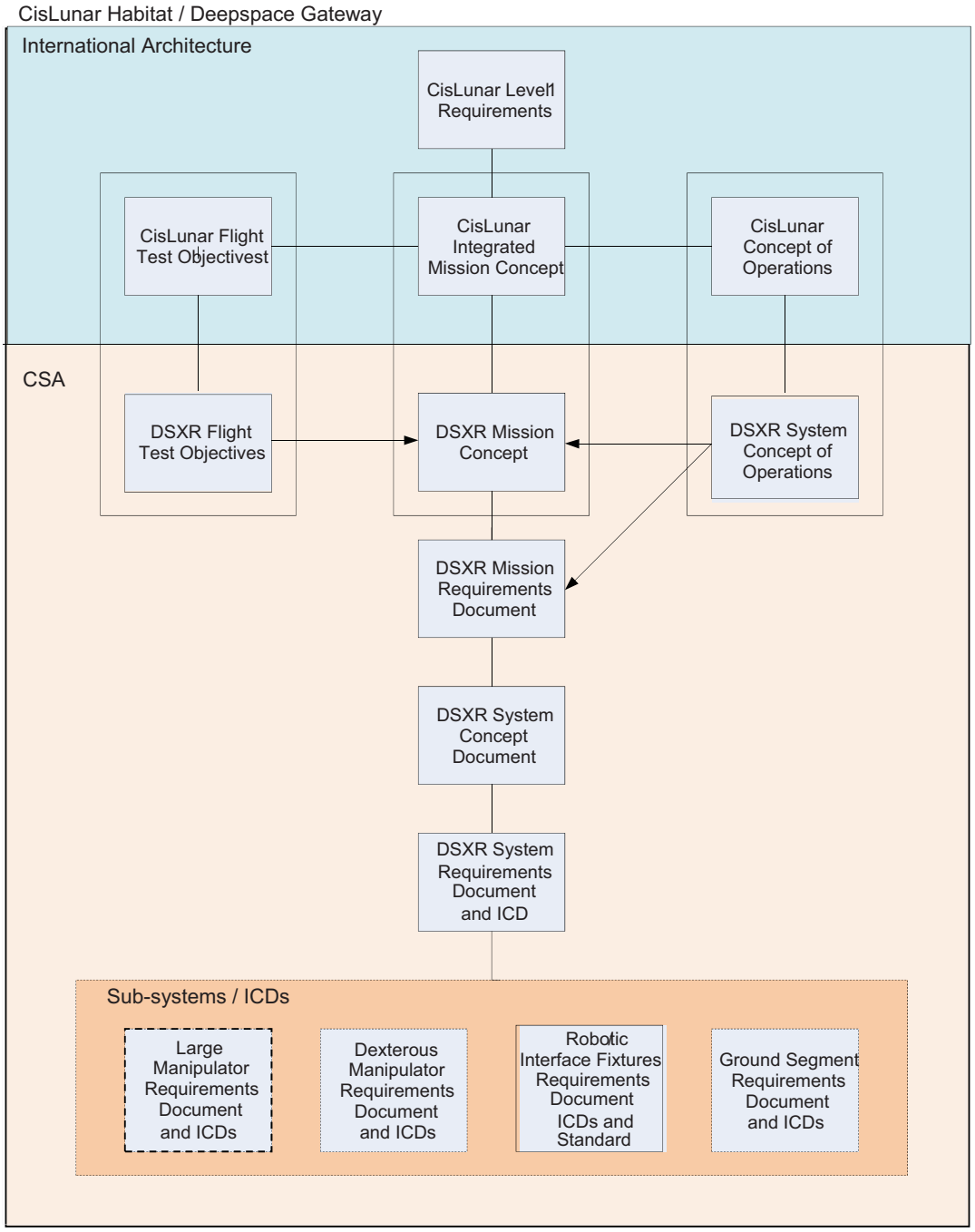


**FIGURE 3-1: REQUIREMENT FLOWDOWN FOR DSXR SYSTEM (NOTIONAL)**

### 3.1.1 Mission Objectives and User Needs Definition

The Contractor must review the Global Exploration Roadmap (RD-06), NASA plans for the Deep Space Gateway (RD-11), the functional needs outlined in Appendix D, as well as CSA provided reference material after contract award further defining the Deep Space Gateway architecture, concept, and concept of operations. The Contractor must produce inputs in the form of a Mission Objective and User Needs Definition Document (CDRL MD1) for the Canadian contribution.

This document must capture and summarize the pertinent mission goals, assumptions and objectives, identify the stakeholders and provide a clear articulation of observation requirements, data and applications needs, processing and distribution requirements, calibration, validation and characterization requirements, as expressed by the user community.

### 3.1.2 Mission Conceptual Design

The Contractor must develop a Mission Concept Document (MCD) (CDRL MD2) that supports the definition, development, and operation of the system based on **Erreur ! Source du renvoi introuvable.**. This document communicates to systems developers and users, in the user's language, the desired characteristics of the system to be developed.

### 3.1.3 DSXR Mission Requirements

Independent of a future availability of the Cislunar Habitat Mission Requirement Document (MRD) a stable mission requirement baseline is necessary to manage the interface with external partners and proceed with the development of system requirements.

The Contractor must develop a DSXR Mission Requirements Document (MRD) for the DSXR System (CDRL MD3) which will be used to capture the subset of mission requirements that will be applicable to the development of the DSXR. The MRD must include system functional and performance requirements, interface requirements, operational requirements, and mission environmental requirements. It will also serve to distinguish essential requirements from goals (desirable objectives), and identify gaps, assumptions, TBDs and TBCs.

### 3.1.4 Mission Feasibility Study

The Contractor must perform a study to demonstrate the viability of the mission (CDRL MD4).

### *3.1.5 Mission Development Plan*

The contractor must breakdown the mission into sub-systems at a level sufficient to estimate required developments, cost, risk and performance. The system breakdown must be the basis of the TRRA and Development Plan for the mission.

The Mission Development Plan includes (Large Robotic System, Dexterous Robotics System, Robotic Interface Fixtures/Platforms/Receptacles, and Ground Segment separately):

- identification of the mission cost;
- identification of the mission schedule;
- identification of the technology development required to bring the technology readiness to the appropriate level at the appropriate time;
- identification of the development and manufacturing approach;
- identification of mission ground support and operations' needs; approach for calibration, data product, application development and simulation;
- provision of a mission risk assessment;
- identification of potential collaborations;
- provision of a Canadian capabilities development strategy; and
- provision of a commercialisation plan.

The information requested in sections 3.1.5.1 through 3.1.5.7 must be presented in the Mission Development Plan (CDRL MD5).

#### 3.1.5.1 Mission Cost Estimate

The Contractor must provide an indicative DSXR System Cost Estimate separately for each of the following: Large Robotic System package, Dexterous Robotics System package and kit options, Robotic Interface Fixtures/Platforms/Receptacles, and Ground Segment, in accordance with Treasury Board (TB) guidelines (RD-09), as per Table 3-1 Template for Cost Breakdown, broken down per Work Breakdown Structure (WBS), for all phases leading to the development, implementation, operation and disposal. Along with the cost estimate, a detailed justification for those costs must be included. The justification must describe the type of analysis (analogous, bottom-up, etc.), as well as the assumptions made (CDRL PM6).

Cost estimates must provide sufficient granularity to allow costing estimating of the DSXR System across the life cycle of the mission.

**TABLE 3-1 : TEMPLATE FOR COST BREAKDOWN (EXAMPLE)**

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

#### 3.1.5.2 Overall Mission Schedule

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

#### 3.1.5.3 Development and Manufacturing Approach

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

#### 3.1.5.4 Preliminary Mission Risk Assessment

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

The Contractor must integrate all risks when producing risk-related information and document it in a Risk Assessment Matrix. The risk assessment process and matrix are generally provided in (RD-01).

#### 3.1.5.5 Collaboration

The Contractor must identify potential partners/stakeholders (for example, Universities, sub-system providers, terrestrial commercial partners, etc.) state the benefits of their participation in such a mission and provide a preliminary assessment of roles and responsibilities. The basis and process of stakeholder analysis is described in the Project Management Book of Knowledge (PMBoK) (RD-01).

#### 3.1.5.6 Canadian Capabilities Development

This report must provide an estimate of the anticipated percentage of Canadian content relative to the overall cost presented in Table 3-1, what options could be undertaken to maximize the Canadian content and their corresponding impacts and benefits. The Contractor must describe the Canadian supply chain involved in this current Phase 0 study, and expected to be involved in subsequent phases.

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

#### 3.1.5.7 Commercialization Plan

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

The Contractor must provide a commercialization plan to explain the potential economic benefits of an investment in such a mission. This plan must include a description of potential products and spin-offs (space and non-space) that can be commercialized, a stakeholder analysis, and analysis of the competitors (national and international) for the potential products. The Contractor must include an estimate of the potential market for their products as well as specify companies/market segments/export markets that would purchase their products. The Contractor must describe and explain their overall/general business model for any potential new business.

The Contractor must conduct a request for information, in coordination with CSA, seeking capabilities within Canada that can be spun into the DSXR System. The goal is to seek any new developments in the terrestrial domains that are of high maturity that could be integrated into the DSXR system. The findings must be part of the commercialization plan.

The Contractor must conduct a request for information, in coordination with CSA, seeking capabilities within Canada on maximizing public engagement, inspiration and innovation through the DSXR system, and how the DSXR system can be used to engage the public. There is high potential for DSXR to inspire Canadians through innovative use of modern and future technologies, in space and on Earth, that could potentially be integrated with the DSXR system.

### *3.1.6 Technology Readiness and Risk Assessment (TRRA)*

The Contractor must conduct a Technology Readiness and Risk Assessment (TRRA) in accordance with the requirements of the CSA TRRA guidelines (AD-01).

The main steps of the TRRA are:

- Logically breakdown the instrument into technology elements (CDRL MD6);
- Classify technology elements as critical or non-critical using the criteria defined in the Critical Technology Elements (CTE) worksheet (AD-02) and provide sufficient rationale for that classification (CDRL MD7);
- Produce a Technology Readiness and Risks Assessment for each Critical Technology Element using the PDF form provided in AD-03 (CDRL MD8).
- Prepare a report according to CDRL-MD9.

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

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

### 3.1.7 Technology Roadmap

The Contractor must provide a Technology Development Plan, also known as Technology Roadmap (TRM) including the recommended timeline and sequence of required technology developments to reach TRL 6 and eventually TRL 8 (CDRL MD10). The TRM will also provide a notional budget providing estimated costing for the proposed technology development steps.

The TRM must show how the technology development plan and associated TRL progression aligns with the system's mission phases/milestones versus the NASA mission phases/milestones.

The Technology Roadmap may be provided as a chapter of the Mission Development Plan (CDRL MD5).

### 3.1.8 Intellectual Property

The Contractor must complete the Contractor Disclosure of Intellectual Property CSA Form (CDRL MD11), identifying the Background and Foreground Intellectual Property (BIP and FIP) that will be generated in this Phase 0 contract, the owners of the BIP and how it will be managed and coordinated among the various collaborators and entities involved.

### 3.1.9 Ground Segment Options Assessment

The Contractor must perform a tradeoff assessment for the Ground Segment (CDRL MD12). The Contractor must list the possible options and concepts for its development and operations. The assessment must include the following (but not limited to): (i) describe, explain each option, including both contractor and government roles (ii) cost/benefit analysis, (iii) evaluation criteria, (iv) advantages and disadvantages, (v) Canadian industrial capabilities, (vi) explain any constraints and assumptions, (vii) explain the essential criteria to selection an option, (viii) provide rationale for discounted and viable options. In the end, provide a recommended option for Ground Segment development and operations.

### 3.1.10 Lunar-Deployable Robotic System Assessment

The Contractor must perform an assessment of a dexterous robotic system that could be used on the habitat and that could either be directly deployable to the lunar surface, or scarred to enable modifications or enhancements by the station-based personnel for deployment on the lunar surface (CDRL MD13). The assessment must include the following (but not limited to): (i) describe the technical deltas, (ii) cost/benefit analysis, (iii) explain any constraints and assumptions, (iv) advantages and disadvantages. The Contractor must produce a preliminary set of mission requirements for lunar-based robotic system.

### 3.1.11 Intra-Vehicular Robotic System Assessment

The Contractor must develop a concept and perform an assessment of an intra-vehicular robotic system for the deep-space habitat (CDRL-MD14). The Contractor must collect the user needs, develop an initial set of mission requirements, assess feasibility of implementation options that the

Contractor will develop in coordination with the CSA. The assessment must include the following (but not limited to): (i) describe each technical option, (ii) cost/benefit analysis, (iii) explain any constraints and assumptions, (iv) advantages and disadvantages, (v) nominal technology readiness and risk assessment (TRRA), (vi) explain the essential criteria to select an option, (vii) provide rationale for discounted and viable options.

### *3.1.12 Collision Impact Detection and Damage Avoidance Assessment*

Collaborative robots for terrestrial applications are more and more common, primarily in manufacturing. It is envisaged that this would expand to space applications. These collaborative robots have active safety features and control systems that continuously detect and avoid hazardous or damaging impact situations. As part of this Phase 0 study, the Contractor must perform an assessment of such systems that have potential to continuously assure EVA, station and robot safety (CDRL MD15). The assessment must include the following (but not limited to): (i) describe each technical option, (ii) cost/benefit analysis, (iii) explain any constraints and assumptions, (iv) advantages and disadvantages, (v) technology readiness and risk assessment (TRRA), (vi) explain the essential criteria to select an option, (vii) provide rationale discounted and viable options. The Contractor must produce a preliminary set of mission and system requirements for the viable option(s).

### *3.1.13 Cislunar Architecture and Draft Standards Review*

It is expected that the Cislunar Architecture will evolve and that draft international standards will be proposed to facilitate interoperability, reduce costs, and inform early definition and design work. The Contractor must support CSA in the analysis, review, evaluation and development of recommendations regarding the other partner element concepts and the proposed standards. The standards include External Robotic Interfaces, Power, Avionics, Software, and Thermal.

## 3.2 OPERATIONS

### *3.2.1 Concept of Operations and Operational Requirements*

The Contractor must develop a Concept of Operations (CDRL OP1) in order to meet the mission objectives. This document must provide a comprehensive summary of all operability aspects of the mission. The associated or derived Mission and System level operational requirements must be captured in the Mission Requirements and Preliminary System Requirements documents respectively (CDRLs MD3 and EN9).

### *3.2.2 Preliminary Ground Segment Facility Requirements Specification*

The Contractor must develop a Preliminary Ground Segment Facility Requirements Specification (CDRL OP2) that responds to the Mission Requirements of the space segment. This specification follows the assessment resulting from Section 3.1.9.

## 3.3 ENGINEERING

### *3.3.1 System Conceptual Design*

The Contractor must develop a System Conceptual Design Document (CDRL EN1) that meets the DSXR Mission Requirements.

The system conceptual design document must include the considered alternatives and trades performed to meet the DSXR requirements.

### *3.3.2 Preliminary Interface Control Document*

The Contractor must prepare a Preliminary Interface Control Document (ICD) (CDRL EN2) in which:

1. All external interfaces are identified and characterized.
2. All internal interfaces are identified and characterized between all sub-systems, including those between the DSXR Large Robotics, Dexterous System, Robotic Interface Fixtures/Platforms/Receptacles and Ground Segment.
3. All software interfaces are identified and characterized.
    i. The software interface must include an interface to Apogy (RD-07). It is intended that the DSXR contribution to the CisLunar concept will be integrated with Apogy simulation environment. In order to integrate into Apogy, the first step is to define a software interface using the Xcore (RD-08) language. The Contractor must provide a preliminary version of the Software Interface implemented by the API. The language must be the Xcore language format (CDRL EN3). The goal is to integrate into Apogy during subsequent phases of the project.
    ii. The software interface should include an interface to the NASA core Flight System software framework (RD-10).

### *3.3.3 Preliminary Systems Engineering Management Plan*

The Contractor must provide or produce a preliminary Systems Engineering Management Plan (CDRL EN8). The Contractor must use CSA's System Engineering methods and practices or equivalent (RD-02).

### *3.3.4 Preliminary Systems Requirements Document*

The Contractor must produce a preliminary Systems Requirements Document (CDRL-EN9) for both software and hardware.

### *3.3.5 Preliminary Environmental Requirements Document*

The Contractor must produce a preliminary Environmental Requirements Document (CDRL-EN10). It must consider all environments the DSXR system and sub-systems will be subject to, that is, from ground, launch and to accomplishing the functional requirements in deep-space including external, internal and lunar surface. It must not reproduce what has already been captured in NASA documents (e.g. RD-12) but refer to applicable sections of existing relevant documents as much as possible and provide derived requirements as applicable to DSXR.

### 3.3.6 Preliminary CAD Models

The Contractor must develop a Computer Assisted Design (CAD) model (CDRL EN4) for the DSXR hardware configuration for use as input to future analyses or trade-off studies. In order to facilitate international collaboration, high level CAD models will be shared with international partners. In order to protect intellectual property, the contractor is requested to provide simplified models in addition to those models developed to meet the intent of this contract.

### 3.3.7 Preliminary Proofs of Concept and SLA Models

The Contractor must identify key risk areas that can be mitigated through proofs of concept such as functional Stereolithography (SLA) models (CDRL EN5). The Contractor must demonstrate risk mitigation or areas of development by use of these proofs of concept. These can be used as inputs to future demonstrations or trade-off studies. An approximately 40:1 reduced scale model of the DSXR with functional joints must be delivered along with at least two habitat base modules and a logistics vehicle model with nominal base and grapple fixture locations.

### 3.3.8 Preliminary Graphical Simulation Models

The Contractor must develop kinematic and geometric simulation models of the Proving Ground Habitat Systems and DSXR concept (CDRL EN6). These models can be used to graphically demonstrating mission scenarios and for communications purposes. The models must be based on common industry standards.

### 3.3.9 Mission Requirements Verification Matrix

The Contractor must develop the Mission Requirements Verification Matrix (CDRL EN7) to identify the various requirements developed to meet the Phase 0 scope.

### 3.3.10 Core Flight Software System Architecture Assessment

The envisioned software architecture for CisLunar will be based on NASA's Core Flight System (cFS) framework (RD-10). The cFS is a NASA Agency Asset for Spacecraft Flight Software Reuse. It has been productized over several years by Goddard Space Flight Center and has been supported by continuous NASA level funding since 2012. The cFS is an open source software supported by the NASA community. It has been fully tested, documented and is at TRL 9. The architecture is based on published service layer (cFS) and open source Operating System Abstraction Layer (OSAL) for common services such as: publish and subscribe message bus, time services, events, tables, file, task execution. It also runs on multiple platforms. Figure 3-2 presents an overview of the CFS architecture.

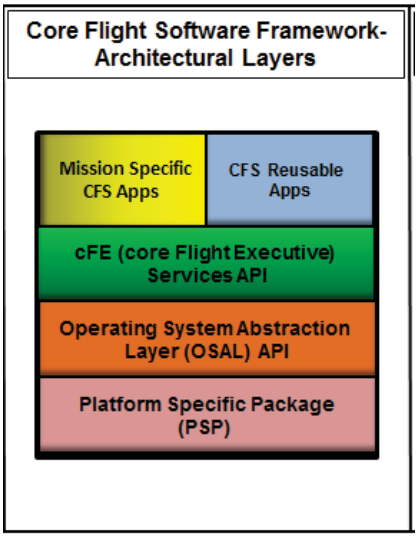


**FIGURE 3-2: CFS ARCHITECTURAL LAYERS**

It is envisioned that the cFS will be running on NASA assets and therefore, there will be a Mission Specific App (yellow box in Figure 3-2) connecting to the Deep Space Exploration Robotics System. The Contractor is required to evaluate the option of building their architecture also on CFS and must perform a feasibility assessment. A preliminary software design option based on cFS is required along with recommendations and total end-to-end system impacts. (CDRL-EN11). An alternative architecture may also be assumed.

A software breadboard may be developed for trial purposes.

## 3.4 PROJECT MANAGEMENT

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

Refer to Appendix A, for the full Contract Data Requirement List (CDRL).

### *3.4.1 Team Organization*

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

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

The Contractor must also identify other key personnel who are considered essential to the performance of the contract. The Contractor must assign personnel with appropriate qualifications and experience to all posts within the project organization, including engineers and supporting staff with the necessary expertise to define/interpret the operational requirements for the mission and data products (for the purpose of the contract work).

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

### *3.4.2 Contractor Work Breakdown Structure*

The Contractor must prepare and maintain a detailed Contractor Work Breakdown Structure (CWBS) (CDRL PM4). The CWBS must include all project management, product assurance, mission and operations planning and engineering work identified in this SOW, including subcontractors' work.

### *3.4.3 Detailed Schedule and Critical Path*

The Contractor must prepare and maintain a detailed schedule (CDRL PM5) based on the CWBS for all the work to be performed under this Phase 0 contract.

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

**TABLE 3-2: PROPOSED PROJECT MILESTONES**

| ID | Milestone |
|---|---|
| 1 | Kick-off Meeting (KoM) |
| 2 | Mission Concept Review (MCR) |
| 3 | Mission Requirements Review (MRR) and Technical Readiness and Risk Assessment |
| 4 | Mission Development Plan Review and Preliminary System Requirements Review |
| 5 | Phase 0 Final Review |

### *3.4.4 Communications and Access*

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

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

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

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

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

### *3.4.5 Project Meetings*

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

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

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

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

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

All technical reviews will be chaired by the CSA Mission Manager.

**TABLE 3-3 : NOMINAL PLANNED MEETINGS**

| ID | Milestone | Months after Contract Award | Venue |
|---|---|---|---|
| M1 | Kick-off Meeting (KoM) | ≤ 1 month | CSA |
| M2 | Mission Concept Review (MCR) | ≤ 3 months | Videocon |
| M3 | Mission Requirements Review (MRR) and Technology Readiness and Risk Assessment (TRRA) | 6 months | Contractor |
| M4 | Mission Development Plan Review (MDPR) and Preliminary System Requirements Review (PSRR) | 9 months | CSA |
| M5 | Phase 0 Final Review (FR) | 12 months | CSA |
| | Monthly Meetings | As required | Telecon |
| | Provision to support four (4) international meetings | TBD | TBD, could be USA, Europe or Japan |

#### 3.4.5.1 M1 – Kick-off Meeting

This meeting will serve as an opportunity for CSA and Public Services and Procurement Canada (PSPC) to review the Contractor's plans, the requirements of the work (SOW), schedules, deliverables, risks, and address issues (CDRL PM8). It will also serve to baseline the Product Breakdown Structure (PBS) (CDRL MD6) for the mission and sub-systems which will be subsequently used in the TRRA and Mission Development Plans.

#### 3.4.5.2 M2 – Mission Concept Review (MCR)

The purpose of the MCR is to demonstrate the feasibility of the mission and the project readiness to proceed with the development of mission requirements.

The Contractor must make a presentation (CDRL PM9) such as to demonstrate that the MCR entry and exit criteria are met, including the common entry and exit criteria as per AD-04.

The deliverables for this review will

- Comprehensively define mission objectives and user needs, as they relate to DSXR (CDRL MD1), thus establishing mission success criteria (equivalent to NASA minimum, full, and stretch mission requirements);
- Ensure the Mission Conceptual Design meets mission objectives and needs (CDRL MD2);
- Ensure the Concept of Operations clearly supports the achievement of the mission objectives and needs (CDRL OP1).

#### 3.4.5.3 M3 – Mission Requirements Review (MRR)

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

The Contractor must make a presentation (CDRL PM10) such as to demonstrate that the MRR entry and exit criteria are met, including the common entry and exit criteria as per AD-04.

The deliverables for this review will serve to ensure that:

- The mission objectives and needs have been logically and fully flowed down to the mission requirements;
- The pertinent subset of mission requirements have been defined;
- The preliminary system conceptual design meets mission requirements and is feasible;
- The Concept of Operations clearly supports the achievement of mission requirements
- Identify the list of critical technology elements and technology dependencies (i.e. new or emerging technologies on which the project depends).

#### 3.4.5.4 M3 – Technology Readiness and Risk Assessment (TRRA)

The focus of the TRRA process is to provide inputs to the Technology Development Plan by identify critical technologies and assess their maturity level. The intent of this milestone is to review the PDF worksheets (CDRL MD8) for each Critical Technology Element.

Please refer to section 3.1.6 for more information.

#### 3.4.5.5 M4 – Mission Development Plan Review (MDPR)

The deliverables of the MDPR will serve as input for CSA's downselect decision. The Contractor must make a Mission Development Plan Review presentation (CDRL PM11).

#### 3.4.5.6 M4 – Preliminary System Requirements Review (PSRR)

The purpose of the DSXR PSRR is to prepare for the DSXR Mission SRR for each subsystem of the DSXR. The Contractor must make a Preliminary System Requirements Review presentation (CDRL PM12).

#### 3.4.5.7 M5 – Final Review Meeting (FR)

The Final Review will serve to review all final deliverables, and close all open actions. The Contractor must make a Final Review Presentation (CDRL PM13) to accomplish this objective.

### *3.4.6 Agendas, Minutes and Action Item Log*

The Contractor must provide a Meeting Agenda (CDRL PM1) for all reviews and meetings including teleconferences and must deliver these to the CSA Mission Manager and/or TA no less than 5 working days before the meeting and must have it approved by the CSA Mission Manager and/or TA.

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

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

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

Also, a chart indicating how many action items are open and how many are closed since the beginning of the project must be produced for the monthly progress report and at the meetings. The AIL (CDRL PM3) must be delivered with the Monthly Progress Report PM7.

### *3.4.7 Bi-Weekly Teleconference Meetings*

The Contractor must hold bi-weekly teleconference meeting with the PM, and the duration should be limited to one hour. The bi-weekly teleconference is mainly to address technical issues and to discuss progress.

### *3.4.8 Other Meetings*

Coordination meetings between Canadian Space Agency and international space agencies are ongoing regarding the development of overarching mission objectives and requirements with regards to a Beyond LEO Deep Space Habitat. These meetings offer "up to the minute" information that is beneficial to the work performed in this Contract. As such, the Contractor must have allowance to support these meetings, subject to CSA approval. Furthermore, the Contractor must include allowance to adjust any of the deliverables based on information from these meetings, as applicable and at the appropriate Contract milestones. Four international, week-long meetings must be assumed, supported onsite by a maximum of two members of the Contractor team. These meetings typically also require the review of material and may require presentation material from the contractor. These would be on a task authorization basis.

### *3.4.9 Project Reporting*

#### 3.4.9.1 Monthly Progress Reports

The Contractor must submit monthly Progress Reports (CDRL PM7).

The Monthly Progress Reports must be delivered no later than five working days after the end of the month. As all deliverables, it must be submitted via CSA's Configuration Management Library for the DSXR mission, and a copy must also be sent by email to (PSPC) Contracting Officer.

#### 3.4.9.2 Phase 0 Closure Report

The Contractor must submit a Phase 0 Closure Report (CDRL PM14). The report must summarize the outcome of the Phase 0 work.

### *3.4.10 Document Deliverables*

The Contractor must deliver all documentation listed in the CDRL tables (Appendix A) as a minimum. Some documents may be combined or divided by mutual agreement. The format and content of the deliverables must be in accordance with the requirements specified in the Data Item Descriptions (DIDs) (Appendix B), both the specific DID identified in the CDRL and the DID-100 – General Preparation Instructions.

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

All documents must be delivered via CSA's Configuration Management Library for the DSXR mission.

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

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

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

#### 3.4.10.1 Documents Delivered for Approval

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

The document may not be changed without the CSA Mission Manager approval. No request or document for which approval is required must be acted upon or implemented by the Contractor until such approval is provided. Such requests and documents will be reviewed promptly by the CSA Mission Manager and the necessary written approval or disapproval will be provided after their receipt by CSA. In the event of a failure by the CSA Mission Manager to approve or disapprove the document within fifteen (15) working days, the document may be deemed approved.

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

#### 3.4.10.2 Documents Delivered for Review

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

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

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

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

### *3.4.11 Subcontract Management*

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

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

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

### *3.4.12 Product Assurance*

The Contractor must produce a preliminary DSXR System Product Assurance Requirements document (CDRL **Erreur ! Source du renvoi introuvable.**). The Contractor must review the GSFC Standard Mission Assurance Requirements (MAR) (RD-04) and must produce an assessment of these requirements and to identify any recommendations that should be captured in the DSXR System Product Assurance Requirements as a result of the assessment (CDRL **Erreur ! Source du renvoi introuvable.**). Any other references used in the development of the System Product Assurance Requirement document must be cited in the document.

The Contractor must produce a Preliminary System Product Assurance Requirements document (CDRL PA2). This document must encompass the design, development, procurement, manufacturing, integration, test and delivery of the space segment and ground segment hardware, software. It must cover the following Product Assurance activities: Product Assurance Program, Qualification Program, Reliability, Parts/Materials/Processes Program, Quality Assurance Program, Software Product Assurance, Verification, Safety, Configuration management and Non-conformance management.

Ongoing discussions at the international level may lead to informed product assurance requirements specific to the DSXR mission. The Contractor must consider these discussions as input to the Phase 0 work.

In presenting the Development Plans for follow up phases (CDRL MD5), the Contractor must explain the mission Reliability/Availability Policy (CDRL PA1) that will be used to meet the reliability and availability of the mission goals.

The Contractor must produce a preliminary Product Assurance and Implementation Plan (CDRL PA3).

## 3.5 OPTIONAL SERVICES

It is expected that the Deep Space Gateway architecture and associated standards will undergo modifications during this period, that the DSXR concept will need to be updated, and that the International Partners will have special requests or raise new questions regarding the DSXR concept and architecture.

The Contractor must:

Project Management

1. Plan, schedule, assign and organize resources and ensure completion of all work carried out under the contract.
2. Maintain project management interface with the CSA project team.
3. Monitor and report on technical, cost and schedule progress, on a monthly basis according to CDRL-PM7.
4. Provide the management, technical leadership, applicable technical subject matter experts and disciplines, and the support necessary to ensure effective and efficient performance of all project efforts and activities.
5. Produce a closure report at the end of the option period (per CDRL-PM14)

Engineering

1. Support CSA in the review, evaluation and development of recommendations regarding modifications to the Deep Space Gateway partner element concepts and the proposed standards. The standards include External Robotic Interfaces, Power, Avionics, Software, and Thermal.
2. Provide technical leadership on the conceptual design and architecture of the DSXR including preparation and presentation of special topics, as requested by CSA.
3. Provide support as requested by CSA to develop/evaluate new/novel concepts for DSXR and its subsystems in order to remain compatible with modifications to the Deep Space Gateway concept.
4. As requested by CSA, generate CSA ICD material for novel operations and/or review external ICD material related to Robotics and Robotic interfaces. Support CSA in the identification and evolution of interface definition. This includes the preparation of draft technical drawings or models.
5. As requested by CSA, perform relevant analysis, model updates, operational flows, and deliver associated documentation as required to address technical aspects and changes related to the DSXR concept, requirements or operations.
6. Maintain and update Phase 0 documentation, as applicable, based on international developments.

International Meeting Support

1. Prepare/review/update presentations in support of international discussions and meetings with respect to technical aspects of the DSXR.
2. As requested by CSA, participate in concept and mission review meetings at international partner locations. Four international, week-long meetings must be assumed, supported onsite by a maximum of two members of the Contractor team. These would be on a task authorization basis.

# 4 CONTRACTOR DELIVERABLES

## 4.1 HARDWARE

No hardware is expected to be deliverable under this contract. However, all SLA models developed under this contract, in support of proof of concept activities must be identified and delivered (CDRL-EN6).

## 4.2 SOFTWARE

The Contractor must deliver source code of the software developed as part of the Work.

## 4.3 DOCUMENTATION

The Contractor must deliver all documentation requested in Appendix A.

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

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

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

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

# 5 GOVERNMENT FURNISHED EQUIPMENT

No government furnished equipment is expected to be deliverable under this internal study. If applicable, any government furnished information must be returned to the Crown at the conclusion of the Contract.

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# APPENDICES

# A CONTRACT DATA REQUIREMENTS LIST (CDRL)

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

**LEGEND:**

**C) DID No.**

- CF = Contractor's format

**2) Document Versions:**

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

**TABLE A-1: CONTRACT DATA REQUIREMENTS LIST**

| CDRL No. | Title | SOW Sect. No. | DID No. | Initial Release | Update | Final | Acceptance Category |
|---|---|---|---|---|---|---|---|
| **A.1 PROJECT MANAGEMENT** | | | | | | | |
| PM1 | Meeting Agenda | 3.4.6 | 110 | Each milestone | | | Review |
| PM2 | Minutes of Meetings | 3.4.6 | 111 | Each milestone | | | Review |
| PM3 | Action Items Log (AIL) | 3.4.6 | 112 | Each milestone | As required | | Review |
| PM4 | CWBS and Work Package Descriptions | 3.4.2 | 102 | Proposal | M1 KoM | | Approval |
| PM5 | Phase 0 Project Schedule | 3.4.3 | 105 | M1 KoM | Monthly | | Review |
| PM6 | Mission Life-Cycle Cost Estimates | 3.1.5.1 | Table 3-1 | M3 MRR | M4 MDPR | M5 FR | Approval |
| PM7 | Progress Report | 3.4.9.1 | 107 | | Monthly | | Review |
| PM8 | Kick-Off Meeting Presentation | 3.4.5.1 | CF | M1 KoM | | | Review |
| PM9 | Mission Concept Review Presentation | 3.4.5.2 | CF | M2 MCR | | | Review |
| PM10 | Mission Requirements Review Presentation | 3.4.5.3 | CF | M3 MRR | | | Review |
| PM11 | Mission Development Plan Presentation | 3.4.5.5 | CF | M4 MDPR | | | Review |
| PM12 | Preliminary SRR Presentation | 3.4.5.6 | CF | M4 PSRR | | | Review |
| PM13 | Final Review Presentation | 3.4.5.7 | CF | M5 FR | | | Review |
| PM14 | Phase 0 Closure Report | 3.4.9.2 | 114 | M5 FR | | | Review |
| **A.2 PRODUCT ASSURANCE** | | | | | | | |
| PA1 | Reliability/Availability Policy | 3.4.12 | CF | M4 MDPR | As required | M5 FR | Approval |
| PA2 | Preliminary Product Assurance Requirements | | CF | M4 PSRR | | M5 FR | Review |
| PA3 | Preliminary Product Assurance and Implementation Plan | 3.4.12 | 320 | M4 MDPR | As required | M5 FR | Review |
| **A.3 MISSION DOCUMENTATION** | | | | | | | |
| MD1. | Mission Objectives and User Needs Definition | 3.1.1 | CF | M2 MCR | As required | M5 FR | Approve |
| MD2. | Mission Concept Document (MCD) | 3.1.2 | 002 | M2 MCR | As required | M5 FR | Approve |

| CDRL No. | Title | SOW Sect. No. | DID No. | Initial Release | Update | Final | Acceptance Category |
|---|---|---|---|---|---|---|---|
| MD3. | DSXR Mission Requirements Document (MRD) | 3.1.3 | 008 | M3 MRR | | M5 FR | Approval |
| MD4. | Mission Feasibility Study | 3.1.4 | 204 | M3 MRR | As required | M5 FR | Review |
| MD5. | Mission Development Plan (MDP) | 3.1.5 | 007 | M2 MCR | M3 MRR & As Required | M4 MDPR | Approval |
| MD6. | Product Breakdown Structure (PBS) for the mission and sub-systems (to be used in TRRA and Mission Development Plan) | 3.1.6 | CF | M2 MCR | | M4 MDPR | Approval |
| MD7. | Criticality Technology Element (CTE) Report | 3.1.6 | AD-02 | M3 MRR | | M4 MDPR | Approval |
| MD8. | TRRA for Critical Elements (PDF Worksheets) | 3.1.6 | AD-03 | M3 TRRA | | M4 MDPR | Approval |
| MD9. | TRRA Stand Alone Report | 3.1.6 | 0013 | M3 TRRA | As required | M4 MDPR | Approval |
| MD10. | Technology Roadmap (TRM) | 3.1.7 | CF | M4 MDPR | | M5 FR | Approval |
| MD11. | Contractor Disclosure of IP | 3.1.8 | App C | Proposal | | M5 FR | Approval |
| MD12. | Ground Segment Assessment | 3.1.9 | CF | M2 MCR | As required | M5 FR | Review |
| MD13. | Lunar-Deployable Robotic System Assessment | 3.1.10 | CF | M2 MCR | As required | M5 FR | Review |
| MD14. | Intra-Vehicular Robotic System Assessment | 3.1.11 | CF | M2 MCR | As required | M5 FR | Review |
| MD15. | Collision Impact Detection and Avoidance Assessment | 3.1.12 | CF | M2 MCR | As required | M5 FR | Review |
| MD16. | Cislunar Architecture and Draft Standards Review | 3.1.13 | CF | As required | As required | As required | Review |
| **A.4 OPERATIONS** | | | | | | | |
| OP1. | Concept of Operations (ConOps) | 3.2.1 | 825 | M2 MCR | M3 MRR | M5 FR | Approval |
| OP2. | Preliminary Ground Segment Facility Requirements Specification | 3.2.2 | 801 | M4 MDPR | | M5 FR | |

| CDRL No. | Title | SOW Sect. No. | DID No. | Initial Release | Update | Final | Acceptance Category |
|---|---|---|---|---|---|---|---|
| **A.5 ENGINEERING** | | | | | | | |
| EN1. | System Conceptual Design Document | 3.3.1 | 700 | M3 MRR | As required | M5 FR | Review |
| EN2. | Preliminary Interface Control Document (ICD) | 3.3.2 | 501 | M4 PSRR | | M5 FR | Review |
| EN3. | Software Interface Definition in Xcore Format | 3.3.2 | CF | M3 MRR | As required | M5 FR | Approval |
| EN4. | CAD models | 3.3.6 | 600 | M3 MRR | As required | M5 FR | Review |
| EN5. | Proofs of Concept (SLA Models) | 3.3.7 | CF | M3 MRR | | M5 FR | Review |
| EN6. | Graphical/Kinematic Simulation Models | 3.3.8 | CF | M4 PSRR | | M5 FR | Review |
| EN7. | Requirements Verification Matrix | 3.3.9 | CF | M4 PSRR | As required | M5 FR | Approval |
| EN8. | Preliminary Systems Engineering Management Plan | 3.3.3 | 450 | M4 PSRR | | M5 FR | Review |
| EN9. | Preliminary System Requirements Document (SRD) | 3.3.4 | 400 | M4 PSRR | | M5 FR | Review |
| EN10. | Preliminary Environmental Requirements | 3.3.5 | CF | M4 PSRR | | M5 FR | Review |
| EN11. | cFS Mission Specific App Feasibility Assessment | 3.3.10 | CF | M3 MRR | | M4 MDPR | Review |

# B DATA ITEMS DESCRIPTIONS (DIDS)

# DID-002 – Mission Concept Document (MCD)

**DID Issue: IR** **Date: 2014-02-17**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

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

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

# DID-007 – Mission Development Plan

**DID Issue: Tailored for DSXR** **Date: 2017-03-08**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

Referring to Table A-1:

- The Initial Release must include drafts of items 3, 10, 12, and 13, and preliminary inputs of the remainder of the plan.
- The Update must include final versions of items 3, 10, 12, and 13, and drafts of the remainder of the plan.
- The Final release must be the final version of the plan.

The plan must include the following:

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

# DID-008 – Mission Requirements Document

**DID Issue: Tailored for use in DSXR Phase 0** **Date: 2017-04-11**

## PURPOSE:

To capture the mission requirements required to proceed with the development of system requirements. The MRD will include functional and performance requirements, interface requirements, mission environmental requirements, and operational requirements. It will also serve to distinguish essential requirements from goals (desirable objectives), and identify gaps, assumptions, TBDs, TBCs and unknowns that must be addressed.

## PREPARATION INSTRUCTIONS:

The document must include the following:

1) An introduction including the scope and purpose
2) A short description of the mission including background objectives and a list of assumptions (if any);
3) A list of applicable and reference documents (if any);
4) User requirements, which represent a clear articulation of the data and applications needs as expressed by the user community; these requirements shall be summarized in a table at the end of this section or in an Appendix;
5) Mission requirements that respond to user requirements and break down as follows:
    a) functional requirements,
    b) performance requirements,
    c) operational requirements,
    d) resource allocation requirements,
    e) verification requirements, other applicable requirements types.
6) Interface Requirements, including but not limited to:
    a) Electrical Interface Requirements;
    b) Thermal Interface Requirements;
    c) Mechanical Interface Requirements;
7) Mission environmental requirements will likely be derived from GSFC Standard GEVS (RD-03) and will cover topics such as mechanical, thermal, vacuum, contamination, outgassing, EMC/EMI, acoustics, shock, radiation, for the following environments:
    a) Ground operations and handling
    b) Integration to launch vehicle environment (for flight segment only)
    c) Launch environment (for flight segment only)

d) On-orbit environment (for flight segment only)

8) In-flight requirements:
   a) Operational modes
   b) Upload and download of data/telemetry requirements
   c) Telemetry availability
   d) Commanding capabilities
   e) Staffing requirements (ground and flight segments)
9) Recovery of samples (for flight segment only, the DSXR may retrieve lunar or asteroid samples brought to the deep space habitat)
   a) Timing and location of recovery
   b) Contamination protection requirements (reciprocal)

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

# DID-0013 – Technology Readiness and Risk Assessment with Stand Alone Report

**DID Issue: IR** **Date: 2015-04-28**

## PURPOSE:

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

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

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

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

## PREPARATION INSTRUCTIONS:

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

**1. INTRODUCTION**

This section should include

1.1. Project Description;

1.2. Purpose of Document;

1.3. Scope.

**2. DOCUMENTS**

This section must include

2.1. Applicable Documents (which must include the following):

a) TRRA Guidelines (CSA-ST-GDL-0001 at latest approved revision).

2.2. Reference Documents (which must include the following):

a) TRL Handbook for Space Applications (TEC-SHS/5574; ESTEC);

b) (all evidence documents referred to in body of report).

**3. MISSION OBJECTIVES**

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

**4. MISSION ENVIRONMENT**

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

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

**5. PRODUCT BREAKDOWN STRUCTURE**

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

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

**6. KEY PERFORMANCE PARAMETERS (KPPS) FOR EACH CTE**

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

**7. CRITICAL TECHNOLOGY ELEMENTS (CTES)**

7.1. Description of the CTE;

7.2. Rationale for selecting the CTEs.

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

**8. TECHNOLOGY MATURITY AND VIABILITY ASSESSMENTS**

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

8.1. Description;

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

8.3. Heritage and compliance;

8.4. TRL achieved;

8.5. R&D3;

8.6. TNV.

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

**9. TRRA SUMMARY AND RECOMMENDATIONS**

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

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

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

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

**10. CONCLUSIONS**

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

**11. APPENDIX A – TECHNOLOGY READINESS AND RISK ASSESSMENT WORKSHEETS**

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

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

# DID-100 – General Preparation Instructions

**DID Issue: Tailored for use in DSXR Phase 0** **Date: 2017-04-11**

## PURPOSE:

This DID specifies:

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

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

c) document and data structure requirements.

d) Metadata requirements for all document and data submissions

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

---

## PREPARATION INSTRUCTIONS:

### 1. GENERAL INSTRUCTIONS

1.1. Preparation

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

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

WXYZ-CDRL-NUM-CIE_ContractNumber_sentYYYY-MM-DD_Title

where:

WXYZ: A 4-8 letter acronym of the project

CDRL-NUM: The CDRL Identifier

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

ContractNumber: For example: _9F028-07-4200-03

_sentYEAR-MONTH-DAY: Date Tracking Number

_Title: Document Title (Can be an acronym)

1.2. Electronic Documents Format

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

*1.2.1.Page Numbering*

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

*1.2.2.Document Numbers*

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

1.3. Delivery, Notifications and Identification Requirements

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

*1.3.1.E-mailed Documents*

E-mailed documents must be sent to:

asc.bibliothequegc-cmlibrary.csa@canada.ca

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

*1.3.2.Direct Transferred Documents*

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

asc.bibliothequegc-cmlibrary.csa@canada.ca

If deliverables contain ITAR content, notifications of their availability on Contractor repositories shall be sent to:

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

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

*1.3.3.Documents Delivers on DVD or CD-ROM Disk*

Hard copy and media deliverables are to be addressed to:

CM Library, 6A-100

Attention: CSA DSXR Phase 0 Project

Canadian Space Agency

6767, Route de l'Aéroport

Longueuil, QC, J3Y 8Y9

CANADA

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

a) Company Name

b) Document Title

c) Document Number and Revision Status

d) CSA SOW Number

e) CDRL Number and Title

f) Contract Number

## 2. DOCUMENT STRUCTURE AND CONTENT

### 2.1. Overall

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

a) Cover/Title Page;

b) Table of Contents;

c) Introduction;

d) Applicable and Reference Documents;

e) Body of Document; and

f) Appendices

### 2.2. Cover/Title Page

The title page must contain the following information:

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

b) Rev. indicator / date of Rev.

c) Document Title

d) Project Name

e) Contract No.

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

g) Prepared for: Canadian Space Agency

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

i) Product tree identifier, if applicable

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

### 2.3. Table of Contents

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

### 2.4. Introduction

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

a) Project description and background;

b) Identification (number, title) and a brief overview of the system, hardware, or software to which the document applies;

c) Purpose of the document;

d) Scope of the document (what it includes and what it does not include);

e) Document conventions; and

f) Roles and responsibilities of the participants and stakeholders.

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

2.5. Applicable and Reference Documents

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

2.6. Body of Document

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

2.7. Appendices

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

## 3. METADATA ON DELIVERABLES

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

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

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

# DID-102 – CWBS and Work Package Descriptions

**DID Issue: IR** **Date: 2013-12-18**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

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

a) A unique identifier traceable to the WBS;

b) A title;

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

d) The scope of the work package;

e) The start date and duration;

f) Required inputs and dependencies;

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

h) Assumptions;

i) Output and work package acceptance criteria;

j) Issue date;

k) Version number; and

l) List of deliverable with delivery milestone.

# DID-105 – Project Schedule

**DID Issue: IR** **Date: 2014-01-06**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

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

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

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

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

# DID-107 – Progress Report

**DID Issue: Tailored for use in DSXR Phase 0**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

Each progress report must answer the following 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.

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

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

5) Schedule variances from the plan, including deviations from schedule and proposed corrective actions for significant variances;
6) Major meetings schedule update;
7) Status of the work in progress, specifically the work performed in the previous calendar period; sufficient sketches, diagrams, photographs, etc. must be included, if necessary, to describe the progress accomplished;
8) The work projected for the next period, and estimated date of completion of next milestone;
9) Outline of technical and programmatic issues, with solutions recommended;
10) Contractual issues, including changes to activities and costs;
11) Subcontracts events, status and issues;
12) Equipment ordered, received, made and assembled;
13) Description of trips or conferences connected with the Contract during the period of the report;
14) Risk status report including previous issues resolved, status of on-going risks (changes, likelihoods and impacts), and identification of new risks, their likelihood and impact, and proposed mitigation action;
15) PA Reporting: A narrative section describing: significant accomplishments during the reporting period, audits performed, significant problems, recommended solutions, and corrective action status, significant changes in the PA organization and program related organizations.
16) Status of all action items from previous review(s) and meeting(s).

# DID-110 – Meeting Agenda

**DID Issue: IR** **Date: 2013-12-19**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

**1 DOCUMENT HEADER:**

a) Title;

b) Type of meeting;

c) Project title, project number, and contract number;

d) Date, time, and place;

e) Chairperson; and

f) Expected duration.

**2 DOCUMENT BODY:**

a) Introduction;

b) Opening Remarks: CSA;

c) Opening Remarks: Contractor;

d) Review of previous minutes and all open action items;

e) Project technical issues;

f) Project management issues;

g) Other topics;

h) Review of newly created/closed action items, decisions, agreements and minutes; and

i) Set or confirm dates of future meetings.

# DID-111 – Minutes of Meetings

**DID Issue: IR** **Date: 2013-12-19**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

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

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

# DID-112 – Action Items Log (AIL)

**DID Issue: IR** **Date: 2013-12-19**

## PURPOSE:

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

## PREPARATION INSTRUCTIONS:

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

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

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

# DID-114 – Phase Closure / Final Report

**DID Issue: Tailored for use in DSXR Phase 0** **Date: 2017-03-08**

## PURPOSE:

The purpose of the Phase Closure/ Final Report is to record formally the history of the Phase (or Project if this is the Final Report), its achievements, financial, material and human resources expenditure, problems encountered and solutions implemented.

## PREPARATION INSTRUCTIONS:

The Phase Closure / Final Report will encompass all the work done in the project during the Phase just ended or for the entire project. It should be a comprehensive summary of the phase or project work with the emphasis on the problems encountered, solutions implemented, successes encountered and lessons learned. It must include sufficient drawings, graphs, tables, figures, sketches and photographs as appropriate. The Phase Closure Report must be a standalone document and must contain at least the following information:

1) Executive Summary.
2) Comparison of mission and system requirements against user requirements and objectives.
3) Comparison of run-out costs with estimates by major Work Package (if applicable).
4) Comparison of actual versus planned schedules and milestones.
5) Comparison of risks anticipated versus actual experience.
6) Problems encountered and solutions implemented.
7) Final CDRL.
8) Lessons learned.

# DID-204 – Mission Feasibility Study

**DID Issue: IR** **Date: 2014-02-18**

## PURPOSE:

The feasibility report is used to assess the strengths and weaknesses of the proposed mission and its objectives. It must determine the practicality of the mission objectives, evaluate the prospects of success and provide recommendations based on the findings of the report.

---

## PREPARATION INSTRUCTIONS:

The document must include the following:

1) an introduction including the scope, the purpose and a list of assumptions (if any);
2) a list of applicable and reference documents (if any);
3) a short description of the mission including the mission objectives, performance criteria , the overall requirements of the spacecraft (BUS, sub-systems), the payload(s), the ground segment and user terminals.
4) define the success criteria for the mission and analyze the current status of the project for comparison
5) Assess present and future needs
6) Define alternatives to meet those needs
7) Evaluate viable alternatives (note: consider the most applicable approach for the mission)
    a) Experimental approach: demonstrate the viability of achieving the performance criteria for each mission objective through experimental data and results.
        i) The experimental data and results must be compared to the applicable theories. Any divergence between theory and experiment must be explained and suggestions are to be made for possible improvements to reduce the deviation between experimental results and theory.
    b) Analytical approach: demonstrate the viability of achieving the performance criteria for each mission objective through previously obtained experimental data and flight demonstration results.
        i) The contractor must demonstrate the applicability of the analytical data used to evaluate the feasibility of the performance criteria of the mission objectives. The contractor must provide a description of the methods used to obtain the analytical data and present the applicability of the analytical data to the current mission.
        ii) The contractor must propose improvements/changes to obtain the analytical results to conform to the current mission performance criteria and applicable theories.
8) Identify and develop the preferred solution
9) Programmatic Aspects:

a) Provide an estimation of the cost of developing the most viable technologies that are essential to the completion of the project.

b) Provide a realistic timeline of the development of the viable technologies

c) Deduce from cost and scheduling estimations; the most cost and time efficient technology to develop and apply in the project.

d) State the benefits of the technological developments and the project itself toward Canada in social and economic terms.

Any appendices required to provide detailed information pertinent to the mission requirements that is not suitable to be contained in the main document as explanatory notes.

# DID-320 – Product Assurance and Implementation Plan

**DID Issue: IR** **Date: 2014-01-17**

## PURPOSE:

The Product Assurance Implementation Plan (PAIP) describes the organization, objectives, and PA activities planned for the project. The PAIP provides the Government with insight into the Contractor's PA organization, tasks, and activities and allows the Government to assess compliance with the governing PA requirements specified in the PAR Document and in this SOW.

---

## PREPARATION INSTRUCTIONS:

The PAIP may be prepared in the Contractor's format and shall, as a minimum, provide the following information, to the extent it is applicable in the Phase(s) covered by this SOW:

**1. INTRODUCTION**

1.1. Purpose and Scope

1.2. General Approach to Product Assurance

This section provides an overview of the objectives to be achieved by the plan.

1.3. Document Conventions

**2. APPLICABLE AND REFERENCE DOCUMENTS**

2.1. Applicable Documents

This section lists applicable documents that will be followed in the implementation of the PAIP.

*2.1.1. CSA Documents*

*2.1.2. In-house PA procedures*

*2.1.3. General standards and practices (Military, NASA, Industry, Software, etc.)*

2.2. Reference Documents

This section lists documents that provide additional information or guidelines, but that are not compulsory.

**3. PRODUCT ASSURANCE PROGRAM**

3.1. General Requirements and Approach to Product Assurance

3.2. QA System, ISO 9001 or Equivalent

3.3. Responsibility

3.4. PA Organization

This section identifies the organizations in the company responsible for applying the provisions of the PAIP: organizational structure, relationships to other organizations within the project and company, including personnel identification and required skill levels.

3.5. Audits

This section describes the audits to be performed throughout the life of the project including an audit schedule to be approved by the CSA S&MA representative. This applies to the Contractor and the subcontractors.

3.6. Mandatory Inspections

3.7. Right of Access/Observation

This section covers government rights to access the premises and the program data including: a list of all reviews Government representatives may attend, a list of all audits the Government may conduct, and any special agreements or conditions of access, including Subcontractor Audits;

3.8. Project Reviews

3.9. PA Reporting

This section describes the plans for monitoring the different phases of the program development, for problem reporting and for ensuring that corrective actions are taken.

*3.9.1.CSA Notification*

This section specifies the frequency, format, and content of the PA reports submitted to program management to report program progress as well as problems, risks, and proposed solutions.

*3.9.2.Requests for Deviations and Waivers*

3.10. Product Assurance at Subcontractors Facilities

**4. QUALIFICATION PROGRAM**

This section presents parts, materials and processes control plans that describe the approach, methods, procedures and organization that will be implemented to assure compliance to the parts/materials/processes program requirements. This shall include a commercial parts control plan in accordance with the requirements of the S&MA Requirements.

4.1. General

4.2. Classification for Qualification Status

4.3. Qualification Philosophy

4.4. Qualification Status Reviews

4.5. Qualification Process Requirements

4.6. Qualification Status List

4.7. Qualification of Parts

*4.7.1.Parts Qualification – General*

*4.7.2.Application-specific Integrated Circuits (ASICs)*

*4.7.3.GIDEP / ESA Alerts*

4.8. Qualification of Material and Processes

4.9. Software Qualification

10.4. Safety Activities

*10.4.1. Design*

*10.4.2. Manufacturing*

*10.4.3. AIT*

*10.4.4. Launch*

**APPENDIX A PA COMPLIANCE MATRIX**

This Appendix presents a matrix testifying to the compliance with the applicable PA Requirements. The compliance matrix shall include as a minimum the following:

a) Indicate the PAR specification paragraph and requirement;

b) Indicate the PAIP corresponding paragraph to address the requirement in the CSA PAR;

c) Indicate Compliance I or Non-compliance (NC) and reasons for NC; and

d) List of the contractor PA and process documents that will be used to address a requirement.

**APPENDIX B ACRONYMS**

# DID-400 – System Requirements Document

**DID Issue: A** **Date: 2017-04-11**

## PURPOSE:

To define the functional, performance, environmental and other requirements for a given system, segment, subsystem, unit, module or assembly and to provide the basis on which the Specifications Documents will be developed.

*NOTE: Requirements Documents are sometimes called "Requirements Specification". This DID applies to them as well.*

---

## PREPARATION INSTRUCTIONS:

1) Requirements documents shall conform to norms of English usage for Systems Engineering:

   "shall" indicates a mandatory requirement

   "should" indicates a preferred but not mandatory alternative,

   "will" indicates statement of intention or fact

   "may" indicates an option.

2) Requirements documents shall define the requirements on the subject item (segment, subsystem, etc.) as a whole and shall not contain specific requirements on sub-items. All requirements shall be verifiable on the item as integrated.

3) All requirements shall be documented in the MBSE model and requirements documents expressed from the model *(Optional)*.

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

5) There shall be one set of requirements for each node in the System Hierarchical Tree. Note that interface requirements (which are between two or more nodes) are in separate documents.

6) Requirements shall conform to the following standards for quality:

   a) They shall be unambiguously clear to the intended readership;

   b) There shall be one requirement per paragraph;

   c) Each requirement shall have a unique identifier (e.g. an ID number or paragraph number);

   d) They shall not define design solutions;

   e) They shall define their source and/or rationale

   f) They shall be verifiable, preferably by test;

   g) They shall specify the conditions under which they apply; and

   h) Performance requirements shall be quantified.

7) The Requirements Document shall comprise a number of sections, each defining a specific set of requirements. The document shall address all of the following categories of requirements, as applicable to the project:
    a) Functional and performance requirements (see item 8) below);
    b) External interface requirements (unless done in a separate document);
    c) Resource allocation requirements,
    d) Design requirements;
    e) Construction requirements (see item 9) below);
    f) Environmental requirements (see item 10) below),
    g) Qualification and/or verification requirements;
    h) Safety requirements
    i) System environmental requirements associated with:
        i) Storage, packaging and handling environment
        ii) External stowage requirements, if any;
        iii) Ground operations environment
        iv) Integration to launch vehicle environment (for flight payload only)
        v) Launch environment (for flight payload only)
        vi) On-orbit environment (for flight payload only)
    j) Operational requirements, (unless done in a dedicated document),;
    k) Ground Support Equipment requirements, if any (unless done in a separate document); and
    l) Other applicable requirements types.
8) Functional and performance requirements shall include:
    a) Functional and performance requirements imposed on the system by the needs (flow down from MRD);
    b) Operating modes requirements;
    c) Power requirements including:
        i) Power consumption,
        ii) Power transients,
        iii) Voltage requirements;
    d) Telemetry and Telecommand requirements;
    e) Software requirements;
    f) Other applicable requirements.
9) Construction requirements shall include, as applicable to the project:
    a) Requirements associated with materials, parts and processes;

b) Physical requirements including
    i) mass properties,
    ii) envelopes,
    iii) physical attributes (# of samples, etc.);
c) Containment requirements.

10) Environmental requirements shall address the following, as applicable to the project:
a) Environmental test factors;
b) Protoflight and Qualification testing, philosophy and factors;
c) Environmental Design and Test Requirements:
    i) Structural/Mechanical Design Requirements,
    ii) Thermal Design requirements,
    iii) Grounding requirements
    iv) Electrostatic and EMC Design requirements,
    v) Atmospheric Environment,
    vi) Radiation Environment,
    vii) Meteoroid and orbital debris environment, and
    viii) Cleanliness and contamination environment;
d) Subsystem and Component requirements Item c) applied to subsystem and units.

# DID-450 – Systems Engineering Management Plan (SEMP)

**DID Issue: IR** **Date: 2014-01-24**

## PURPOSE:

To define and describe the approach to and details of System Engineering activities to be performed by the Contractor and its lower-tier contractors.

---

## PREPARATION INSTRUCTIONS:

The SEMP shall cover all engineering activities to be performed within the applicable contractual time and responsibility boundaries. The System Engineering Management Plan (SEMP) shall describe how a fully integrated engineering effort will be managed and conducted through design, analysis, development, integration, and testing of the system. It shall highlight key engineering methods and tools to be applied, and describe interfaces to external activities. It shall also reference and make use of the lower-tier Engineering Management Plans, and provide a coherent and consistent planning document for the entire Contractor Engineering program.

The SEMP shall include the following data, tailored to the specific needs of each project. See the CSA Systems Engineering Management Plan (SEMP) Template, CSA-SE-PL-0001, Rev. A for more details. Where one of the items listed below is the subject of a separate document, the SEMP shall merely include a pointer to that document.

**1. INTRODUCTION**

1.1. Purpose

1.2. Scope

1.3. Relationship to other standards and plans

**2. DOCUMENTS**

2.1. Applicable Documents

2.2. Reference Documents

**3. PROJECT OVERVIEW**

3.1. Mission Description

3.2. Project Objectives and Constraints

3.3. System Description

3.4. Project Phases and Reviews

**4. APPROACHES AND TECHNIQUES**

4.1. Systems Engineering Process

4.2. SE Management and Control

*4.2.1.SE Management*

*4.2.2.Technical Organisation*

*4.2.3.Responsibility Allocation*

*4.2.4.Systems Engineering Working Group (SEWG)*

*4.2.5.Technical Reviews and Audits*

*4.2.6.Design and Development Plan*

*4.2.7.Technology Readiness Levels*

*4.2.8.Interface Management*

*4.2.9.Technical Performance Measures (TPM) Management*

*4.2.10. Environmental Engineering*

*4.2.11. Human Factors Engineering*

*4.2.12. Software Development*

*4.2.13. Schedule and Cost*

*4.2.14. Risk Management*

*4.2.15. Procurement*

*4.2.16. Documentation*

*4.2.17. Configuration Management*

4.3. Requirements Engineering

*4.3.1.Requirements Generation*

*4.3.2.Requirements Maintenance*

4.4. Requirements Analysis, Functional Analysis/Allocation and Synthesis/Design

4.5. Manufacturing, Software Development and AIT

*4.5.1.Manufacturing*

*4.5.2.Software Development*

*4.5.3.Assembly, Integration and Test*

*4.5.4.Handling, Storage and Shipping*

4.6. Verification

*4.6.1.Verification Strategy and Verification Plan*

*4.6.2.Space Environmental Qualification Program*

*4.6.3.Verification Process*

*4.6.4.Verification Categories*

*4.6.5.Verification Implementation*

4.7. Validation

*4.7.1.Validation Strategy and Validation Plan*

# DID-501 – Interface Control Document (ICD)

**DID Issue: IR** **Date: 2014-01-16**

## PURPOSE:

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

---

## PREPARATION INSTRUCTIONS:

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

Examples of External ICDs are:

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

Examples of Internal ICDs are:

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

Systems may be manned or unmanned; they may be space or ground systems such as Ground Segment facilities. The specific requirements below must be tailored accordingly.

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

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

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

6.4. Envelope, Volume and Mass Properties

6.5. Attachment methods

6.6. Alignment features

7. Structural/Mechanical Interfaces

7.1. Applied Loads and Disturbances (including random vibrations, frequency spectrum)

7.2. Acoustics

7.3. Depressurization/Repressurization

7.4. Ground Handling Environment

8. Thermal/Fluids Interfaces

8.1. General Requirements (touch temperature, condensation prevention, etc.)

8.2. Thermal Environment

8.3. Payload/Subsystems Cooling

8.4. Vacuum Exhaust Interfaces

9. Electrical Power Interfaces

9.1. Electrical Power Requirements, Sources and Allocation

9.2. Power Supply characteristics and limits

9.3. Overload protection and limits

9.4. Power control

9.5. Electrical connectors (types, pinouts, locations, mating and demating)

9.6. Cable schematics

10. Electromagnetic Compatibility (EMC)

10.1. EMC Classifications

10.2. Host system produced interference environment

10.3. Payload produced interference environment

10.4. Bonding and grounding

10.5. Power and signal circuits isolation

11. Command and Data Handling (C&DH)

11.1. Communications Technology (RS-422, Ethernet, Analog, Discrete, video, laptop, etc.)

11.2. Signal Characteristics

11.3. Response / Telemetry Format

11.4. Request/Command Format

11.5. Processing Requirements

11.6. Connector/Pin Interface

11.7. Data Acquisition, Storage and Management

11.8. Synchronization

11.9. Application Programming Interfaces

12. Environmental Interfaces

    Any environmental factors not addressed elsewhere in the ICD (e.g. radiation, atmosphere, illumination, etc.)

13. Materials and Processes Interfaces
14. Human Factors Interfaces
15. Propulsion Interfaces
16. Pyrotechnic Interfaces
17. Fire Prevention
18. Ground Operations and scientific data processing

    18.1. Facilities

    18.2. Payload Handling

    18.3. Ground Support Equipment (GSE)

    18.4. Communications Requirements

    18.5. Power Requirements

    18.6. Special Equipment

    18.7. Storage

# DID-600 – CAD Models

**DID Issue: IR** **Date: 2014-01-16**

## PURPOSE:

To provide a 2D or 3D virtual model of a product to support the performance of various analyses (mechanical, electrical, thermal, optical) and virtual testing.

## PREPARATION INSTRUCTIONS:

All CAD models developed must be delivered.

Models must be delivered in the following formats:

a) Mechanical design: STEP AP203 (.stp) and in JT2GO (.jt) and PDF (with 3-D viewing);

b) Electrical design: .dsn, .sch, Pspice and Gerber formats;

c) Thermal Design: TMG universal file format, or I-Deas Archive file format;

d) Software design: UML 2.0 or XML;

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

f) Optical design models: Zemax

In cases where a different tool is used from the one CSA uses, the model and outputs must be supplied in native format in addition to the required format. For generic modeling and analysis that don't use a specialty tool, CSA will accept Matlab, Excel and MathCad format data. Where a highly specialized tool is used (e.g. bearing analysis, EMC analysis) delivery format must be negotiated with the CSA. 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.

Assumptions that are used must be stated, along with resulting limits on model accuracy.

# DID-700 – System Conceptual Design Document

**DID Issue: A** **Date: 2017-04-11**

## PURPOSE:

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

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

---

## PREPARATION INSTRUCTIONS:

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

**Preliminary form**

The preliminary document must include the following:

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

**Final form**

The final document must include the following:

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

8) Tests: summarizing the tests to be performed to verify the performance and environmental requirements;
9) Operations concepts: summarizing the operations of the system in both nominal and contingency conditions;
10) Maintenance approach: describing the maintenance approach especially for maintainable items such as the spares for manned systems, flight software and ground systems;
11) Verification Matrix: To demonstrate design compliance to system requirements by providing clear link between design and requirements. Indication of design compliance, non-compliance and partial compliance.

# DID-801 – Ground Segment Facility Requirements Specification

**DID Issue: IR** **Date: 2014-02-12**

## PURPOSE:

To determine the upgrade(s) required to existing Government Ground Segment (GS) facilities to meet the operations requirements of a new system.

---

## PREPARATION INSTRUCTIONS:

The GS Facility Requirements Specification shall contain the following information, as a minimum:

**1. INTRODUCTION**

- 1.1. Purpose
- 1.2. Scope
- 1.3. Intended Audience
- 1.4. Assumptions
- 1.5. Document Overview

**2. DOCUMENTS**

- 2.1. Applicable Documents
- 2.2. Reference Documents

**3. FACILITY REQUIREMENTS**

- 3.1. GS Facility Requirements
- 3.2. Operations Support Infrastructure
- 3.3. Office Accommodations
- 3.4. Network Infrastructure Requirements

**4. FACILITY UPGRADES**

- 4.1. Existing Government Facilities

  *List of existing subsystems such as Planning Subsystem, Spacecraft Control Subsystem, etc.*

- 4.2. New Government Facilities

  *List of new subsystems that are required.*

**APPENDIX A EXISTING GOVERNMENT FACILITIES EQUIPMENT REPORTS**

# DID-825 –System Concept of Operations

**DID Issue: IR** **Date: 2014-02-06**

## PURPOSE:

To define the overall end-to-end System Concept of Operations.

## PREPARATION INSTRUCTIONS:

This document must be prepared in accordance with standard ANSI/AIAA G-043-1992 – Guide for the Preparation of Operational Concept Documents (RD-05).

The System Concept of Operations must contain the following information:

1) Introduction including the scope, the purpose and a list of assumptions (if any);
2) Description of the overall concept of operations that proves the feasibility of command and control, housekeeping and payload data acquisition, downlinking, turnaround time, processing, analysis and distribution and payload calibration;
3) System operations requirements and constraints:
    a) System description,
    b) End-users description and requirements,
    c) System Health and Safety requirements,
    d) Programmatic and operational constraints,
    e) Relationship with other missions / programs,
    f) External dependencies or interfaces with other organizations;
4) Space segment characteristics including spacecraft monitoring and control, and spacecraft modes;
5) Ground segment characteristics including Command & Control and Data Reception for the LEOP, commissioning phase and routine operations phase;
6) System operations concepts:
    a) Planning processes,
    b) Operations execution processes,
    c) Evaluation processes,
    d) Data Reception,
    e) Data Transfer,
    f) Data processing,
    g) Data turnaround time,
    h) Instrument calibration,

i) Support processes,

j) Operations team,

k) Orbit determination and maintenance;

7) Operational Scenarios.

# C CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY

## C.1 PURPOSE

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

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

## C.2 DEFINITIONS

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

## C.3 INSTRUCTIONS FOR COMPLETING IP DISCLOSURE TABLES

Identification

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

BIP

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

FIP

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

General Instructions for BIP and FIP tables

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

**TABLE C-1: CONTRACTOR DISCLOSURE OF INTELLECTUAL PROPERTY**

| | | |
|---|---|---|
| 1. | Contractor Legal Name: | |
| 2. | Project Title supported by the Contract: | |
| 3. | CSA Project Manager of the Contract: | |
| 4. | Contract #: | |
| 5. | Date of the disclosure: | |

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

- ☐ Yes – Complete Table C-2 – Disclosure of Background Intellectual Property
- ☐ No

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

- ☐ Not applicable, FIP resides with the Contractor
- ☐ Yes – Complete Table 5 5 – Canada's Owned Additional Information
- ☐ No

For the Contractor:

| | |
|---|---|
| | |
| Signature | Date |

For CSA Project Manager:

| | |
|---|---|
| | |
| Signature | Date |

## TABLE C-2: BIP DISCLOSURE

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

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

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

| Robotic Functions | Rationale & Value Added to Mission |
|---|---|
| 1) Habitat inspection; | The ability to position the tip of a robotic arm with cameras and/or sensors on the end can enable the in-flight inspection of the Habitat vehicle and its subsystems to observe both nominal and off-nominal operations. |
| 2) Crewed vehicle inspection | The ability to position the tip of a robotic arm with cameras and/or sensors on the end can enable the in-flight inspection of critical regions on the crewed vehicle such as thermal protection surfaces. |
| **Visiting Vehicle (or new Outpost module) operations support** | |
| 3) Berthing/Docking interface inspection | A robotic manipulator can perform a visual inspection of the berthing/docking interface to verify integrity of the interface seals and mechanisms and other critical features. |
| 4) Free-Flyer Capture | A robotic manipulator on the Habitat can provide free-flyer capture capability so as to support the resupply of the facility and offer the mission an alternate/backup capability to direct docking. Visiting vehicles can be autonomously captured and berthed for unloading of pressurized (via crew) or unpressurized (via robotics) cargo. |
| 5) Vehicle/Module berthing (up to soft-capture, then release prior to hard dock) | In addition to providing functional redundancy to logistics resupply architecture, the use of berthing rather than docking enables larger volume equipment to be transferred from the vehicle to the Habitat |
| 6) Cargo unloading/loading | Robotics will enable the remote or autonomous transfer of unpressurized cargo from visiting vehicles to Gateway to support station resupply activities even during unmanned periods in the mission. |
| 7) Vehicle/Module relocation between ports | A robotic arm allows for a flexible configuration of the Cis-lunar Habitat by providing the ability to relocate modules and vehicles to manage and optimize the occupied nodes. |
| 8) Visiting vehicle inspection | The ability to position the tip of a robotic arm with cameras and/or sensors on the end can enable the in-flight inspection of critical regions on visiting vehicles (those designed for non-destructive re-entry to Earth) such as thermal protection surfaces. |
| 9) Visiting vehicle unberthing and release | A robotic manipulator on the Habitat can provide the mission an alternate/backup capability to direct undocking of visiting vehicles. |

| Robotic Functions | Rationale & Value Added to Mission |
|---|---|
| **Extra-Vehicular Activity (EVA) support** | |
| 10) EVA viewing and monitoring | The ability to position the tip of a robotic arm with cameras and/or sensors on the end can provide mission managers (on the Earth), public relations, and the EVA crew themselves a birds-eye-view of the activities for improved situational awareness. |
| 11) Direct EVA support for planned and unscheduled Outpost maintenance | As has been demonstrated with over 30 years of space shuttle and international space station operations, manifesting a robotic arm can provide the crewed phases of the mission with an efficient, reconfigurable, and stable EVA platform. |
| **Extra-Vehicular Robotic (EVR) Maintenance and Logistics Operations** | |
| 12) Relocation of modules | The use of robotics to conduct the replacement of external ORUs offers the ability to reduce the demand for EVA during crewed phases and enable continued maintenance of the facility during un-crewed phases. |
| 13) Relocation of sensor (e.g. rendezvous sensor) packages | Using a manipulator to relocate rendezvous sensor packages between the various Cis-lunar habitat docking ports enables efficient reuse of mass where, rather than integrating a rendezvous sensor on each visiting vehicle, a single sensor system can be manifested on the habitat and used to support rendezvous of all visiting vehicles to each of the docking ports. |
| 14) Launching of science payloads | The ability to perform controlled ejection of components in any direction provides the mission the ability an option for Habitat waste management as well as to offer the capability to deploy microsatellites (delivered to Cis-lunar via visiting vehicles) to deep space. |
| 15) Jettisoning spent components | The ability to perform controlled jettisoning of components in any direction provides the mission an option for Habitat waste management. I.e. rather than storing waste within the volume-limited habitable environment of the Cis-lunar vehicle, a vehicle airlock can be used to transfer waste containers to the external environment for the manipulator to retrieve and dispose of. |
| **Support to lunar missions** | |
| 16) Transfer dirty samples to Outpost airlock | The mission is seeking to have a geological sample from the moon returned to the Cis-lunar Transit Habitat by a robotic spacecraft. The sample is located within a canister or container that can be removed using the robotic manipulator. In this scenario, the robotic manipulator grapples the sample container and removes it from the robotic lunar lander. The robotic manipulator then moves the sample container to an airlock which allows the Cis-lunar Transit Habitat crew to then access the sample container from within the pressurized habitat environment. |

# E ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AD | Applicable Document |
| AI | Action Items |
| AIL | Action Items Log |
| BIP | Background Intellectual Property |
| CA | Contract Authority |
| CASCA | Canadian Astronomical Society |
| CDRL | Contract Data Requirements List |
| CM | Configuration Management |
| ConOps | Concept of Operations |
| CSA | Canadian Space Agency |
| CWBS | Contract Work Breakdown Structure |
| DID | Data Item Description |
| DSXR | Deep Space Exploration Robotics |
| FIP | Foreground Intellectual Property |
| GFE | Government Furnished Equipment |
| GS | Ground Segment |
| GSE | Ground Support Equipment |
| ICD | Interface Control Documents |
| IP | Intellectual Property |
| ISS | International Space Station |
| IVR | Intra-Vehicular Robotics |
| KoM | Kick-off Meeting |
| LEOP | Launch and Early Operations |
| LRP | Long Range Plan |
| LV | Launch Vehicle |
| MAR | Mission Assurance Requirements |
| MCR | Mission Concept Review |
| MDP | Mission Development Plan |
| MM | Mission Manager |
| MRD | Mission Requirements Document |
| MRR | Mission Requirements Review |
| NASA | National Aeronautics and Space Administration |
| OGD | Other Government Departments |
| OpRR | Operation Requirement Review |
| PA | Product Assurance |

| | |
|---|---|
| PFR | Performance and Functional Requirements |
| PM | Project Manager |
| RD | Reference Document |
| RID | Review Items Discrepancy |
| SLA | Stereolithography |
| SOW | Statement Of Work |
| TA | Technical Authority |
| TB | Treasury Board |
| TBC | To Be Confirmed |
| TBD | To Be Determined |
| TRRA | Technology Readiness and Risk Assessment |
| TRL | Technology Readiness Level |
| TRM | Technology Roadmap |
| WBS | Work Breakdown Structure |
| WPD | Work Package Description |
| XML | Extensible Markup Language |

## TABLE OF CONTENTS

**CHANGE OF ADDRESS-BIDS DELIVERY**
**For bids delivered starting Monday 8th, 2017: In person or by mail:**

**PLACE BONAVENTURE, 1ST FLOOR, Local 1110**

**800 DE LA Gauchetière Street West,**

**Suite 1110, Montréal, (QC) H5A 1L6**

## PART 1 - GENERAL INFORMATION

1.1 Introduction

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

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

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

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

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

Part 5 Certifications: includes the certifications to be provided;

Part 6 Financial Requirements: includes specific 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 following Annexes and Attachments**:

Annex A Statement of Work
Annex B Basis of Payment-Firm Price
Annex B-1 Basis of Payment-Optional Services
Annex C Non-Disclosure Agreement
Attachment 1 to Part 2 Mandatory Non-Disclosure Agreement
Attachment 1 to Part 3 Technical and Managerial Bid Preparation Instructions
Attachment 1 to Part 4 Point Rated Evaluation Criteria
Attachment 1 to Part 5 Federal Contractors Program for Employment Equity-Certification

## 1.2 Summary

**Project title**

Deep Space Exploration Robotics (DSXR) Phase 0

**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 project entitled DSXR Phase 0. Canada has participated in international discussions to determine the next step for human exploration. A common long term goal is the human exploration of Mars. One step towards this long term goal is demonstrating and proving technologies beyond LEO. A deep-space habitat platform in a lunar orbit will extend human presence and further demonstrate and prove technologies and operations at a larger distance from Earth, which is described in the Global Exploration Roadmap (2013).

A Deep-Space Exploration Robotic System (DSXR) is a critical capability and a potential Canadian contribution. As such, a Phase 0 study is solicited so as to inform Canada on key aspects of a DSXR mission. Like the Canadarm2 on the ISS, a DSXR System will assure the logistics and maintenance and assembly of this outpost. Phase 0 essentially is the “Mission Definition Phase” during which, based on Mission Objectives and Users’ Needs, all mission definition activities are performed and Mission Requirements are developed. One key result of a Phase 0 is to provide information for Canada to clearly understand the mission feasibility, options, costs, schedule, and risks associated with a DSXR contribution. Furthermore, at the end of the Phase 0 study, Canada should have all the technical and programmatic information necessary to make an informed decision about a potential DSXR system contribution and for subsequent immediate next steps.

Work requirements include elements associated with mission analysis, planning and development, mission operations, systems engineering, trades assessments, support to CSA with respect to the overall deep-space habitat mission development, and project management of the study.

**Period of Contract**
The contract will be issued for a period of twelve (12) months and one (1) year option.

**Intellectual Property**
The Intellectual Property will vest to the Crown.

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

**Integrity provisions for procurement**
As per the Integrity Provisions under section 01 of *Standard Instructions* 2003 *and* 2004, bidders must provide a list of all owners and/or Directors and other associated information as required. Refer to section 4.21, 5.16 and 8.70.2 of the *Supply Manual* for additional information on the Integrity Provisions.

**Former Public Servant**
For services requirements, Bidders must provide the required information as detailed in article 2.3 of Part 2 of *the bid solicitation*, in order to comply with Treasury Board policies and directives on contracts awarded to former public servants. Please also refer to Part 5 – Certifications.

**Trade agreements**
This requirement is not subject to the trade agreements.

**Canadian Content**
The requirement is limited to Canadian goods and/or services.

**Federal Contractors Program for Employment Equity**
The Federal Contractors Program (FCP) for employment equity applies to this procurement; see Part 5 – Certifications and Part 7 - Resulting Contract Clauses.

**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 fifteen (15) working days from receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

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

## 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-conditionsmanual) issued by Public Works and Government Services Canada.
Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The 2003 (2017-04-27) 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: 240 days

### 2.1.1 Mandatory Non-Disclosure Agreement Requirement

If a Supplier or a subcontractor wishes to review the Reference documents, it must request these documents from the Contracting Authority listed below through e-mail. The documents mentioned above contains information that is confidential or proprietary to Canada or third party. The Supplier or any subcontractor 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 these documents. All Suppliers must return the documents at the end of the RFP period, or upon request from the Contracting Authority within thirty (30) days following that request.

### 2.2 Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid **Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation:**
**Public Works and Government Services Canada**
**Quebec Region**
**Place Bonaventure, South-East Portal**
**800 de La Gauchetière Street West**
**1st Floor, Local 1110, Montreal, Quebec,**
**Canada, H5A 1L6**

**Due to the nature of the bid solicitation, bids transmitted by facsimile or by electronic mail 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 with FPS, bidders must provide the information required below before contract award. If the answer to the questions and, as applicable the information required have not been received by the time the evaluation of bids is completed, Canada will inform the Bidder of a time frame within which to provide the information. Failure to comply with Canada's request and meet the requirement within the prescribed time frame will render the bid non-responsive.

**Definitions**

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

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

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

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

**Former Public Servant in Receipt of a Pension**

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

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

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

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

**Work Force Adjustment Directive**

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

**If so, the Bidder must provide the following information:**

a. name of former public servant;

b. conditions of the lump sum payment incentive;
c. date of termination of employment;
d. amount of lump sum payment;
e. rate of pay on which lump sum payment is based;
f. period of lump sum payment including start date, end date and number of weeks;
g. number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.
For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is $5,000, including Applicable Taxes.

### 2.4 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 Maximum Funding

The maximum available funding, applicable taxes extra, as appropriate, for the contract for the purposes of this bid solicitation is $2,750,000.00 (Applicable Taxes extra, as appropriate). Bids valued in excess of this amount will be considered non-responsive, pursuant to Part4-Evaluation Procedures and Basis of Selection, Section 4.1.2-Financial Evaluation. This disclosure does not commit Canada to pay the maximum funding available.

### 2.8 Basis for Canada's Ownership of Intellectual Property

**The Canadian Space Agency (CSA) has determined that any intellectual property rights arising from the performance of the Work under the resulting contract will belong to Canada, on the following grounds:**

-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 expanded Background to the private sector, through licensing or assignment of ownership (not necessarily to the original Contractor), for the purposes of Commercial Exploitation.

## PART 3 - BID PREPARATION INSTRUCTIONS

### 3.1 Bid Preparation Instructions

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

Section I: Technical and Managerial Bid, Executive Summary (in separate stand-alone documents) **one (1) paper copy and two (2) electronic copies on CD or USB**
Section II: Financial Bid **one (1) paper copy and one (1) electronic copy on CD or USB**
Section III: Certifications **one (1) paper copy**

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

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

For the electronic copies of Section I (Technical and Managerial Bid and Executive Summary), all of the information must be contained in one file. The only acceptable formats are: MS Word, PDF and HTML;

For the electronic copy of Section II (Financial Bid), all of the information must be contained in one file. The only acceptable formats are: MS Word, PDF and HTML;

The electronic copy of Section II must be submitted on a separate CD or USB than the electronic copy submitted for Section I;

Prices must appear in Section II (Financial Bid) only. No prices must be indicated in any other section of the bid;

The total number of pages for Section I should not exceed 50 pages (8.5 X 11 inches) 216 mm X 279 mm) paper excluding bid appendices;

The bid should use a numbering system that corresponds to the bid solicitation;
In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process Policy on Green Procurement (http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achatsprocurement/politique-policy-eng.html). To assist Canada in reaching its objectives, bidders should:

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

The bid should use a numbering system that corresponds to the bid solicitation;

The bidder should ensure that the cover page in their bid (Section I, II and III) includes the following table duly filled out:

| Company Name | Company address |
|---|---|
| **Project Title** | **Title of the Request for Proposal: Deep Space Exploration Robotics (DSXR) Phase 0** |
| | |
| **Project summary (7 lines)** | |

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

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

Part 4: *Evaluation Procedures and Basis of Selection* contains additional instructions that bidders should consider when preparing their technical and managerial bid.

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

**Section II: Financial Bid**
**3.1.1** Bidders must submit their financial bid in accordance with the basis of payment Annex B, and Annex B-1-Optional Services, included in the Request for Proposal. The total amount of Applicable Taxes must be shown separately.

Prices must be in Canadian funds, Applicable Taxes excluded and Canadian customs duties and excise taxes included.

**3.1.2 Price Breakdown**

Bidders are requested to detail the following elements for the performance of each task, milestone or phase of the Work, as applicable:

(a) Labour: For each individual and (or) labour category to be assigned to the Work, indicate: i) the hourly rate, inclusive of overhead and profit; and ii) the estimated number of hours.

(b) Equipment: Specify each item required to complete the Work and provide the pricing basis of each one, Canadian customs duty and excise taxes included, as applicable.

(c) Materials and Supplies: Identify each category of materials and supplies required to complete the Work and provide the pricing basis.

(d) Travel and Living Expenses: Indicate the number of trips and the number of days for each trip, the cost, destination and purpose of each journey, together with the basis of these costs which must not exceed the limits of the National Joint Council (NJC) Directive. With respect to the National Joint Council (NJC) Travel Directive, only the meal, private vehicle and incidental allowances specified in Appendices B, C and D of the Directive (http://www.njc-cnm.gc.ca/directive/travel-voyage/index-eng.php), and with the other provisions of the directive referring to “travellers”, rather than those referring to “employees” are applicable. All travel must have prior authorization of the Project Authority. All payments are subject to government audit.

(e) Subcontracts: Identify any proposed subcontractor and provide for each one the same price breakdown information as contained in this article.

(f) Other Direct Charges: Identify any other direct charges anticipated, such as long distance communications and rentals, and provide the pricing basis.
(g) Applicable Taxes: Identify any Applicable Taxes separately.

**Section III: Certifications**
Bidders must submit the certifications 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 managerial evaluation criteria;

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

#### 4.1.1 Technical and Management Evaluation

##### 4.1.1.1 Mandatory Technical Criterion

The Mandatory Technical Criterion is described at Attachment 1 to Part 4: Evaluation Criteria for the Technical and Managerial Bid. Bids must meet the mandatory technical criterion. Bids that fail to meet the mandatory technical criterion will be declared non-responsive

##### 4.1.1.2 Point Rated Technical and Management Criteria

The Point Rated Technical and Management Criteria are described at Attachment 1 to Part 4: Point Rated Technical Criteria. **Criteria not addressed will be given a score of zero.**

#### 4.1.2 Financial Evaluation

##### 4.1.2.1 Mandatory Financial Criterion

Bids must meet the mandatory financial criterion. Bidder must respect the maximum funding available under the heading Maximum Funding in Part 2, Section 2.7-Maximum Funding (Applicable Taxes extra, as appropriate).

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

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

##### 4.1.2.2 Evaluation of Price

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

### 4.2 Basis of Selection – Highest Combined Rating of Technical Merit and Price

1) To be declared responsive, each bid must:

(a) comply with all the requirements of the bid solicitation;
(b) meet the mandatory technical criterion and mandatory financial criterion;
(c) obtain the required minimum of 10 points on a scale of 20 points for the Evaluation Criterion #1: Relevance and Merit of the Concept; obtain the required minimum of 10 points on a scale of 20 points for the Evaluation Criterion #2: Feasibility of Achieving Goals and Technical Objective; obtain the required minimum of 10 points on a scale of 20 points for the Evaluation Criterion #3: Understanding the Requirements and Technical Principles; obtain the required minimum of 10 points on a scale of 20 points for the Evaluation Criterion #4: Scope of the Study; obtain the required minimum of 5 points on a scale of 10 points for the Evaluation Criterion #5: Team Capability; and obtain the required minimum of 5 points on a scale of 10 points for the Evaluation Criterion #6: Project Management Plan;

(d) obtain the minimum overall score of sixty (60) points in the evaluation of rated technical criteria. The rating scale contains one hundred (100) points.

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

3. Responsive bids received will be ranked according to their combined score made up of the overall technical score and pricing score. For each responsive bid, the overall technical score and the pricing score will be added to determine its combined score. Bids will be ranked starting from the Bid with the highest combined score down to the lowest combined score resulting in a Responsive Bid List.

4. For each responsive bid, the score obtained for each technical criterion will be added to determine its overall technical score (maximum of 100 points).

5. To establish the pricing score, the following equation will be used:

$$\textbf{pricing score} = \left(\frac{\textbf{max funding} - \textbf{bid price}}{\textbf{max funding}}\right) \textbf{x 50}$$

the pricing score is limited to 10 points. It therefore follows that the maximum pricing score is awarded to bids with a price representing 80% of the maximum funding. Bids with a price lower than 80% funding will receive the maximum score of 10.

6. Neither the responsive bid obtaining the highest overall technical score nor the one with the highest pricing score will necessarily be accepted. The responsive bid with the highest combined score of technical merit and price will be recommended for award of a contract.

In the event that more than one responsive bid has the same combined score, the bid which obtained the highest overall technical score will be recommended for award of a contract.

In the event that all available budget has not been spent, Canada may elect to award a contract to responsive bid that finished second. CSA will make a decision based on the availability of funds.

The table below illustrates an example where all three bids are responsive and the selection of the contractor is determined by adding the overall technical score and pricing scores, respectively. In this example, the maximum funding is 100,000$(100).

**Ex. Basis of Selection – Highest Combined Rating of Technical Merit and Price**

| Bidder | **Bidder 1** | **Bidder 2** | **Bidder 3** |
|---|---|---|---|
| Overall Technical Score | 70 | 85 | 92 |
| Bid Price | $90 000 | $80 000 | $100 000 |
| Calculation of Pricing Score | ((100-90)/100) x 50=5 | ((100-80)/100) x 50=10 | ((100-100/100) x 50=0 |
| Combined Score | 75 | 95 | 92 |
| Overall Rating | 3rd | 1st | 2nd |

## PART 5 – CERTIFICATIONS

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

The certifications provided by bidders to Canada are subject to verification by Canada at all times. Canada will declare a bid non-responsive, or will declare a contractor in default in carrying out any of its obligations under the Contract, if any certification made by the Bidder is found to be untrue, whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

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

### 5.1 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 is not completed and submitted as requested, the Contracting Authority will inform the Bidder of a time frame within which to provide the information. Failure to comply with the request of the Contracting Authority may meet the requirement within that time period will render the bid non-responsive.

#### 5.1.1 Integrity Provision-Required Documentation

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

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

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder ia a Joint Venture, is not named on the federal Contractor Program (FCP) for employment equity «FCP Limited Eligibilty to Bid» list (http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml) available from Human Resources and Skills Development Canada (HRSDC)-Labour's website.

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

#### 5.1.3 Additional Certifications Precedent to Contract Award

##### 5.1.3.1 Former Public Servant

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts with FPS, bidders must provide the information required below before contract award. If

the answer to the questions and, as applicable the information required have not been received by the time the evaluation of bids is completed, Canada will inform the Bidder of a time frame within which to provide the information. Failure to comply with Canada's request and meet the requirement within the prescribed time frame will render the bid non-responsive.

**Definitions**

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

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

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

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

**Former Public Servant in Receipt of a Pension**

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

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

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

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

**Work Force Adjustment Directive**

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

**If so, the Bidder must provide the following information:**

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

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

**5.1.3.2 Canadian Content Certification**

This procurement is conditionally limited to Canadian goods.

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

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

The Bidder certifies that:

( ) a minimum of 80 percent of the total bid price consist of Canadian goods as defined in paragraph 1 of clause A3050T.

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

**5.1.3.2.1** *SACC Manual* clause A3050T (2014-11-27) Canadian Content Definition.

**5.1.3.3 Status and Availability of Resources**
The Bidder certifies that, should it be awarded a contract as a result of the bid solicitation, every individual proposed in its bid will be available to perform the Work as required by Canada's representatives and at the time specified in the bid solicitation or agreed to with Canada's representatives. If for reasons beyond its control, the Bidder is unable to provide the services of an individual named in its bid, the Bidder may propose a substitute with similar qualifications and experience. The Bidder must advise the Contracting Authority of the reason for the substitution and provide the name, qualifications and experience of the proposed replacement. For the purposes of this clause, only the following reasons will be considered as beyond the control of the Bidder: death, sickness, maternity and parental leave, retirement, resignation, dismissal for cause or termination of an agreement for default.
If the Bidder has proposed any individual who is not an employee of the Bidder, the Bidder certifies that it has the permission from that individual to propose his/her services in relation to the Work to be performed and to submit his/her résumé to Canada. The Bidder must, upon request from the Contracting Authority, provide a written confirmation, signed by the individual, of the permission given to the Bidder and of his/her availability. Failure to comply with the request may result in the bid being declared non-responsive.

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

## PART 6 - FINANCIAL AND OTHER REQUIREMENTS

### 6.1 Financial Capability

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

## PART 7 - RESULTING CONTRACT CLAUSES

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

### 7.1 Statement of Work

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

### 7.2 Optional Goods and/or Services

The Contractor grants to Canada the irrevocable option to acquire optional goods and services defined in the Statement of Work, in Annex A, Par. 3.5, 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 covers during a period of up to one (1) year after the baseline contract for Phase 0 activities is deemed completed.

### 7.3 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-andguidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

#### 7.3.1 General Conditions

2040 (2017-04-27), General Conditions - Research & Development, apply to and form part of the Contract:

##### 7.3.1.1 Canada to Own Intellectual Property Rights in Foreground Information

1. The general conditions 2040 are amended by deleting the sections entitled "Records and Disclosure of Foreground Information", Ownership of Intellectual Property Rights in Foreground Information", "Licenses to Intellectual Property Rights in Foreground and Background Information", "Contractor's Rights to Grant Licenses", "Waiver of Moral Rights", "License to Intellectual Property Rights in Canada's Information", "Transfer or License of Contractor's Rights", "Transfer of Intellectual Property Rights upon Termination of the Contract for Default", and "Products Created Using the Foreground Information" in their entirety. This section applies in lieu of those sections.

2. Record Keeping and Provision of Information

    a. During and after the performance of the Contract, the Contractor must keep detailed records of the Foreground Information, including details of its creation. The Contractor must report and fully disclose to Canada all Foreground Information as required by the Contract. If the Contract does not specifically state when and how the Contractor must do so, the Contractor must provide this information if requested by the Contracting Authority, whether before or after the completion of the Contract.

b. Before and after final payment to the Contractor, the Contractor must provide Canada with access to all records and supporting data that Canada considers pertinent to the identification of Foreground Information.

c. For any Intellectual Property that was developed or created in relation to the Work, Canada will be entitled to assume that it was developed or created by Canada, if the Contractor's records do not list that Intellectual Property or do not indicate that it was created by the Contractor, or by someone on behalf of the Contractor, other than Canada.

3. Contractor Requirements

a. All Intellectual Property rights in the Foreground Information belong to Canada as soon as they come into existence. The Contractor has no right in or to any such Intellectual Property Rights in the Foreground Information, except any right that may be granted in writing by Canada.

b. The Contractor must incorporate the copyright symbol and one of the following notices, as appropriate into all Foreground Information that is subject to copyright regardless of the form or medium upon which it is recorded: © Her Majesty the Queen in Right of Canada (year), or © Sa Majesté la Reine du chef du Canada (year).

c. The Contractor must execute any documents relating to the Intellectual Property Rights in the Foreground Information as Canada may require. The Contractor must, at Canada's expense, provide Canada all reasonable assistance in the preparation of applications and in the prosecution of any applications for registration of any Intellectual Property Rights in any jurisdiction, including the assistance of the inventor in the case on inventions.

4. Licensing Requirements

a. The Contractor grants to Canada a license to use the Background Information to the extent that it is reasonably necessary for Canada to exercise fully all its rights in the deliverables and in the Foreground Information. This license is non-exclusive, perpetual, irrevocable, worldwide, fully-paid and royalty-free. The license cannot be restricted in any way by the Contractor providing any form of notice to the contrary, including the wording on any shrink-wrapped license attached to any deliverable.

b. For greater certainty, Canada's license in the Background Information includes, but is not limited to:

i. the right to disclose the Background Information to third parties bidding on or negotiating contracts with Canada and to sublicense or otherwise authorize the use of that information by any contractor engaged by Canada solely for the purpose of carrying out such contracts. Canada will require these third parties and contractors not to use or disclose that

information except as may be necessary to bid, negotiate or carry out those contracts;

ii. the right to disclose the Background Information to other governments for information purposes;

iii. the right reproduce, modify, improve, develop or translate the Background Information or have it done by a person hired by Canada. Canada, or a person designated by Canada, will own the Intellectual Property Rights associated with reproduction, modification, improvement, development or translation.

iv. without restricting the scope of any license or other right in the Background Information that Canada may otherwise hold in relation to any custom-designed or custom-manufactured part of the Work, the right to use and disclose to a contractor engaged by Canada the Background Information for the following purposes:

A. For the use, operation, maintenance, repair or overhaul of the custom-designed or custom-manufactured parts of the Work;

B. In the manufacturing of spare parts for maintenance, repair or overhaul of any custom-designed or custom-manufactured part of the Work by Canada if those parts are not available on reasonable commercial terms to enable timely maintenance, repair or overhaul.

c. The Contractor agrees to make the Background Information, including in the case of Software, the source code, promptly available to Canada for any purpose mentioned above. The license does not apply to any Software that is subject to detailed license conditions that are set out elsewhere in the Contract. Furthermore, in the case of commercial off-the-shelf software, the Contractor's obligation to make the source code promptly available to Canada applies only to source code that is within the control of or can be obtained by the Contractor or any subcontractor.

5. The Contractor represents and warrants that it has the right to grant to Canada the license and any other rights to use the Background Information. If the Intellectual Property Rights in any Background Information are owned by a subcontractor or any other third party, the Contractor must have a license from that subcontractor or third party that permits compliance with paragraph 4 or arrange, without delay, for the subcontractor or third party to grant promptly the required license directly to Canada.

6. If requested by Canada, during and after the Contract, the Contractor must provide a written permanent waiver of moral rights, as defined in the *Copyright Act*, R.S., 1985, c. C-42, from every author that contributes to any Foreground Information subject to copyright protection that is a deliverable to Canada under the Contract. If the Contractor is an author of the Foreground Information, the Contractor permanently waives the Contractor's moral rights in that Foreground Information.

**7.3.2 Supplemental General Conditions**
The following supplemental general conditions apply to and form part of the Contract:
4002 (2010-08-16), Software Development or Modification Services
4003 (2010-08-16), Licensed Software

**7.3.3 Non-disclosure Agreement**
The Contractor must obtain from its employee(s) or subcontractor(s) the completed and signed non-disclosure agreement, attached at Annex C, and provide it to the Contracting Authority before they are given access to information by or on behalf of Canada in connection with the Work.

**7.4 Period of the Contract** *(will be inserted at contract award)*

**7.5 Authorities**

**7.5.1 Contracting Authority**
The Contracting Authority for the Contract is:
Esther Paquin
Contract Specialist
Public Works and Government Services Canada
Quebec Region
7th Floor
Place Bonaventure, South-East Portal
800 de La Gauchetière Street West
Suite 1110,
Montreal, Quebec, H5A 1L6
Telephone: 514-496-3889
Facsimile: 514-496-3822
E-mail address: esther.paquin@tpsgc-pwgsc.gc.ca
The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

**7.5.2 Technical Authority** *(will be inserted at contract award)*
The Technical Authority for the Contract is:
Name : _____
Title : _____
Organization : _____
Address : _____
Telephone: ___ ___ _____
Facsimile: ___ ___ _____
E-mail address: _____
The Technical Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Technical Authority; however, the Technical Authority has no authority

to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

**7.5.3 Contractor's Representative** *(will be inserted at contract award)*
The Contractor's Representative for the Contract is:
Name: _____
Title: _____
Organization: _____
Address: _____
Telephone: ___-___-____
Facsimile: ___-___-____
E-mail: _____

**7.6 Proactive Disclosure of Contracts with Former Public Servants**
SACC Manual Clause A3025C (2013-03-21)

**7.7 Payment**
**7.7.1 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 the Contract for a cost of $ _____ *(the amount will be inserted at contract award).* Customs duties are included and Applicable taxes are extra, if applicable.

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

**7.7.2 Basis of Payment (Limitation of expenditures) (Optional Services)**

Canada's total liability to the Contractor under the Contract must not exceed $ _____ . Customs duties are _____ (*insert "included", "excluded" or "subject to exemption"*) 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:

when it is 75 percent committed, or four (4) months before the contract expiry date, or

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.

**7.7.3 Method of Payment**

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

(a) an accurate and complete claim for payment using form PWGSC-TPSGC 1111 (http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/1111.pdf) and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;

(b) all the certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives;

(c) all work associated with the milestone and as applicable any deliverable required has been completed and accepted by Canada.

**7.7.3.2 Limitation of expenditures (Optional Services)**

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_____ (insert one of the options provided under the Remarks section above.)
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.

**7.7.3.3 Schedule of Milestones**
The schedule of milestones for which payments will be made in accordance with the Contract is detailed in Annex B, Annex B-1.

**7.8 SACC Manual Clauses**

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

**7.9 Invoicing Instructions - Progress Claim - Firm Price**

**7.9.1 Progress Claim - Firm Price**

1. The Contractor must submit a claim for progress payment using form PWGSC-TPSGC 1111 Claim for Progress Payment (http://www.tpsgc-pwgsc.gc.ca/appacq/forms/documents/1111.pdf).

Each claim must show:

(a) all information required on form PWGSC-TPSGC 1111;

(b) all applicable information detailed under the section entitled “Invoice Submission” of the general conditions;

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

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

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

a) the **original and one (1) copy** to the Canadian Space Agency at the address shown on page 1 of the Contract under "Invoices" (Financial Services Section) for appropriate certification by the Project Authority identified herein after inspection and acceptance of the Work takes place;

and,

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 and has been approved by CSA.

**7.9.2 Progress Claim-Limitation of expenditures**

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

1. 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.
2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.
3. The Contractor must prepare and certify **one original and two (2) copies** of the claim on form PWGSC-TPSGC 1111, and forward:
   a) **the original and one (1) copy** to the Canadian Space Agency (CSA) at the address shown on page 1 of the Contract under **" Invoices "** (Financial Services Section) for appropriate certification by the Technical Authority identified herein after inspection and acceptance of the Work takes place;

   and,

   b) **one (1) copy of the original progress claim** (including all back-up documentation) to the Contracting Authority specified herein.
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.

**7.10 Compliance**

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

**7.11 Applicable Laws**

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

**7.12 Priority of Documents**

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.
(a) the Articles of Agreement;
(b) the supplemental general conditions 4002 (2010-08-16), Software Development or Modification Services and 4003(2010-08-16), Licensed Software;
(c) the general conditions 2040 (2017-04-27) General Conditions - Research & Development;
(d) Annex A, Statement of Work;
(e) Annex B, Basis of Payment;
(f) Annex C, Non-disclosure Agreement; and
(g) the Contractor's bid dated _____ (insert date of bid) (If the bid was clarified or amended, insert at the time of contract award: "as clarified on _____" **or** ", as amended on _____" and insert date(s) of clarification(s) or amendment(s))

**7.13 Foreign Nationals (Canadian Contractor)**

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

**7.14 Insurance**

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

**7.15 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 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 one or both 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 the publication.

The Contractor must obtain and use a high resolution printed or electronic copy of the CSA's corporate identity logo and seek advice on its application, by contacting the Technical Authority, as mentioned in section 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 Article 44 of the General Conditions 2040 contract titled Notice. The Communications Notice must include a copy or example of the proposed Communication Activity.

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

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

## ANNEX "A"

### STATEMENT OF WORK

The Statement of Work ((Annex A) appended to the bid solicitation package, forms part of this document. **(See appended document).**

**ANNEX B**

**BASIS OF PAYMENT**
**SCHEDULE OF MILESTONES**

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

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

**Total Firm Price $_____(All Taxes applicable extra)**

**ANNEX B-1 (Optional Services)**

**BASIS OF PAYMENT**

For the work described in Annex «A», the Contractor will be paid as follows:

1. **LABOUR:** at actual hourly firm rate inclusive of overhead and profit: **Est.: $**

2. **EQUIPMENT:** at laid down cost without markup **Est.: $**

3. **MATERIALS AND SUPPLIES:** at laid down cost without markup **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, private vehicle and incidental expenses provided in Appendices B, C and D of the National Joint Council (NJC) 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” are applicable. All travel must have prior authorization of the Project Authority. All payments are subject to government audit.

5. **DIRECT CHARGESSUBCONTRACTS:** at actual cost without markup **Est.: $**
6. **SUBCONTRACTS:** at actual cost without markup **Est.: $**

**Estimated Cost to a Limitation of Expenditure: $**
**(All taxes applicable extra)**

**ANNEX "C"**

**NON-DISCLOSURE AGREEMENT**

I, _____, recognize that in the course of my work as an employee or subcontractor of _____, I may be given access to information by or on behalf of Canada in connection with the Work, pursuant to Contract Serial No _____ between Her Majesty the Queen in right of Canada, represented by the Minister of Public Works and Government Services and _____, including any information that is confidential or proprietary to third parties, and information conceived, developed or produced by the Contractor as part of the Work. For the purposes of this agreement, information includes but not limited to: any documents, instructions, guidelines, data, material, advice or any other information whether received orally, in printed form, recorded electronically, or otherwise and whether or not labeled as proprietary or sensitive, that is disclosed to a person or that a person becomes aware of during the performance of the Contract.

I agree that I will not reproduce copy, use, divulge, release or disclose, in whole or in part, in whatever way or form any information described above to any person other than a person employed by Canada on a need to know basis. I undertake to safeguard the same and take all necessary and appropriate measures, including those set out in any written or oral instructions issued by Canada, to prevent the disclosure of or access to such information in contravention of this agreement.

I also acknowledge that any information provided to the Contractor by or on behalf of Canada must be used solely for the purpose of the Contract and must remain the property of Canada or a third party, as the case may be.

I agree that the obligation of this agreement will survive the completion of the Contract Serial

No: _____

Signature

_____

Date

_____

**ATTACHMENT 1 TO PART 2**

**MANDATORY NON-DISCLOSURE AGREEMENT (NDA)**

**FOR**
**DEEP SPACE EXPLORATION ROBOTICS (DSXR)**

**REQUEST FOR PROPOSAL**

**PUBLIC WORKS GOVERNMENT SERVICES CANADA (PWGSC)**

**9F050-160946/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 Reference documents for must be treated as confidential and must not be disclosed or used in any way except in relation with the Purpose of this RFP.

2. For the purpose of this NDA, Confidential Information includes any Reference documents 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.

3. The Supplier agrees that the Reference documents 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 Reference documents 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.

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

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:

    (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.

IN WITNESS WHEREOF, this Non-Disclosure Agreement has been duly signed this day of _____, 2015, 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

**ATTACHMENT 1 TO PART 3**
**TECHNICAL AND MANAGERIAL BID PREPARATION INSTRUCTIONS**
**(See appended document)**

**ATTACHMENT 1 TO PART 4**
**POINT RATED EVALUATION CRITERIA**
**(See Appended Document)**

**ATTACHMENT 1 TO PART 5**
**FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY-CERTIFICATION**

*(For requirements estimated at $1,000,000.00 and above, Applicable Taxes included)*

**(See appended document)**