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Canadian Space Agency

Radarsat Constellation Mission (RCM)

Statement of Work (SOW) for the Multimission Antenna Reservation System (ARS)

Initial Release

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REVISION HISTORY

Rev.	Description	Initials	Date
IR	Initial Release	ED	June 29, 2015

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1 INTRODUCTION

1.1 ANTENNA RESERVATION SYSTEM DESCRIPTION

The Antenna Reservation System (ARS) fulfills the need for antenna resource management in the context of a multi-mission satellite control center. The ARS is a functional sub-system component of the CSA's Multi-Mission Operation Center (MMOC) architecture.

The ARS is a hub that will allow various existing missions [RADARSAT Constellation Mission (RCM), Scisat, NEOSSat, M3MSat] as well as future missions operated by CSA, to order antenna time from various ground station facilities, which include antennas operated by the Canada Centre for Mapping and Earth Observation (CCMEO), Northern Ground Terminal (NGT) and Polar Epsilon 2 (PE2). With respect to the RCM, the ARS is also a Government Furnished Equipment (GFE) sub-system of the overall RCM Ground Segment (GS).

The ARS Concept of Operation (ConOps) is described in AD1. The ARS requirements are presented in the ARS Requirements Document (AD2) and the interface requirements are provided in AD3.

The ARS Requirements Document (AD2) includes two types of requirements:

a) Mandatory requirements, and

b) Options.

The options are items that would provide additional functionality and performance to the system, but which are not essential. See section 3.8 for a list of the options. The Request for Proposal (RFP) provides more information on options.

The requirement is for one (1) operational ARS system, plus one (1) backup system. Each ARS system will be comprised of:

a) The ARS software, designed so as to meet the system requirements (AD2) and the interface requirements (AD3) and provide the functionality described in the ConOps (AD1);

b) A computer system to run the ARS. More information is provided in Section 3.4.3.

1.2 PURPOSE

The purpose of this Statement of Work (SOW) is to define the work to be performed by the Contractor for the development and provision of the ARS to the CSA.

1.3 SCOPE

The scope of this SOW encompasses the design, implementation, verification and validation, integration, delivery, installation and testing of the required number of ARS systems, as well as support activities after the delivery of the systems, and management of the project.

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:

a) "Must" or "Required" is used to indicate a contractual obligation;

b) "Should" indicates a preferred alternative but is not a contractual obligation under the contract;

c) “May” indicates an option;

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

2 DOCUMENTS

2.1 APPLICABLE DOCUMENTS (AD)

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.

TABLE 2-1 - APPLICABLE DOCUMENTS

AD No.	Document Number	Document Title	Rev. No.	Date
AD1.	MM-CSA-CO-0001	Multi-Mission Antenna Reservation System (ARS) Concept of Operations	Rev. 1.5	July 13, 2015
AD2.	MM-CSA-SP-0001	Multi-Mission Antenna Reservation System (ARS) Requirements Document	Rev. 2.9	July 13, 2015
AD3.	MM-CSA-IC-0003	Multi-Mission Antenna Reservation System (ARS) Interface Control Document	Rev. 2.7	July 13, 2015
AD4.	MM-CSA-IC0002	Live Schedule Board ICD	C	April 30, 2013

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.

TABLE 2-2 – REFERENCE DOCUMENTS

AD No.	Document Number	Document Title	Rev. No.	Date
RD1.	MDA-RCM-IC-53-1948	RCM Reservation System ICD	Rev. 2/1	March 31, 2015
RD2.	RCM-RP-52-3998	RCM ConOps	Rev. 4.5	February 25, 2014

3 WORK REQUIREMENTS

The contractor must provide all facilities, personnel, equipment, materials and services necessary to perform the work specified in this SOW, in accordance with the requirements defined in this SOW and the Applicable Documents listed in Table 2-1.

3.1 PROJECT MANAGEMENT

The Contractor must manage the ARS project to successfully meet performance, scope, quality, and schedule requirements of this SOW.

The Contractor must provide the management, technical leadership, and support necessary to ensure effective and efficient performance of all project efforts and activities. The Contractor must dedicate experienced personnel to the project in all the disciplines required to carry out the work.

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

3.1.1 Project Management Plan (PMP)

The Contractor must implement the Project Management Plan (PMP) [Contract Data Requirements List (CDRL PM-1)] and deliver it as per the information contained in Appendix A.

The PMP will be discussed and reviewed at the Kick-off Meeting (KOM).

3.1.2 Contractor's Project Manager (PM)

The Contractor must appoint a Project Manager (PM) for the purpose of managing and controlling the work. The function of the Contractor's PM is to manage the project and be responsible for successful delivery of the ARS on schedule and in compliance with CSA's technical, interface and quality requirements.

The Contractor's PM must possess all the qualifications and experience needed to lead the Contractor's work and take responsibility for all aspects of the work carried out by the Contractor throughout the duration of the contract and in accordance with the terms of the contract. The Contractor's PM should have the appropriate authority to resolve issues affecting the contract.

The same controls and requirements placed on the Contractor's PM should also be applicable to all major subcontractors (if applicable).

3.1.3 Scope Planning (Work Breakdown Structure and Work Packages)

The project must be planned, controlled and directed using a Work Breakdown Structure (WBS) that organises and defines the total work scope of the project. (CDRL PM-2).

3.1.4 Project Schedule

The Contractor must update and maintain on a monthly basis the Project Schedule (CDRL PM-3). Table 3-1 shows the proposed Project Milestones and Meetings Schedule. The dates indicated for the last four items in this table [ARS Factory Acceptance Test Review (FAT), Delivery of the ARS to CSA, On-Site Acceptance Test (OSAT), Closeout Review] are hard dates linked to the RCM project schedule. These are the latest acceptable dates for these items. This schedule must be based on the Contract Work Breakdown Structure (CWBS), showing dependencies between tasks, durations, % complete and

constraints. The Contractor must maintain and deliver each month the Project Schedule in native format, including the Table 3-1 milestones with the progress report (see section 3.1.5).

3.1.5 Progress Reports

The Contractor must provide Progress Reports (CDRL PM-4) to the CSA and to the Contracting Authority, every two (2) months (up to the delivery of the ARS to CSA), no later than 7 working days after the end of the two months period covered by the report. These reports must identify decisions and events during the reporting period resulting in schedule slips or changes. The Contractor must summarize the work accomplished during the past period and identify the tasks planned for the coming period.

3.1.6 Project Risk Management

The Contractor must implement a risk management process supporting identification and assessment of risks that may impact schedule and technical performance, and the development of appropriate risk response/risk mitigation plans. The Contractor must assess and report the status of each risk element in the Progress Report (CDRL PM-4) and during progress reviews.

The Contractor must maintain a list of currently active risks in order to maintain visibility of software risks and facilitate timely mitigation.

3.1.7 Intellectual Property (IP) Management

The Contractor must maintain the Background Intellectual Property (BIP) and Foreground Intellectual Property (FIP) Report (CDRL PM-5) through the project and deliver the report as specified in Appendix A.

3.1.8 Source Code

The Contractor must deliver the source code and related tools files and documents to the CSA. This is required in order for CSA to be able to maintain and upgrade the ARS over its entire lifetime of many years. This includes but is not limited to:

a) The source code itself, including both BIP and FIP portions;

b) The development environment including the compiler, linker build script, libraries;

c) Configuration files;

d) Accompanying documentation; and

e) Instructions for generating the executable file(s) from the source code.

Any required third party or Commercial-Off-The-Shelf (COTS) software must be identified. See section 3.9.2 for more information and requirements.

Any required Open Source software must be identified. See section 3.9.2 for more information and requirements. The Contractor must ensure that Canada secures all the rights described in the contract.

3.1.9 Project Milestones and Meetings

The Contractor must schedule and co-ordinate with all stakeholders the meetings listed in Table 3-1.

TABLE 3-1: - PROJECT MILESTONES AND MEETINGS SCHEDULE

Milestone	Date	Location
Contract Award	--	--
Kick-off Meeting (KOM)	No later than 2 weeks After Contract Award (ACA).	CSA's premises
Technical Interchange Meeting (TIM) #1	3 months after the KOM.	Contractor's premises
Design Review (DR)	6 months after the KOM.	Contractor's premises
TIM #2	9 months after the KOM.	Contractor's premises
ARS Factory Acceptance Test Review (FAT)	November 2016	Contractor's premises
Delivery of the ARS to CSA	November 2016	CSA's premises
On-Site Acceptance Test (OSAT)	April 2017 (TBC)	CSA's premises
Closeout Review	October 2017	CSA's premises

In the above table, the dates for the TIMs and the DR are indicative.

At the discretion of the CSA, the KOM may be held via teleconference instead of at the location indicated in Table 3-1.

Informal bi-weekly teleconferences must be held between the Contractor and CSA Project Managers, up to the delivery of the ARS to CSA, in order to provide status of the project (typically 30 min duration).

For milestone meetings identified in Table 3-1, the contractor must produce and deliver to CSA the Meeting Presentation (CDRL PM-6) one week before each meeting. Review Data Packages (CDRL PM-7) must be delivered to the CSA two weeks before each review.

The Contractor may request Ad-hoc meetings with CSA whenever required to resolve unforeseen and urgent issues

The CSA reserves the right to invite additional knowledgeable people (public servants or others under Non-Disclosure Agreement) to Milestone/Progress Review Meetings. Key Contractor personnel involved in the work under review must be available to attend Milestone/Project Review Meetings. The timing and location of the Milestone activities and Meetings are provided in Table 3-1, but may be changed if mutually agreed to by the Technical Authority (TA) and the Contractor.

Unless otherwise agreed with the CSA, the Contractor is responsible for providing Meeting Agendas (CDRL PM-8) and Minutes (CDRL PM-9) of all meetings (Table 3-1) held during the project. Minutes will primarily report decisions and actions. The Contractor must also maintain a detailed Action Item Log (AIL) (CDRL PM-10) throughout the project to track actions resulting from reviews and meetings.

The following exit criteria apply to all meetings and reviews:

1) All objectives of the review have been achieved.
2) All Review Items Discrepancies (RIDs) have a disposition agreed with CSA and its project partners;

3) Actions (if any) have clear description, actionees, and due dates;

4) A forward plan or equivalent has been defined.

3.1.9.1 Kick-Off Meeting (KOM)

At the beginning of the contract, the Contractor must hold a KOM at CSA's premises, as per the schedule presented in Table 3-1. This meeting will serve to:

1) Identify and review the proposed Technical Performance Measures (TPM). This is a list of criteria that will be used throughout the project to evaluate the Contractor's technological progress; see more information in section 3.3.2;

2) Review contract deliverables;

3) Review the requirements of the work;

4) Review the work schedule;

5) Review risk assessment and mitigation plan;

6) Review WBS and Work Packages;

7) Review capability to deliver work packages at agreed schedule;

8) Discuss the Background Intellectual Property (BIP) and review the provided list;

9) Discuss the expected Foreground Intellectual Property (FIP) and review the provided list (review Disclosure of FIP issues);

10) Discuss any licensing issues;

11) Review expected claim format;

12) Review reporting requirements;

13) Review communications deliverables; and

14) Meet the personnel assigned to the work.

3.1.9.2 Technical Interchange Meetings (TIM)

Two (2) Technical Interchange Meetings (TIM) will be held at the times shown in Table 3-1. The purpose of the TIMs is to allow informal exchanges of information between the Contractor, the CSA and possibly third parties (e.g. MDA) so as to confirm that the project is on track technically.

The first TIM will be held prior to the DR. The purpose of the first TIM is to confirm the design direction and decisions with the customer. The contractor can propose additional TIM #1 agenda items to the following:

1) Design architecture presentation;

2) Software Selection:

   a) COTS,

   b) Non-COTS;

3) Concept of operation and interfaces;

4) Maintainability;
5) Performance (estimated);
6) System Availability (estimated);
7) Graphical User Interface (GUI) proposal presentation;
8) Schedule status; and
9) Risks status.

The second TIM will be held after the DR. The purpose of the second TIM is to confirm the planning and the final requirements to achieve verification and integration. The contractor can propose additional TIM #2 agenda items to the following:

1) Interface product exchange;
2) Confirm requirements and readiness for FAT;
3) Confirm requirements and readiness for installation of the system at CSA;
4) Confirm requirements and readiness to reach the RCM GS OSAT;
5) Logistics requirements;
6) Schedule status; and
7) Risks status.

3.1.9.3 Design Review (DR)

The purpose of the DR is to demonstrate that the final detailed design meets all requirements and is feasible within the schedule constraints, and that the project is ready to proceed with the Implementation, Verification and Validation activities.

The objectives of the DR are to confirm that:

1) The final detailed design meets the system, operational, design and interface requirements within allocated resources and constraints;
2) The detailed design has been proven and is final, and the project can proceed with the final implementation;
3) The detailed design, including interfaces, has been validated against the concept of operation, and the verification approaches are viable and will confirm compliance with all requirements;
4) The GUI design has been validated and meets CSA's expectations;
5) The technical, schedule and programmatic risks have been appropriately identified and mitigated or are on track for timely mitigation;
6) The plans for implementation, verification, validation and logistics are complete and have been implemented to the extent required at this stage of the project; and
7) The schedule estimates indicate that the project will be completed on time and that the control processes are adequate to ensure remaining within allocated resources.

3.1.9.4 Factory Acceptance Test (FAT) Review

The purpose of the FAT Review is to demonstrate that the system meets the requirements, in a simulated operational environment, and is ready to proceed with the Installation and Integration activities. The FAT will be performed on the Contractor's premises. The Contractor must organize the FAT.

The process will be as follows:

1) The Contractor must provide the FAT Test Plan and detailed test procedures to the CSA two (2) weeks before the test;
2) CSA reviews the Test Plan and test procedures and, if required, requests changes from the Contractor, or accepts the documents as they are;
3) If required, the Contractor must make the requested changes in the Test Plan and/or test procedures to the satisfaction of the CSA and re-submit the modified document to the CSA;
4) The Contractor performs the FAT, with CSA personnel in attendance;
5) Upon completion of the FAT, the Contractor must provide the FAT Test Report to the CSA within two (2) weeks;
6) CSA reviews and accepts the test results, or if necessary requests the Contractor to perform regression testing to solve problems;
7) If required, the Contractor must perform regression testing as requested by the CSA and re-submit the modified FAT report to the CSA.

3.1.9.5 On-Site Acceptance Test (OSAT)

The RCM GS OSAT will be performed on the CSA's premises in the actual Primary Control Facility (PCF). The purpose of the OSAT is to demonstrate that the system meets the requirements, in the actual operational environment. More information on the OSAT is provided in section 3.7.2.

3.1.9.6 Closeout Review (CR)

The intent of the project closeout meeting is to discuss the following:

- All outstanding contract issues;
- Confirm the compliance with the contract and technical requirements; and
- Confirm the completion of the project, also confirming the beginning of the warranty and technical support period for the ARS delivered.

The objectives of the Closeout Review are to demonstrate the readiness of the system and operations personnel to proceed with the routine operations phase, and that all contractual engagements have been completed. The CR may be held at the Contractor's premises or by telecon, at CSA's discretion.

The objectives of the CR are to demonstrate that:

1) The requirements associated with the RCM ground segment OSAT are fully met;
2) Operational documentation is complete and represents the system configuration and its planned modes of operation;

3) Personnel training has been completed;

4) The performance of the system is as specified;

5) Plans and infrastructures have been completed for the acquisition, archiving, processing and distribution of data; and

6) Safety and Quality Assurance (QA) requirements are met.

3.2 SAFETY & MISSION ASSURANCE (S&MA)

3.2.1 Quality Assurance (QA)

The Contractor must deliver its company-standard Quality Assurance Implementation Plan (QAIP) (CDRL PA-1), which meets the ARS Requirements Document (AD2) and this SOW. The Contractor must provide Product Assurance (PA) Management with an independent line of reporting and access to senior management separate from that of the project.

3.2.1.1 Software Product Assurance (SPA)

The Contractor must implement a Software Product Assurance (SPA) program. The SPA program will establish and monitor requirements for the analysis, design, development, test and verification of all software. The Contractor must ensure that software tools used in the development, support, verification and validation of software are evaluated by the software development team and the Contractor's QA representative before use to confirm that they perform as documented.

3.2.1.2 Non-Conformance Reporting

The Contractor's QA representative must identify and document issues that do not conform to contractual requirements or engineering documentation. The Contractor shall inform CSA in a timely fashion of any non-conformance (CDRL PA-2) and provide the proper dispositions of non-conforming items. The failure tracking and corrective action system must have a closed loop control for collecting, analyzing and recording all issues. Non-compliances or deviations found during both product development and post-delivery maintenance activities must be recorded, tracked, and resolved.

A Non-Conformance (NC) is a suspected or proven departure of a characteristic or feature of an item from the specified requirement. A Class I NC is defined as an issue on an end-item (or as part of an end-item) that would not meet the specified end item performance with respect to safety, performance, interfaces with other Project requirements, reliability/availability or a failure occurring during onsite acceptance testing. The Contractor must notify the TA within 48 hours of all Class I NCs. A Class II NC is an item that is not covered by the Class I NC definition. Authorized Non-Conformance Review Boards (NCRBs) must analyze NCs and determine the appropriate disposition of NCs. The CSA ARS PA Team will participate in the NCRB for all Class I NCs. The CSA RCM ARS PA Team has the right to review all Class II Non-Conformance Reports (NCRs) for concurrence to classification.

3.2.1.3 Deviations and Waivers

A variance approved for a planned departure from requirements is known as a deviation prior to production. A variance approved for an item found to depart from specified requirements in an unplanned manner during or after production, but nevertheless considered suitable for use "as is" is known as a waiver.

A Request for Deviation (RFD) or a Request for Waiver (RFW) (CDRL PA-3) consists of a NC or departure to the requirements or specifications that affects a system end item.

In the event that a requirement cannot be complied with, the Contractor must make a formal request to the ARS Team for an RFD or RFW. The onus for obtaining such a concession lies with the Contractor. Without such an RFD/RFW, the ARS Team will consider that the Contractor will comply with all the requirements.

3.2.2 Configuration and Data Management (CADM)

The Contractor must implement Configuration Management (CM) and Data Management (DM) systems for hardware, software (section 3.3.3) and documentation. Documents and data must be submitted, in accordance with the preparation instructions found in Data Item Description (DID-100) in Appendix B, but adapted for the nature of the project. The Contractor must maintain product identification and tracking system.

The ARS Team may request to see changes from one revision of a document deliverable to another during updates; the Contractor must thus ensure that Engineering Change Notices (ECNs) (CDRL PA-4) or redlines of a given document are available.

When specified in Appendix A, documents may be prepared in the Contractor's Format (CF); however they must also meet the requirements stated in this section.

The Contractor must perform the following CM/DM-related tasks:

a) Interface with the TA on CM matters and deliverable transfer (hardware, software and documentation);

b) Control the electronic files of CADM released documents; and

c) Distribute digital copies of documentation, drawings and other deliverables as required by this SOW.

3.2.3 End Item Data Package (EIDP)

The Contractor must deliver an EIDP (CDRL PA-5) for the ARS.

3.2.4 Safety

The ARS computer systems shall be designed to maintain the safety of ground personnel and equipment during operations and maintenance including the following aspects:

a) Electrical safety,

d) Fire safety,

e) Hazardous materials,

f) Ergonomics.

The ARS computer systems shall be marked with a recognized certification marking or field evaluation marking showing compliance with US and Canadian electrical codes.

3.3 SOFTWARE DEVELOPMENT AND MANAGEMENT

This section defines the activities required to develop the software and manage its development.

3.3.1 Software Development Plan (SDP)

The Contractor is free to use the development method of its choice, provided it is equivalent to a recognized standard. The software development method must be such as to facilitate the maintenance of the software, including a modular structure and the use of comments. The use of a method such as the Agile development method is suggested.

The Contractor must deliver its company-standard Software Development Plan (SDP) (CDRL EN-1) to be used as a guide for developing the software. The SDP must be presented with the proposal.

The SDP must describe the management and technical approaches that govern the software development process. It describes what products and materials are received and delivered, how requirements are determined and verified, and important aspects of the provider's relationship with the customer.

Adherence to the SDP must be reviewed at major milestones, and revised as appropriate.

3.3.2 Technical Performance Measures (TPMs)

The Contractor must establish a set of TPMs to show the current performance expectations of the system with respect to key performance and resource parameters, and the comparison of current predictions versus the defined requirements. It must allow trends in the technical progress to be discerned. It must summarize the analyses for decomposition of requirements and for prediction of Technical Performance behaviour. A TPM Report must be presented first at the KOM (CDRL EN-2), and in each Progress Report.

The TPMs must include the following parameters, as appropriate:

1) System Performance vs. Load Level (peak and nominal), i.e. how the system performs when receiving a large number of requests in a short timeframe;
2) Processing time;
3) Computer system resources; and
4) Any other item that the Contractor deems important or carrying some risk.

The report must show for each TPM:

1) the historic trend of the performance with respect to the requirement ,
2) all the margins being carried on the estimates, and
3) the source of the estimates (e.g. allocation, estimation, analysis, measurement).

3.3.3 Software Configuration Management

The Contractor must establish, document and maintain a software configuration management system to control software work products (source code, make files and all others), and the development and test environment. The software to be maintained in CM needs to be, at a minimum, the source code, build scripts and build reports, so that for each official release of the software all these items may be traced, and differences with previous releases identified. The tools used should be able to create an automatic and complete report on changes between versions. A bug tracking system should be implemented, with each bug referring to specific versions by the identifier given in the CM system.

3.4 DESIGN PHASE

During this phase, the Contractor must develop lower-level requirements, an architectural design, interfaces, a specification for the required computer system(s), a detailed design, a system test plan and reduce project risks. The Design Phase will end with the DR (Section 3.1.9.3).

3.4.1 Interface Control Document (ICD)

The Contractor must develop and deliver the ARS Internal ICD and deliver it as part of the ARS System Design Document (CDRL EN-3).

The Contractor must update the ARS Internal ICD to match the DR design.

3.4.2 Architectural Design

The Contractor must define a system design that shows how all the requirements will be addressed by the system design. This design must be documented in a System Design Document (CDRL EN-3). The System Design Document must include the Graphical User Interface (GUI) design, the internal Interface Control Document (ICD) and the Computer System Specification.

Failure modes must be identified, analyzed for criticality, and used for detailed design.

All external and key internal component interfaces must be identified.

Dependencies among components must be determined.

Data types, valid ranges, and appropriate exception handling for components must be defined.

After review and approval, the documented architectural design must be baselined, and put under configuration management. The architectural design must be maintained to reflect changes in requirements and design.

3.4.3 Computer Systems

The Contractor must determine the specification of the computer system(s) to be used with the ARS and include it in the System Design Document (CDRL EN-3).

The computer systems must be capable of running the ARS software efficiently and with sufficient margin in terms of computing power, memory (live and permanent) and communications with external entities.

The Operating System (OS) and the anti-virus are subject to approval by the CSA to ensure maintainability and sustainability over the life-cycle of the system.

3.4.4 Detailed Design

The Contractor must develop, document and maintain the detailed design, and initiate coding. The System Design Document (CDRL EN-3) must be updated.

The detailed design must be such as to meet the software requirements.

The detailed design must be consistent with the architectural design. Any inconsistencies must be noted, reviewed, and approved, and corresponding changes should be made to the architectural design.

The final detailed design must be ready for implementation.

Margins for critical performance parameters must be established early, tracked continually, and re-examined in conjunction with significant design changes. See also TPMs in Section 3.3.2.

Fault protection and correction requirements must be identified and allocated to the affected software units. Fault detection and correction should consider off-nominal behaviour and possible failure of interfacing hardware components.

After review and approval, the documented detailed design must be baselined, put under configuration management, and maintained as necessary.

An ARS User's Manual (OPS-1), to support operations, must be prepared to accompany the delivered product. The purpose of the User's Manual is to provide the end user with instructions explaining how to use the software effectively.

An ARS Maintenance Manual (OPS-2), to support maintenance, must be prepared to accompany the delivered product. The purpose of the Maintenance Manual is to provide a schedule and description of required maintenance activities, both for software and hardware.

3.4.5 Data Products Exchange

At various points in time throughout the development of the ARS, the Contractor will receive, from the CSA, input data products. This will help the Contractor in developing the ARS design, performing testing activities and re-adjusting the ARS design.

In turn, the Contractor must provide to the TA output data products generated by the ARS for use by the Mission. These products will be used to design and test the RCM GS.

This mutual exchange will go on an iterative basis as both the ARS and Mission Planning System (MPS) are being developed concurrently.

3.4.6 Test Planning

The Contractor must develop a Software Test Plan (STP) (CDRL EN-4) describing at a high level how it is planned to verify that the requirements are met.

The Contractor must develop a FAT Procedure (CDRL EN-5) to demonstrate that the system meets all technical and operational design parameters and the requirements of the specifications.

3.4.7 Software Test Environment Design

The Contractor must define the software test environment(s). The software test environment(s) must verify and validate all software in nominal operations as well as identified off-nominal scenarios.

The description of the software test environment must be provided in the Software Test Plan (CDRL EN-4).

3.5 IMPLEMENTATION, VERIFICATION, VALIDATION AND INTEGRATION

During this phase, the Contractor must perform the implementation, verification and validation, and the integration and test of the software. This phase will end with the conduct of the FAT (Section 3.1.9.4).

3.5.1 Software Implementation

The Contractor must initiate the implementation of the software. The Contractor must ensure all requirements are implemented and verified before the FAT.

Source code must be developed following the coding standards and guidelines identified in the SDP, Including:

- Unit testing;

- Unit input and output data type validation; and
- Regression testing.

As-built work product documentation must be updated and maintained to reflect changes.

The Contractor must develop a Software Version Description Document (VDD) (CDRL EN-6) to describe all as-built configurations of the software. This document must be delivered with the ARS, i.e. as part of the EIDP.

3.5.2 Software Verification and Validation

At designated points in the development cycle, intermediate and final work products must be audited to verify compliance with requirements and to ensure adherence to documented development procedures and standards, as defined in the SDP.

The results of verification activities and defect history must be analyzed to understand defect causes, identify systemic problems, and make recommendations for improvements.

The SDP must identify the products to be validated; describe the planned levels of validation; specify the plan for the development of the required validation environments, procedures, and acceptance criteria; and estimate the validation effort.

Operational scenarios used for validation must address both nominal and off-nominal behavior of the system.

Defects found during validation activities must be documented, prioritized, and addressed either by validated design changes or by documented and validated work-arounds.

Prior to delivery, there must be a verification that all software requirements identified for this delivery have been met, that all approved changes have been implemented, and that all defects designated for resolution prior to delivery have been resolved.

3.5.3 Factory Acceptance Test (FAT)

This Phase will conclude with the Factory Acceptance Test (FAT) (see section 3.1.9.4) to be held on the Contractor's premises. The FAT will be witnessed by the TA and other CSA personnel. A successful FAT will constitute a pre-acceptance of the ARS by the CSA.

The Contractor must prepare and deliver a FAT Report (CDRL EN-7) after the conclusion of these tests.

3.6 DELIVERY, INSTALLATION AND DEMONSTRATION

Prior to delivery, the software product must have successfully passed the FAT.

The Contractor must deliver the software, on the date stipulated in Table 3-1, as described in Section 3.9. The Contractor must install and configure the ARS computer systems in the CSA operations facility, and perform testing to demonstrate that the ARS works normally when connected into the network. This test must demonstrate hardware integrity, connectivity and software nominal functionality.

3.7 POST-DELIVERY ACTIVITIES

The following activities will take place approximately six months after delivery, during the RCM GS acceptance phase.

3.7.1 Rehearsal

As part of the commissioning of the GS, the CSA, together with the RCM main contractor, will conduct rehearsals prior to the GS Final Acceptance Test. Support will be required from the ARS Contractor to perform this task. The Contractor must therefore allocate up to two (2) person-weeks (TBC) for this task at CSA.

3.7.2 End-to-End On-Site Acceptance Test (OSAT)

CSA, together with the RCM main contractor, will perform the End-to-End GS Final Acceptance Test and the ARS OSAT at the same time. The OSAT will be conducted by CSA personnel. However support from the Contractor will be required to resolve problems and possibly make adjustments to the software. The Contractor must allocate up to two (2) person-weeks (TBC) for this task at CSA.

Subsequent to the OSAT, if changes have been done in software, the Contractor must update and deliver the Software VDD (CDRL EN-6). The Contractor must also deliver the updated version of the software itself on DVD(s).

The Contractor must also update the ARS User's Manual (CDRL OPS-1) and the ARS Maintenance Manual (OPS-2) if required.

3.7.3 Training

After the OSAT, the Contractor must provide training on site at CSA to personnel who will operate the ARS in sufficient detail so as to allow the system to be used efficiently and knowledgeably in an operational environment. The personnel to be trained will be composed up to five (5) engineers and/or technicians who will have at least 5 years of experience in the operation of space systems. All will undergo training at the same time. The CSA reserves the right to add observers.

Training will begin only after the successful installation of the ARS (section 3.6). The ARS User's Manual (CDRL OPS-3) should be used as training course material.

3.8 OPTIONS

CSA may add to the baseline contract the design, implementation, verification and validation, integration, delivery, installation and testing of system features/functionalities corresponding to any of the options listed in Table 3-2. Refer to AD2 for details.

TABLE 3-2: - OPTIONS

Requirement ID	Requirement Title
Options Group No. 1:	**Standing Requests and Autonomous Contact Management**
ARS041	Augmented Mission Configuration
ARS057	Autonomous Contact Management
ARS096	Contact Time Spawning of Standing Requests
ARS097	Contact Time Spawning for Autonomous Contact Management
Options Group No 2	**Contingency Contact**
ARS150	Contingency Contact identification Process
ARS151	Contingency Contact Allocation Process

Requirement ID	Requirement Title
ARS152	Contingency Contact Labeling
Options Group No. 3	**Computation Performance Goals**
ARS121	Advanced Schedule optimization algorithm
ARS361	Orbit Propagator Computation Time Goal
ARS371	Schedule Computation Time Goal
ARS391	Satellite Contact/Time Request 7 days Overall Processing Time Goal
ARS392	Satellite Contact/Time Request 24h Overall Processing Time Goal
Individual Options	
ARS072	Attitude Model Propagation
ARS465	Reservation Web-Based Interface
ARS702	Automatic Failure Detection and Failover

3.9 CONTRACTOR DELIVERABLES

The Contractor must deliver the items listed in Table 3-3. Details one each deliverable are provided below the table.

TABLE 3-3: LIST OF CONTRACTOR DELIVERABLES

Qty	Description
2	ARS Computer Systems, with the ARS Software installed
2	ARS Software on DVDs
1	ARS software Source Code and development environment
1 each	Third-party Software (if applicable)
1 each	COTS Software (if applicable)
1 each	Open Source Software (if applicable)
1 set	Project Documentation as listed in the CDRL Table A-2
--	Output Data Products on an on-going basis as requested in section 3.4.5

3.9.1 Hardware Deliverables

The Contractor must design, manufacture, test, and deliver the two (2) ARS computer systems at the place and date to be advised by the TA.

3.9.2 Software Deliverables

The Contractor must install one copy of the ARS software in each the two delivered computer systems. The Contractor must also package and deliver the ARS software on one or more DVDs as part of the Software End Item Data Package (EIDP) (CDRL PA-5).

All delivered non-COTS software must include executable code, source code, the source listings and source files, compiled files, configuration and parameter files, test scripts, design documentation, users' manuals, test results and associated plans and procedures. The source files need to be in the development environment, ready to build, and with the CM tools functional.

All third party software must be accompanied by a one year license that allows the software to be archived and copied as necessary.

All COTS software must be accompanied by a license that allows CSA to use the software for at least one year following the Closeout Review.

All Open Source software must be accompanied by a license that allows CSA to use the software for at least one year following the Closeout Review.

3.9.3 Document Deliverables

The Contractor must prepare and deliver the documents requested in the CDRL in Table A-2.

Documents submitted by the Contractor will be approved or reviewed in accordance with the Approval Category of each deliverable. The Contractor must obtain approval from the TA as per the document approval procedures below for all CDRL documents listed in Appendix A and marked as Approval Category "A".

3.9.3.1 Document Deliverables, Format and Content

The Contractor must ensure that documents delivered comply with the applicable Data Item Description (DID) contained in Appendix B (but adapted for the nature of the project) and referred to in the CDRL. General Preparation Instructions are provided in DID-100.

The English language must be used throughout. System International (SI) units should be used/supplied by the Contractor. A conversion factors table must be supplied for all non-SI units used in the deliverable documents.

Documents must be delivered in the original software application format, plus in Portable Document Format (PDF). One electronic copy of each deliverable document must be transferred to the CSA at the address and in the format specified in DID-100. No paper copy is to be delivered.

3.9.3.2 Documents Review and Approval

The term "Approval", as used in this document and in other documents referred to herein, means written approval by the CSA, of documents submitted by the Contractor. The TA will provide approval or disapproval within 15 working days of receiving the document. In the event that a document is disapproved, the TA will advise the Contractor in writing, as to the reasons for such disapproval. Once approved, the document is authorized for further use by the CSA. The document may not be changed without the CSA's approval. No request or document for which approval is required may be acted upon or implemented by the Contractor until such approval is provided.

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 of a document for review implies that the document has been reviewed, commented on, revised as necessary, and has been determined to meet the requirements. In the event of a failure by the CSA to provide a disposition to a document within 15 working days of the receipt of the document, the document may be deemed to have been reviewed and accepted by the TA without comment.

In the event that CSA rejects a document or request, it will notify the Contractor in writing as to the reasons for rejection and will define the additions, deletions or corrections that the CSA deems necessary to render the request or document acceptable.

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 Table A-2 and this SOW.

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.

Abbreviations used in Table A-2:

- ‘A’ stands for ‘Delivered for CSA Approval’;
- ‘R’ stands for ‘Delivered for CSA Review’.
- ‘I’ stands for “Delivered for CSA Information’.

4 GOVERNMENT FURNISHED EQUIPMENT

The TA will provide the required MPS data products (see section 3.4.5).

The TA will provide the Applicable Documents listed in Table 2-1.

APPENDICES

APPENDIX A CONTRACT DATA REQUIREMENTS LIST (CDRL)

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

A.1 ABBREVIATIONS USED

TABLE A-1: - CATEGORY

ABBREVIATION	DEFINITION
A	Approval See Section 3.9.3.2.
R	Review See Section 3.9.3.2.

A.2 DISTRIBUTION AND COPIES

All documents must be provided in the format specified in the relevant DID, 15 working days prior to the specified Review/Meeting unless otherwise indicated.

A.3 CDRL TABLE

TABLE A-2: - DOCUMENT DELIVERABLES

CDRL #	Title	Milestone	Version	Approval Category	SOW Para.	DID #
Project Management						
PM-1	Project Management Plan (PMP)	Proposal Submission KOM + 1 week	Initial Release Update	R R	3.1.1	101
PM-2	Contract Work Breakdown Structure (CWBS)	Proposal Submission KOM + 1 week	Initial Release Update	R R	3.1.3	102
PM-3	Master Project Schedule	Proposal Submission KOM – 1 week Every two months	Initial Release Update Update	R I I	3.1.4	105
PM-4	Progress Report	Every two (2) months (up to the delivery of the ARS to CSA)	Update	I	3.1.5	107
PM-5	BIP/FIP Report	Proposal Submission End of contract	Initial Release Final Release	R A	3.1.7	Contractor IP Disclosure Form
PM-6	Meeting Presentation	Meeting – 1 week	Initial Release	I	3.1.9	CF
PM-7	Review Data Package	Review – 2 weeks	Initial Release	R	3.1.9	113
PM-8	Meeting Agenda	Meetings, reviews and teleconferences – 2 weeks	Initial Release	R	3.1.9	110
PM-9	Minutes of Meeting	Meetings, reviews and teleconferences + 1 week	Final Release	A	3.1.9	111
PM-10	Action Item Log	Meetings +1 week	Final Release	A	3.1.9	112
Product Assurance						
PA-1	Quality Assurance Implementation Plan (QAIP)	Proposal Submission KOM	Initial Release Final Release	R A	3.2.1	CF

CDRL #	Title	Milestone	Version	Approval Category	SOW Para.	DID #
PA-2	Class I Non-Conformance Report (NCR)	As Required Closeout Review	Initial Release Final Release	A A	3.2.1.2	385
PA-3	Request For Deviation (RFD) / Request For Waiver (RFW)	As Required Closeout Review	Initial Release Final Release	A A	3.2.1.3	383
PA-4	Engineering Change Notices (ECNs)	As Required Closeout Review	Initial Release Final Release	A A	3.2.2	390
PA-5	End Item Data Package (EIDP)	FAT Delivery of the ARS to CSA	Initial Release Final Release	A A	3.2.3	381
Engineering						
EN-1	Software Development Plan	Proposal Submission	Initial Release	R	3.3.1	CF
EN-2	TPM Report	Proposal Submission TIM #1 DR TIM #2 In each Progress Report after TIM #1	Initial Release Update Update Update Update	R R R R R	3.3.2	CF
EN-3	System Design Document	DR FAT	Initial Release Final Release	A A	3.4.2	CF
EN-4	Software Test Plan	TIM #1 DR	Initial Release Final Release	R A	3.4.6	751
EN-5	Factory Acceptance Test (FAT) Procedure	FAT-1 month	Initial Release	A	3.4.6	755
EN-6	Software Version Description Document (VDD)	Delivery of the ARS to the CSA	Initial Release	I	3.5.1, 3.7.2	710
EN-7	Factory Acceptance Test (FAT) Report	FAT + 10 days	Initial Release	A	3.5.3	760
Operations						
OPS-1	ARS User's Manual	FAT Project Closeout Meeting	Initial Release Final Release	R A	3.4.4 3.7.2	CF

CDRL #	Title	Milestone	Version	Approval Category	SOW Para.	DID #
OPS-2	ARS Maintenance Manual	TIM #2 FAT Project Closeout Meeting	Table of Content Update Final Release	R R A	3.4.4 3.7.2	CF

APPENDIX B DATA ITEMS DESCRIPTIONS (DIDS)

DID-100 – General Preparation Instructions

DID Issue: IR

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; and
c) document and data structure requirements.

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

PREPARATION INSTRUCTIONS:

1 GENERAL INSTRUCTIONS

1.1 Preparation

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

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

WXYZ-CDRL-NUM-CIE_ContractNumber_sentYYYY-MM-DD

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

1.2 Electronic Documents Format

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

1.2.1 Page Numbering

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

1.2.2 Document Numbers

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

1.3 Delivery, Notifications and Identification Requirements

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

Documents may be delivered via e-mail or direct transfer (FTP) or on DVD or CD-ROM disk.

1.3.1 E-mailed documents

E-mailed documents must be sent to:

CM_Receipt@space.gc.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:

CM_Receipt@space.gc.ca

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

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

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

1.3.3 Documents Delivered on DVD or CD-ROM disk

Hard copy and media deliverables are to be addressed to:

CM Library, 6A-100
Attention: CSA ARS 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 as required.

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.

DID-101 – Project Management Plan

DID Issue: IR

PURPOSE:

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

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

PREPARATION INSTRUCTIONS:

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

1) A project organization section that clearly defines the reporting structure, responsibility and authority of each position, and the personnel within the project team for the complete project and their associated coordinates. For key (core) positions identified in the contract, the background and experience of each key team member must be provided.
2) A financial management section that must include a detailed description of how the Contractor proposes to control financial expenditure during the Contract so as to meet the requirements of the SOW within the proposed schedule and within the terms of the financial proposal as well as a detailed description of how the money is to be allocated and a detailed description of how funds are allocated throughout the project.
3) A higher-level project schedule than what is presented in the master project schedule (CDRL PM-3) that must reflect the contract schedule for all of the work. Variance must be presented in Progress Reports as required.
4) A section on project management control and tracking system that will be implemented for the project.
5) A section on Configuration and Data Management (CADM) for the process used by the Contractor to perform documentation control and for the systematic review cycle process.
6) A section on risk management explaining how the Contractor intends to maintain, define, update and report on risk items for the complete project.
7) A section on systems engineering management wherein the Contractor must explain the development process to be followed, the management of design reviews, the management of technical exchanges with the customer, the process for disposition of problems identified at the end of each phase, the management of component and system testing, the management of system documentation development and the process for resolving problems discovered after delivery.
8) A section on subcontractor management (if applicable). If the Contractor intends to subcontract, the Contractor must detail their roles, duties, responsibilities and the process that will be implemented with the subcontractor in order to meet its obligation as a prime. The subcontractor's expertise must be demonstrated for the work they will be engaged to do. Previous relevant and similar work experience must be demonstrated and supporting documentation by means of reports and, or publications should be provided.

DID-102 – CWBS and Work Package Descriptions

DID Issue: IR

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 work planning, responsibility assignment, work authorization, problem identification, scheduling, budgeting and performance management and analysis of the project.

PREPARATION INSTRUCTIONS:

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

The WBS should go down to a level sufficient for the Contractor to monitor and report on the progress of the system and subsystems (at least two (2) levels below the system level).

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

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 its native tool format (MS project or PS8 are the two accepted formats), 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. For major subcontracts involving significant new development, subcontractors' master schedules must be provided including the same information as required form the prime contractor.

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.

The contractor must report schedule performance status in tabular form, with the following information provided for each WP:

1) Schedule variance (current and cumulative), and
2) Schedule Performance Index (SPI).

The progress status may be reported as a part of the Progress Reports. Baseline versions of these schedules will be maintained against which the project will be reported. These baseline schedules must not be revised or changed without prior approval from the CSA.

DID-107 – Progress Report

DID Issue: IR

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 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 two questions:

1) Is the project on schedule?
2) 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 of progress this month*: a summary of main activities accomplished during the reporting period.
2) *For fixed price contracts:* Updated milestones payment plan.
3) *Schedule status reports*: a narrative explanation of the critical path progression shall be provided and shall be rationalized for deviation from baseline (if applicable). For any slippage of milestones identified in Table 3-1, a recovery plan shall be presented. An update of the master project schedule (CDRL PM-3) shall be provided.
4) *Brief summary of the technical progress of the work* for each work package, including:
    a) Description of major items developed, purchased or constructed during the reporting period, and
    b) List of internal engineering reports produced during the reporting period;
    c) TPM requirements trends, estimates and current margins,
5) *Discussion of planned activities not accomplished*: a summary of main activities not accomplished during the month, the reasons why and the potential impact on the project plan.
6) *Planned work next month*: a summary of the planned important accomplishments for the following month, and shall be limited to half a page.

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

8) *Equipment*: a list of equipment ordered and received.

9) *Risks*: a risk status report including Contractor's and subcontractors' (if applicable) previous issues resolved, status of ongoing risks (changes, likelihoods and impacts) and identification of new risks, their likelihood and impact and proposed mitigation actions.

10) *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 project related organizations.

11) *Action Items (AIs) Log*: a log of all AIs from previous review(s) and meeting(s). Each AI shall contain the following information: ID, title, description of the action, open date (usually the meeting date), meeting name, originator, Office of Prime Interest (OPI), assignee (person responsible for taking action), due date, progress update, rationale for closure, closure date, status (e.g. "Open" or "Closed"), remarks / additional comments. Note that the due date will be the target date as long as the item is open.

DID-110 – Meeting Agenda

DID Issue: IR

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

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
   c) Space for signatures of the designated representatives of the Contractor, the CSA and the Public Works and Government Services Canada (PWGSC), and
   d) Name and address of the Contractor.
2) Purpose and objective of the meeting;
3) Location;
4) Agenda;
5) Summary of the discussions, decisions and agreements reached;
6) List of 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

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. DR meeting, RID, etc.);
6) Originator;
7) Office of Prime Interest (OPI);
8) Person responsible (for taking action);
9) Target/Actual Date of Resolution;
10) Progress update;
11) Rationale for closure;
12) Status (Open or Closed); and
13) Remarks.

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

DID-113 – Review Data Package

DID Issue: IR

PURPOSE:

The Review Data Package is a collection of all documents to be presented by the Contractor at a formal Technical Review.

PREPARATION INSTRUCTIONS:

The Review Data Package must contain the following:

1. The documents identified in the Milestone column of the CDRL Table as due for that review;
2. The presentations made at the meeting;
3. The meeting agenda;
4. The minutes of the previous meeting;
5. Copies of the comments/RIDs raised since the previous formal review;
6. The AIL.

For Test Readiness Reviews, the following additional items are required:

1. Test specifications and procedures;
2. Test support requirements and status;
3. Documentation status;
4. Functional and environmental test history of systems and subsystems;
5. Anomalies and their resolution;
6. Deviations and waivers.

DID-381 –End Item Data Package

DID Issue: IR

PURPOSE:

To provide the historical record and documentation of a software end item.

PREPARATION INSTRUCTIONS:

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

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

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

DID-383 – Request for Deviation / Waiver

DID Issue: IR

PURPOSE:

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

PREPARATION INSTRUCTIONS:

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

ID	Data	Description	Deviation	Waiver
RFD/RFW Identification				
1.	Organization	Identification of the organization originating the RFD/RFW	X	X
2.	Number	Unique identification and register number	X	X
3.	Revision	Revision status of the RFD/RFW	X	X
4.	Date	Issue date of the RFD/RFW	X	X
5.	Classification	Classification (i.e. major or minor)	X	X
6.	Project	Project under which the nonconforming item is supplied	X	X
7.	Business agreement/ contract identifier	Business agreement / contract identification under which the nonconforming item is supplied (if applicable)	X	X
8.	Order	Order number under which the nonconforming item is supplied (if applicable)	X	X
9.	Originator site	Location of the request for deviation originator (if applicable)	X	X

ID	Data	Description	Deviation	Waiver
Identification of Affected Item and Affected Documents				
10.	Item designation	Identification of the nonconforming item per name, manufacturer, part number and serial number (for a waiver), according to its configuration item data list	X	X
11.	Affected item(s)	Identification of the CI(s) (number and name) affected by the deviation of waiver	X	X
12.	Effectivity	Software version number, Model or serial number (or batch / lot number) of the deviating or non-conforming item	X	X
13.	Affected document(s)	Identification of the document(s) (specification, design drawing, etc.) to which the item does not conform (document number and revision/issue, paragraph or requirement ID)	X	X
14.	Short description	Title or short description of the RFD/RFW (consistent with the title of the related non-conformance report)	X	X
15.	Detailed description	Description of the deviation from the relevant requirement or design feature. / Description of the non-conformity, supported by sketches and attachments as appropriate. Include information on the origin of the deviation/waiver (design difficulties, non-conformance observed, procurement difficulties, ambiguous specifications, schedule constraints, etc.)	X	X
16.	Non-conformance Report	Identification number of the Non-conformance Report related to the request for waiver		X
17.	NCRB	Identification of the minutes of meeting of the NCRB or issue number which decided to raise the RFW		X
Technical and Programmatic Impact Assessment and Decision				
18.	Impact Assessment	Impact on cost, schedule, functionality, performance, reliability and safety	X	X

ID	Data	Description	Deviation	Waiver
19.	Consequences of non-approval	Project impact if the deviation/waiver is not approved (cost and schedule)	X	X
20.	Rationale for acceptance	Reason why the proposed deviation/non-conformity can be accepted (supporting analyses, drawings, etc.)	X	X
21.	Adverse effects	Item characteristics affected by the deviation or non-conformity	X	X
22.	Limitation of use	Regarding the intended use		X
23.	Approval	Decision (Approval or Disapproval), names, date and signatures of the relevant authorities (Project Manager, Systems Manager, S&MA Manager)	X	X

DID-385 – Non-Conformance Reports

DID Issue: IR

PURPOSE:

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

PREPARATION INSTRUCTIONS:

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

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

DID-390 –ECNs

DID Issue: IR

PURPOSE:

This DID contains the content preparation instruction for Engineering Change Notices (ECNs) generated under the work described in this SOW.

PREPARATION INSTRUCTIONS:

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

1) Engineering Change Proposal (ECP)/ECN No.;
2) Program;
3) Originator;
4) Description of Item;
5) Configuration Item Number;
6) Documents affected;
7) Impact of change (cost, schedule, interface, weight, configuration, or other (specify));
8) Change (from – to (ECN));
9) Reason for Change;
10) Effectivity;
11) Contractor Approval (PA, CM, Chairman).

DID-710 – Software Version Description Document (VDD)

DID Issue: IR

PURPOSE:

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

PREPARATION INSTRUCTIONS:

This document must follow a recognized standard such as the J-STD-016 DID for a software Version Description Document. This document must identify the software modules that make up the system software. Changes from the previous version (if any) must be documented along with any known deficiencies that affect the operation of the current version.

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

1) Introduction:
    a) Identification;
    b) System Overview.
2) Applicable and Reference Documents.
3) Version Description:
    a) Inventory of Materials Released:
        i) Materials;
        ii) Hardware Tools;
        iii) Development Platform Hardware Requirements;
        iv) Software Tools;
        v) CSCI Source File Listing;
        vi) Documentation; this section must list all relevant documents revisions associated with this build version (requirements, ICDs, etc.).
    b) Inventory of Software Content.
    c) Changes Incorporated. This section must list all new functionalities that were added, and/or all problems that were corrected in this version. A list of all modified and created files with the rationale must be included.
    d) Build Procedures and Development Environment Setup Information. The procedure must provide step-by-step actions with screen shots as appropriate to document the complete build process.
    e) Installation Instructions.

f) Validation Test Scripts, Data and Results.

4) Known Errors and Possible Problems.

5) Notes

DID-751 – Software Test Plan

DID Issue: IR

PURPOSE:

To describe the purpose and goals of the software testing, including the Software Test Environment architecture, showing how all the requirements will be addressed by the Software Test Environment design, and to identify the strategies to be used to implement and execute testing, and the resources needed.

PREPARATION INSTRUCTIONS:

The document must include the following:

1. Scope

The Software Test Plan (STP) identifies the software test environment resources required for testing, including the Software Test Environment, and provides schedules for testing activities. In addition the STP identifies the individual tests that must be performed during testing. The testing must include Human-Computer Interface Testing.

2. Content

The STP may be prepared in the Contractor's format and must, as a minimum, contain the following information:

1) identification number, title, and brief overview of the system and Computer Software Configuration Items (CSCIs) to which the STP applies;
2) a description of the relationship of this plan to other project management plans;
3) identification and description of all hardware and software items required to perform testing including identification of the proprietary nature and Government rights associated with each item;
4) Requirements Verification and Compliance Matrix;
5) a description of plans to install, setup, and maintain items in the software test environment;
6) identification and description of general test requirements applicable to all tests or group of tests (e.g. measurement of execution time);
7) a description of the types or classes of tests (e.g. stress tests, timing tests, erroneous input tests, maximum capacity tests) and levels at which testing will be performed (e.g. CSCI, CSCI to CSCI, CSCI to Hardware Configuration Item (HWCI), system);
8) a description of the data recording, reduction, and analysis activities to be carried out both during and after tests;
9) a schedule of tests; and
10) identification and description of each test to be conducted on the CSCI(s) including:
    a) test objective,

b) test level,

c) type or class,

d) test method,

e) cross reference to the CSCI design requirements,

f) cross reference to the CSCI interface requirements,

g) type of data to be recorded, and

h) assumptions and constraints.

The Software Test Environment description must contain the following information, as applicable.

1) Operational environment
2) Design decisions
3) Test environment architectural design
4) Test environment detailed design
5) Requirements traceability
6) Test Process description
7) Testing Tools description
8) Test Capabilities description
9) Constraint description
10) Support capability for:
    a) Test planning
    b) Test management
    c) Test measurement
    d) Test failure analysis
    e) Test development
    f) Test execution
11) Allocation of the environment's functions to specific implementation structures
12) Support to changes to processing algorithms, data representation and functionality
13) Performance description
14) Reusability capability
15) Modifiability capability
16) Extensibility capability
17) Portability capability

DID-755 – Software Test Procedure

DID Issue: IR

PURPOSE:

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

PREPARATION INSTRUCTIONS:

This DID is applicable to all software.

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

1. Scope

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

2. Test Item and feature(s) to be tested.

This section must identify the test items and describe the features and combination of features that are going to be the object of the test.

3. Participants Required

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

4. Test Design Specification

1) **Approach refinement**: This section must refine the approach described in the test plan. It must include the specific testing techniques to be used and the method of analyzing the test results.
2) **Automated or Manual Testing**: This section must state whether the testing will be done manually or automatically. If it is done automatically, the automatic testing software must be identified and briefly described.
3) **Test case/procedure identification**. This section must include a brief description of each test case associated with its particular design and procedure.

5. Test Case Specification

This section must include the following information:

1) **Test case and feature specification identifier:** Test case number, feature ID, and name.
2) **Input specifications:** This section must specify each input required to execute the test case. Note: explain how each input will be identified either by name, value, file, etc.
3) **Output expectations:** This section must specify the outcome of the feature's input execution (time response, valid or invalid etc.)

6. Test Hardware and Software

This section must include the following information:

1) **Hardware**: This section must specify hardware configurations, size, memory space etc.

2) **Software**: This must specify the software required to execute each test case. It must include operating system, compiler, test environment and test tools if applicable.

7. Test Log

This section must include the following information:

1) **Test Log identifier**: Number assigned to a feature to identify it.
2) **Execution description:** This section must specify the execution process used for the item tested.
3) **Activity and event entry:** This section must provide a brief description of the events and activities that occurred during the test.
4) **Procedure results:** For each execution, a record of visually observable results (for example, error messages generated, abort, and requests for operator action), and a statement of whether the test was successful or unsuccessful (Pass or Fail).

8. Test Summary Report

This section must include the following information:

1) Test summary report identifier.
2) Summary of results. This section must contain a summary of all the testing. It must include any incidents and their resolution.
3) Evaluation. This section must provide an overall evaluation of each test feature item including its limitations.

DID-760 – Software Test Report

DID Issue: IR

PURPOSE:

To document the results of tests done on the software.

PREPARATION INSTRUCTIONS:

This DID is applicable to all software.

The test report must document all tests performed to verify that the software will meet all the requirements specified in the applicable Requirements Document.

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

1. Overview.
2. Software identification, including name and version number.
3. Dates and duration [start and end dates, duration (the number of calendar days that the test phase spanned) and test effort (the sum of all the work days of all the test team over the test duration)].
4. Resources
   - 4.1. People (test lead, test analyst, development lead, developer, etc.);
   - 4.2. Environment (test rigs, test PCs, test server, production server);
   - 4.3. References (references such as Requirements Specification, Functional Specification, Test Specification, etc.)
5. Testing
   - 5.1. Methodology:

     This should reflect the approach described in the Test Procedure. If it became necessary to use different techniques and methods as testing progressed, then document these changes in this section. Otherwise simply refer to the original document.
   - 5.2. Tools (names and version)
   - 5.3. Tests performed:

     Describe the tests that were performed: area, component, screen, load, performance, etc. This should be as documented in the Test Procedure. If different, then mention those differences in this section.
   - 5.4. Tests not performed:

     This section must identify items or areas that were not tested. The reason for not testing must be provided.
6. Requirements Verification and Compliance Matrix
7. Issues

7.1. Issues raised: number of bugs and change requests raised.

7.2. Issues closed: number of bugs and change requests closed.

7.3. Issues deferred to future releases: number of bugs and change requests deferred.

7.4. Issues outstanding: number of bugs and change requests outstanding.

For each outstanding issue, provide the following information:

a) ID: the unique ID number of the issue

b) Severity (e.g. low, medium or high)

c) Type: bug or change request

d) Summary: one line summary of the issue

e) Workaround: state/identify any workaround that mitigates the issue; these workarounds should be included in release notes or equivalent documentation.

f) Plan: state what the plan is to finally resolve this issue for the final version of the flight software.

8. Recommendations.

APPENDIX C ACRONYMS

ACA	After Contract Award
AD	Applicable Documents
AIL	Action Item Log
ARS	Antenna Reservation System
BIP	Background Intellectual Property
CADM	Configuration and Data Management
CAGE	Commercial And Government Entity
CCMEO	Canada Centre for Mapping and Earth Observation
CDRL	Contract Data Requirements List
CF	Contractor's Format
CM	Configuration Management
ConOps	Concept of Operation
COTS	Commercial Off-The-Shelf
CR	Closeout Review
CSA	Canadian Space Agency
CSCI	Computer Software Configuration Item
CWBS	Contract Work Breakdown Structure
DID	Data Item Description
DM	Data Management
DR	Design Review
ECN	Engineering Change Notice
ECP	Engineering Change Proposal
EIDP	End Item Data Package
FAT	Factory Acceptance Test Review
FIP	Foreground Intellectual Property
GFE	Government Furnished Equipment
GS	Ground Segment
GSE	Ground Support Equipment
GUI	Graphical User Interface
HWCI	Hardware Configuration Item
ICD	Interface Control Documents
IP	Intellectual Property
KOM	Kick-off Meeting

MMOC	Multi-Mission Operation Center
MPS	Mission Planning System
NCR	Non-Conformance Report
NCRB	Non-Conformance Review Board
NGT	Northern Ground Terminal
OS	Operating System
OSAT	On-Site Acceptance Test
PA	Product Assurance
PCF	Primary Control Facility
PDF	Portable Document Format
PE2	Polar Epsilon 2
PM	Project Manager
PMP	Project Management Plan
QA	Quality Assurance
QAIP	Quality Assurance Implementation Plan
RCM	RADARSAT Constellation Mission
RD	Reference Documents
RFD	Request for Deviation
RFP	Request for Proposal
RFW	Request for Waiver
RID	Review Items Discrepancy
S&MA	Safety & Mission Assurance
SDP	Software Development Plan
SI	System International
SOW	Statement of Work
SPA	Software Product Assurance
STP	Software Test Plan
TA	Technical Authority
TIM	Technical Interchange Meeting
TPM	Technical Performance Measure
VDD	Version Description Document
WBS	Work Breakdown Structure
WPD	Work Package Description