

RAPID III DRFP NNG09207304J

ATTACHMENT D

RAPID III

DRAFT

CONTRACT DATA REQUIREMENTS LIST

JUNE 9, 2009

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SECTION 1 - INTRODUCTION

1.1 Scope

This Contract Data Requirements List (CDRL) is the Rapid III contractual document defining the baseline set of all required data to be provided by the Contractor on each Rapid III contract delivery order (DO).

The Government may modify the CDRL list, including the MAR related CDRL items for each mission specific DO.

All data shall be prepared, maintained, and delivered to the Government in accordance with the requirements of the mission specific CDRL and the associated Data Item Descriptions (DIDs).

This CDRL is to be treated as an extension of the SOW. As such, in the event of conflict between the content of this CDRL and the MAR and MAR CDRL, this CDRL shall take precedence.

1.2 Contract Data Requirements List (CDRL) Description

This CDRL is divided into two lists; one defining the CDRLs required by the Rapid III Statement of Work (SOW) (listed in CDRL Table 1 of this document) and a second, defining the CDRLs required by the Rapid III Systems Safety and Mission Assurance Requirement (MAR) document and contained in that document.

Each CDRL contains the following information:

a) CDRL #

Note that the MAR required CDRLs have a CDRL # that begins with the letters MA. The MA number associates with the MAR section that calls out the CDRL item. The SOW CDRLs are sequentially numbered.

b) SOW or MAR Reference:

Indicates where the CDRL item is called out in the SOW or MAR.

c) The Data Item Title

d) CDRL Delivery Information:

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‘Yes’ in the Core Prop (Proposal) column indicates the CDRL is to be delivered with the Core Spacecraft Proposal in accordance with the Rapid III RFP instructions (Section L). Note that the Mission Assurance Implementation Plan, CDRL MA 1-1, for the purposes of the Core Proposal is defined in Section L.

The contract baseline schedule for delivery of CDRL items on delivery orders is shown in the next seven columns associated with acronyms for the various program reviews that form the contract baseline set of payment milestones (reference: Contract Clause I.86, Performance Based Payment Events and Completion Criteria; and SOW, Section 4.3.1.4, Spacecraft Project Reviews).

The following Codes apply:

I: Indicates required submission of the **Initial** (or preliminary) version of the data or document.

U: Indicates required submission of an **Updated** revision.

F: Indicates required submission of the **Final** version of the document.

A/R: Indicates the item delivery is “as required” and is not tied to a specific milestone review.

Note that the MAR delivery requirements are often stated in terms of days before or after the milestone meeting.

e) “**Purposes**” are defined as follows:

Approval: The document is submitted for Government **Approval**. Starting when the Government receives the data, the Contractor shall wait 14 calendar days for written approval from the Government Contracting Officer (CO) before proceeding with the associated work. If a response is not received in the prescribed time, the Contractor may proceed as though approval was received, after notifying the Government of the intention to proceed.

Review: The document is submitted to the Government for **Review**. Starting when the Government receives the data, the Contractor shall wait the prescribed period of time, not to exceed 14 calendar days, for Government review and comment; to be sent in writing from the Government Contracting Officer (CO). If a response is not received in the prescribed time, the Contractor may assume that the Government has no response, and continue with the effort after notifying the Government of the intention to proceed. Once provided with Government review comments, the contractor may proceed with the associated work while preparing a response to the Government’s comments, unless otherwise directed by the Government CO.

Information: Deliverables are sent to the Government for **Informational** purposes. The Government may request changes on deliverables where errors or omissions are noted.

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The Contractor shall notify the Government Contracting Officer (CO) and Government Project Management in writing, when mailing or transmitting each CDRL Data Item.

1.3 Data Item Descriptions (DID) Overview

- a) Each data requirement listed on the CDRL is defined by the corresponding DID. The CDRL items DIDs required by the SOW are found in Section 3 of this CDRL. Those required by the Rapid III MAR are found in APPENDIX E of the MAR.
- b) The DID describes the use, purpose and required content of the data item, and provides specific Preparation Instructions where content and format is described. The delivery requirements of the CDRL are also reiterated in the DID.
- c) **Much of the information requested in the DIDs may already exist in your documentation and format. Existing documents and formats may be used if they meet the intent of DID requirements.** In this case a matrix or notation shall be supplied in the DID that indicates where in your document the information that satisfies the requirement can be found.

1.4 Delivery Instructions

The Contractor shall deliver each data item via the indicated type of media, in the specified quantities, in accordance with any special instructions indicated in the CDRL and in accordance with the contract requirements and provisions.

Mission Specific CDRL data shall be delivered to the following address:

Mission Project Office Contracting Officer
(Address to be supplied with DO)

In addition to the above, the original transmittal letter for all deliverables shall be addressed to:

Goddard Space Flight Center
Attn: RSDO Contracting Officer
Rapid Spacecraft Development Office

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Code 401.1
Greenbelt, MD 20771

The following shall be provided for each data item submission:

- a) Copy of Record - The Copy of Record is the official paper “hard copy” file copy submitted in the form in which it is intended to be distributed and marked “Copy of Record” and suitable for reproduction.
- b) Additional Copies (if requested) - Copies of each document specified in the CDRL shall be delivered in a condition suitable for immediate distribution.
- c) Electronic Data Delivery - Formats for electronic media delivery are defined in paragraph 1.5 of this CDRL. Delivery of electronic media data items shall occur per the same delivery schedule as printed media.
- d) For the baseline core effort the contractor shall assume the delivery requirements to be one hard copy and one electronic copy for each CDRL except for the Project Systems Review CDRLS 15A through 15G. For each review the contractor shall supply 30 additional hard copies, provided to the Government attendees at the meeting.

1.5 Delivery Media

- a) There are two media in which data will be documented and are defined as:
 - 1. Hard Copy - Data typed, drawn or printed on paper by common conventional practices. By these means, the original, a reproducible copy or the record copy shall be reproduced for distribution as printed copies.
 - 2. Electronic - Data which is recorded on CD ROM or other electronic storage media.
- b) Documentation delivery (in hardcopy or electronic format) shall be as specified in the CDRL. Additionally, all CDRL data which has been generated electronically shall be delivered via electronic transfer or electronic storage media.
- c) The instructions to facilitate the use of electronic media will be supplied.

1.6 Documentation Change Procedures

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- a) The Contractor shall issue Documentation Change Notices (DCNs), starting with the number 001, whenever minor changes or updates occur in data items that have been delivered to the Government.
- b) Change bars shall be used to indicate changes or updates.
- c) When major changes to a document are made, a complete revision of the document shall be issued and delivered to the Government in accordance with the original instructions for the data item. A description of all changes incorporated into the new revision shall be included in the new document or otherwise documented. Major versus minor changes will be defined in the mission-specific DO.
- d) No change bars are used when a document is updated by revision and the DCN numbers for that document shall be automatically recycled to 001.

Section 2

CDRL

CDRL TABLE 1: Rapid III SOW Data Items

(See CDRL Introduction for meaning of letter codes)

CDRL Reference Information				CDRL Delivery Information for DO								
CDRL #	SOW Ref.	DID Title	Core Prop	SRR	PDR	CDR	IIRR	PER	PSR	OAR	Purpose	Media & Delivery Instructions
1	4.3.4.1 4.3.7.3	Core Spacecraft Performance Spec	Yes	I	U	F	-	-	-	-	Approval	(Per CDRL section 1.4 d)
2	4.3.2.2.2 4.3.4.4	Instrument Interface Control Document (IICD)	Yes	I	U	F	-	-	-	-	Approval	(Per CDRL section 1.4 d)
3	4.3.4 4.3.7.3	System Performance Verification Program Plan	Yes	I	U	F	--	--	--	--	Approval	(Per CDRL section 1.4 d)
4	4.3.4	System Performance Verification Matrix	Yes	I	U	F	--	--	--	--	Information	(Per CDRL section 1.4 d)
5	4.3.2.2	Telemetry and Command Requirements Documentation	-	I	U	F			-	-	Information	(Per CDRL section 1.4 d)
6	4.3.2.2	External Interfaces, Models and Analysis	-	I	U	U	U	U	F	-	Review	(Per CDRL section 1.4 d)
7	4.3.2.2.2	Flight Operations Ground System Interface Documentation	-	I	U	U	-	F	-	-	Review	(Per CDRL section 1.4 d)
8	4.3.2.2.3	Launch Vehicle Documentation	-	I	U	U	-	U	F	-	Review	(Per CDRL section 1.4 d)
9	4.3.4.5 4.3.4.6	Storage, Transportation and Handling Plan	Yes	-	I	U	-	F	-	-	Review	(Per CDRL section 1.4 d)
10	4.3.2.2.3	Observatory Launch Site Operations and Test Plan	Yes	-	I	U	-	F	-	-	Review	(Per CDRL section 1.4 d)
11	4.3.2.2.3	Observatory Launch Site Operations and Test Procedures Note: Safety related (“hazardous”) procedures shall be provided per MAR section 3.1.2 and CDRL MA 3-2.	-	-	-	-	-	I	F	-	Approval	(Per CDRL section 1.4 d)

CDRL Reference Information				CDRL Delivery Information for DO								
CDRL #	SOW Ref.	DID Title	Core Prop	SRR	PDR	CDR	IIRR	PER	PSR	OAR	Purpose	Media & Delivery Instructions
12	4.3.2.2.2 4.3.6.1	Flight Operations Support Plan	Yes	-	I	U	-	U	F	-	Information	(Per CDRL section 1.4 d)
13	4.3.2.2.2 4.3.7.2	Spacecraft Operations Description Manual	-	-	-	-	I	U	F	-	Information	(Per CDRL section 1.4 d)
14	4.3.1.5	Engineering Change Proposals, Deviations and Waivers	-	A/R						Approval	(Per CDRL section 1.4 d)	
15A	4.3.1.4.1	Spacecraft (S/C) Requirements Review (SRR) Information Requirements	-	F	-	-	-	-	-	-	Information	(Per CDRL section 1.4 d)
15B	4.3.1.4.2	S/C Preliminary Design Review (PDR) Information Requirements	-	-	F	-	-	-	-	-	Information	(Per CDRL section 1.4 d)
15C	4.3.1.4.3	S/C Critical Design Review (CDR) Information Requirements	-	-	-	F	-	-	-	-	Information	(Per CDRL section 1.4 d)
15D	4.3.1.4.4	Instrument Integration Readiness Review (IIRR) Information Requirements	-	-	-	-	F	-	-	-	Information	(Per CDRL section 1.4 d)
15E	4.3.1.4.5	Observatory Pre-Environmental Review (PER) Information Requirements	-	-	-	-	-	F	-	-	Information	(Per CDRL section 1.4 d)
15F	4.3.1.4.6	Observatory Pre-Shipment Review (PSR) Information Requirements	-	-	-	-	-	-	F	-	Information	(Per CDRL section 1.4 d)
15G	4.3.1.4.7 4.3.7.3	Observatory Acceptance Review (OAR) Information Requirements	-	-	-	-	-	-	-	F	Information	(Per CDRL section 1.4 d)

Notes:

- 1. The DIDs for the above CDRLs are at the end of this CDRL Document**
 - 2. Safety and Mission Assurance CDRL and DIDs are contained within the Rapid III MAR.**
- (End of SOW CDRL Table)

Section 3

SOW CDRLs Data Item Descriptions

<p><u>Title:</u> Core Spacecraft Performance Specification</p>	<p><u>DID for CDRL #:</u> 1 – (Part 1)</p>
<p><u>Reference:</u> SOW Section 4.3.4.1 & 4.3.7.3 EXCEL file “CDRL 1 enclosure.xls”</p>	
<p><u>Use:</u> To specify the performance and characteristics of the Core Spacecraft. The intent of this document is to present the top-level system performance separately from the detailed component and subsystem descriptions. In other words, <i>what</i> the Core Spacecraft does is captured in the first section, <i>how</i> it gets it done is in the second section.</p>	
<p><u>Related Documents:</u> EXCEL file “CDRL 1 enclosure.xls”</p>	

Preparation Information:

The Core System Performance Specification consists of two main sections, 1) a Performance Characteristics section and 2) a Systems and Subsystems Description section.

1) CORE SYSTEM PERFORMANCE CHARACTERISTICS

The offeror shall detail the top-level performance characteristics of the proposed Core Spacecraft System (Top level system performance characteristics **only**, component descriptions are in Part 2 of this DID). The offeror is **strongly** encouraged to provide any additional performance characteristics which will help the Government understand the Core System and option(s) offered, beyond those characteristics outlined here. Explanatory text, in addition to the completed enclosure, is allowable.

1.1 Observatory (or Mission) Level Performance

(Complete EXCEL Spreadsheet “CDRL 1 enclosure.xls” provided as Enclosure 1 to this DID)

1.2 Core Spacecraft Major Systems Performance

(Complete EXCEL Spreadsheet “CDRL 1 enclosure.xls” provided as Enclosure 1 to this DID)

<u>Title:</u> Core Spacecraft Performance Specification (cont)	<u>DID FOR CDRL #:</u> 1– (Part 2)
<u>Reference:</u> SOW Section 4.3.4.1 & 4.3.7.3	
<u>Use:</u>	
<u>Related Documents:</u>	

Preparation Information (cont'd):

2) CORE SYSTEM AND SUBSYSTEM DESCRIPTIONS

The offeror shall describe the make-up of the Core System and major subsystems (component descriptions and block diagrams **only**, no subsystem performance characteristics). The description shall provide the basis for performance claims made in 1 and confirm the design margins.

2.1 *Structural/Mechanical Subsystem*

2.2 *Power Subsystem*

2.3 *Propulsion Subsystem*

2.4 *Attitude Control Subsystem*

2.5 *Command and Data Handling Subsystem*

2.6 *Communications Subsystem*

2.7 *Thermal Control Subsystem*

2.8 *Core System Flight Software/Firmware*

2.9 *Core System Ground Support Equipment*

This section shall contain an equipment list or table itemizing all core system components down to the subsystem “component level” (that is, core system structure, solar array, battery vessel and cell type and number, wire harness, star tracker etc., high-density boards and electronics should be itemized at the box level). For each component show the manufacturer, model, mass, power, and heritage.

An optional suggested format for this information is included in the enclosure “CDRL 1 enclosure.xls”.

The offeror is **strongly** encouraged to provide any additional component descriptions which will help the Government understand the Core System offered, beyond those components outlined here.

Title: Instrument Interface Control Document (IICD)	<u>DID FOR CDRL # 2</u>
Reference: SOW Section 4.3.2.2.1 & 4.3.4.4	
Use: To coordinate and control all interface items between the Core Spacecraft and the payload instrument(s) to provide efficient electrical and mechanical integration.	
<u>Related Documents:</u>	
<u>Preparation Information</u> <p>The offeror shall provide detailed information regarding the Core Spacecraft interface to the payload instrument(s) The data provided by the payload instrument, in the form of written words, drawings, and schematics, will be incorporated into this combined instrument and Core Spacecraft ICD for applicable signatures.</p> <p>The spacecraft to instrument interface is defined per the following topics, as a minimum:</p> <ul style="list-style-type: none"> A. <u>Physical Requirements</u> - such as mass properties, footprint, clearance envelope, drill template, alignment, orientation, fields-of-view (optical, thermal, glint, RF), including tolerances. Electrical Connectors - regarding sex, type, orientation, pin assignments. Thermal control coatings, blankets, heat flow and operating limits. Red and green tag items for test and flight. B. <u>Electrical Power and Signals</u> - such as timing clock pulses, data busses, signal (name, type, function), voltage and current limits, frequencies, waveforms, rise and fall time, duration, periodicity, shielding, grounding, formats, line driver/receiver characteristics. Power fusing, voltage, currents, ripple, regulation. C. <u>Software</u> - such as codes, processors, memory storage, application description, uses. D. <u>Payload Environmental</u> - such as vibration, shock, acoustic, EMI/EMC, ESD, thermal, contamination, purges. E. <u>Safety</u> - such as pyrotechnics, energy storage, trip-over, hazardous materials. F. <u>Ground Support Equipment</u> - such as mechanical, electrical, test specific, targets, stimulators. G. <u>Operational Factors</u> – e.g. ground contacts needed per day, data storage capacity and compression, general flight rules and limitations. <p>Show sufficient detail on both sides of each interface to provide a complete definition of the mated interface; e.g. electrical interfaces should be presented to schematic detail (logic elements and piece parts) to the point where impedance and transfer characteristics no longer affect the interface.</p>	

<u>Title:</u> System Performance Verification Program Plan	<u>DID FOR CDRL #:</u> 3
<u>Reference:</u> SOW Section 4.3.4	
<u>Use:</u> To show the contractor's plans and approach to I&T of the Core Spacecraft and Observatory and is to include a Comprehensive Performance Testing at the Core Spacecraft and Observatory level.	
<u>Related Documents:</u> Spacecraft Performance Verification Plan (CDRL #4)	

Preparation Information

The Contractor shall also follow the Preparation Information of MAR DID's MA 9-1 and MA 9-2 in preparing the content of this CDRL #3.

The Contractor shall provide definitive test plans for the Core Spacecraft and Observatory integration and test which identify the scope, purpose, sequence (test flow), and success criteria for the activities below. The Contractor shall identify where in the test flow repeat activities (e.g. Observatory Full Functional Test) occur to re-baseline system performance. The minimum integration and test activities the Contractor shall address in the plan at the Core Spacecraft and Observatory levels are:

Core Spacecraft Level:

- Integration and Test
- Comprehensive Performance Tests (CPT)

Observatory Level:

Instrument Integration(*):

- Mechanical Integration
- Electrical Integration
- Instrument Performance Test
- EMI/EMC/ESD Tests
- Optical and Mechanical Alignments
- Magnetic Survey
- Attitude Control Subsystem Phasing
- Solar Array Integration (required only if integrated at the Observatory level)
- Flight Payload Attach Fitting Integration
- Mass Properties Measurements
- Vibration Test
- Acoustics Test

(*) The Contractor shall coordinate plans and procedures for Instrument Integration with the Instrument representative. (mission specific)

(Continued on next page)

<u>Title:</u> System Performance Verification Program Plan (cont'd)	<u>DID FOR CDRL #:</u> 3 (cont'd)
<u>Preparation Information: (cont'd)</u> <u>Observatory Level: (cont'd)</u> Shock Test Solar Array Deployment Thermal Vacuum Test Thermal Balance Test Cleanliness, Control and Monitoring Comprehensive Performance Tests End-to-End Functional Test	

<p><u>Title:</u> System Performance Verification Matrix</p>	<p><u>DID FOR CDRL #:</u> 4</p>
<p><u>Reference:</u> SOW Section 4.3.4</p>	
<p><u>Use:</u> To identify clearly where, how, and when each Core Spacecraft and Observatory performance requirements are verified in the I&T program before launch and how these requirements are again going to be verified on-orbit.</p>	
<p><u>Related Documents:</u> System Performance Verification Program Plan (CDRL #3)</p>	
<p><u>Preparation Information</u> The Contractor shall also follow the Preparation Information of MAR DIDs MA 9-3 and MA 9-4 in preparing the content of this CDRL #4.</p> <p>Each spacecraft performance requirement is to be verified either by analysis or by test before and after launch.</p> <p>A. (I&T) Provide a matrix of where each performance requirement of the Core Spacecraft will be verified in the I&T flow. Identify the test procedure or analysis that accomplishes that item's requirement verification.</p> <p>B. (On-orbit) Provide a matrix of where and how each performance requirement of the Observatory is going to be verified after launch. Identify the test procedure or analysis that accomplishes each requirement verification.</p>	

<p><u>Title:</u> Telemetry and Command Requirements Document</p>	<p><u>DID FOR CDRL #:</u> 5</p>
<p><u>Reference:</u> SOW Section 4.3.2.2</p>	
<p><u>Use:</u> To describe (in detail) the Core Spacecraft, its payload instrument(s) and launch vehicle interfaces telemetry and command features for launch and flight operations application.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information</u></p> <p><u>Telemetry Requirements Document contents:</u></p> <ol style="list-style-type: none"> 1. Detailed listing of all telemetry assignments. 2. Key parameters and information necessary for the description and interpretation of the telemetry requirements. 3. Summary of number and type of telemetry assignments, including spares. 4. Description of telemetry interfaces, format, and requirements data. 5. Listing of telemetry assignments that confirm commands. 6. Schematic reference for each telemetry assignment. 7. Transmission or sampling rates. 8. Methods of in-flight or ground-test verification. 9. Engineering units and calibration data, A to D for readout and calibration. <p><u>Command Requirements Document contents:</u></p> <ol style="list-style-type: none"> 1. Detailed listings of all commands that can be applied to the Observatory that can affect a response or change in its configuration in anyway, either in test or in flight. 2. Key parameters necessary for description of commands. 	

3. Summary of number and type of commands used by each subsystem and the number of spares.
4. Description of command input, verification, rates, and filler commands.
5. Description of command requirements data and information necessary for interpretation.
6. Listing of commands verified by telemetry and resultant telemetry verifications.
7. Schematic reference for each command.

<p><u>Title:</u> External Interfaces, Models and Analysis</p>	<p>DID FOR CDRL #:6</p>
<p><u>Reference:</u> SOW Section 4.3.2.2</p>	
<p><u>Use:</u> To provide the instrument and ground system teams with spacecraft interface data, models, and analysis needed to assist them in their designs and preparations to support the Observatory for launch and mission operations.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information</u> The offeror shall provide to the instrument developer and ground system team the required external interface information (data, models, and analysis) for the development of the instrument or ground system. This shall include as a minimum:</p> <ol style="list-style-type: none"> A. Core Spacecraft and Observatory reduced finite element models B. Structural interface analyses C. Pointing and alignment budgets D. Core Spacecraft and Observatory thermal models analyses E. Ground system protocols and data rates compatibility analyses 	

F. Data contact scenarios and optimization (contacts versus data recorder size trade study)

G. Flight dynamics and orbital maintenance analysis.

<u>Title:</u> Flight Operations Ground System Interface Documentation	<u>DID FOR CDRL #:</u> 7
<u>Reference:</u> SOW Section 4.3.2.2.2	
<u>Use:</u> To document and define requirements and control all aspects of the interface between the Observatory and the Ground system to insure efficient integration and promote successful mission operations.	
<u>Related Documents:</u>	
<u>Preparation Information</u> A. Data formats, communications protocols, data rates. B. Compression algorithms, Error Detection and Correction schemes. C. Antenna patterns, Equivalent Isotropically Radiated Power (EIRP), Gain to Temperature Ratio (G/T), Beam width, Frequency, Polarization, and Link Margins. D. Command and Telemetry formats. E. Spacecraft contact scenarios for data transmission, operations, and maintenance.	

<p><u>Title:</u> Launch Vehicle Documentation</p>	<p><u>DID FOR CDRL #:</u> 8</p>
<p><u>Reference:</u> SOW Section 4.3.2.2.3</p>	
<p><u>Use:</u> To document and define requirements the interface between the Observatory and the launch vehicle to insure efficient integration and promote a successful launch to the mission orbit.</p>	
<p><u>Related Documents:</u> Launch Vehicle User Planners Guide External Interfaces, Models and Analysis, CDRL #6</p>	
<p><u>Preparation Information</u> This deliverable set of data defines the requirements of the Observatory for the launch vehicle provider and is to include the following as a minimum:</p> <ul style="list-style-type: none"> A. Spacecraft Questionnaire B. Spacecraft Mathematical Model for Dynamic Analysis C. Spacecraft Environmental Test documents D. Missile System Pre-Launch Safety Package (MSPSP) inputs (Ref CDRL MA 1-1) E. Payload/Launch System Interface Specification (electrical, mechanical, data) F. Mission Operations and Support Requirements G. Payload Requirements Documents (PRD) H. Payload Compatibility Drawings I. Electrical Wiring Requirements J. Fairing Requirements, including spacecraft environment controls K. Launch Site Test Plan 	

- L. Launch Site Operations and Test Procedures List (Ref. CDRL 11)
- M. Spacecraft Integrated Test Procedure Inputs
- N. Mission Analysis Requirements
- O. Launch Intervals (window)
- P. Radio Frequency Applications
- Q. Post-Launch Orbit Confirmation Data

Title: Storage, Transportation and Handling Plan	<u>DID FOR CDRL #:</u> 9
<u>Reference:</u> SOW Section 4.3.4.5 & 4.3.4.6	
<u>Use:</u> To understand the offeror's role, responsibility and plans to store and ship the integrated Observatory with flight instrument(s), along with the supporting equipment, from the Contractor's integration and test facility to the launch site.	
<u>Related Documents:</u>	
<u>Preparation Information</u> The data provided in the plan should address the following as a minimum: <ul style="list-style-type: none"> A. Definition of storage related activities including: locations; methods; GSE; environmental controls and monitoring; and pre-, post-, or intermittent storage testing required. B. Description of shipping container C. Methods of transporting the Observatory and ground support equipment (GSE) D. Bagging and purging requirements E. Environmental controls and monitoring equipment F. Expected roles and responsibilities of the Offeror and the Government. G. Who provides ground transportation at launch site H. Shipping crew support, convoy support I. Off-loading of Observatory at the launch site J. Movement between facilities at the launch site K. Fueling GSE L. Lifting slings M. Electrical and mechanical support equipment general description. N. Identify specific procedures available or needed. 	

<p><u>Title:</u> Observatory Launch Site Operations and Test Plan</p>	<p><u>DID FOR CDRL #:</u>10</p>
<p><u>Reference:</u> SOW Section 4.3.2.2.3 AFSPCMAN 91-710, “Range Safety User Requirements Manual” Launch Vehicle Payload Planner’s Guides (as applicable)</p>	
<p><u>Use:</u> (1) To provide a detailed understanding of the launch site activities, operations and testing planned for a particular mission, (2) to support requirements of the Missile System Prelaunch Data Package (MSPSP) and (3) to obtain launch site procedure approvals.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information</u> Describe all aspects of the activities at the launch site beginning with arrival of the Observatory, including final testing and preparations, fueling, transportation between buildings and the launch vehicle, launch vehicle integration and testing, and removal of systems after launch. The data shall be originated to support launch site “test and inspection plans” requirements and the “ground operations plan” requirements as referenced in AFSPCMAN 91-710.</p> <ul style="list-style-type: none"> A. Layout a schedule and timeline of proposed activities B. Specify what facilities and facility resources are needed C. Show equipment placement and personnel area requirements D. Fully explain staffing plan E. Explain schedule and personnel contingency methods F. Describe roles and responsibilities and the other equipment needed at each step of the plan G. Describe fueling methods, crew training, SCAPE (Self Contained Air breathing Protective Equipment) operations, fuel storage locations H. Address cleanliness methods, purge gasses and lines, garments I. Identify special test equipment needed on the launch tower or in the blockhouse <p>Identify specific communication links needed between locations at the launch site to perform Observatory end-to-end testing and to support the Observatory on the launch vehicle up to the point of launch.</p>	

<p><u>Title:</u> Observatory Launch Site Operations and Test Procedures</p>	<p><u>DID for CDRL #:</u> 11</p>
<p><u>Reference:</u> SOW Section 4.3.2.2.3</p>	
<p><u>Use:</u> To document the complete understanding of how the planned activities are to be carried out at the launch site to meet requirements of (1) MSPSP, (2) the ground operations plan, (3) test and inspection plans and (4) procedure approval specified in AFSPCMAN 91-710.</p>	
<p><u>Related Documents:</u> AFSPCMAN 91-710, “Range Safety User Requirements Manual” Missile System Prelaunch Safety Package (MSPSP), CDRL # MA 3-7 Launch Vehicle Payload Planner’s Guides (as applicable) Observatory Launch Site Operations and Test Plan CDRL # 10</p>	
<p><u>Preparation Information</u> For all of the activities at the launch site, most of which are identified in the referenced Observatory Launch Site Operations and Test Plan, CDRL# 10, detailed procedures are to be prepared, reviewed, and approved before use. Hazardous activities shall be identified and included in the referenced MSPSP, CDRL # MA 3-7. Specify in the procedures, the test objectives, personnel and equipment requirements, environmental handling needs, Core Spacecraft and payload instrument(s) and electrical tests and operations to be performed, including the conditioning of batteries, special calibrations, end-to-end type testing, red tags, green tags, load cells, optical alignment equipment. Particular interest will be paid to the period of time that the Observatory is mated to the launch vehicle to assure safety, smooth interaction between Observatory and launch vehicle activities and a successful launch. Safety related (i.e. “hazardous”) procedures shall be provided to the Government in accordance with MAR section 3.1.2. and MAR CDRL MA 3-2.</p>	

<p><u>Title:</u> Flight Operations Support Plan</p>	<p><u>DID FOR CDRL #:</u> 12</p>
<p><u>Reference:</u> SOW Section 4.3.2.2.2 & 4.3.6.1</p>	
<p><u>Use:</u> To describe the contractor’s plan for supporting the flight operations of the Observatory starting at integration and test, through launch, and throughout the life of the mission. Included is how the offeror intends to provide anomaly resolution support to the end of the mission, and how Flight Software will be supported through the mission life cycle.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information</u></p> <ul style="list-style-type: none"> A. Description of roles and responsibilities and plans of how the offeror will support the operations of the spacecraft during test, launch, and on-orbit operations for the life of the mission. B. Description and designation of ground systems and responsibilities needed for spacecraft operations. C. Plan for anomaly identification, investigation, and resolution process. D. Plan for periodic performance assessments to determine spacecraft viability. E. Description of complement of skills needed to provide this support and how the offeror will provide these resources. F. Description of the Flight Software standards and practices through development, integration and Test, and in-orbit checkout. Describe the documentation system, how source and executable code is generated and used, and the method(s) of maintaining equipment. G. Description of the governments right to Flight Software source and executable code, and discuss how software maintenance and future mission modifications can be performed. Describe configuration control methods and safeguards, how emulators are accessed or dedicated, and how software corrections or changes are verified before uploading to the on-orbit Observatory. 	

<p><u>Title:</u> Spacecraft Operations Description Manual</p>	<p><u>DID FOR CDRL #:</u> 13</p>
<p><u>Reference:</u> SOW Section 4.3.2.2.2 & 4.3.7.2</p>	
<p><u>Use:</u> Provides a description of the operation of the Spacecraft to be used by the operations organization to develop detailed operations procedures and the Observatory Operations Manual.</p>	
<p><u>Related Documents:</u> Flight Operations Support Plan CDRL #12, Flight Operations Ground System Interface Documentation; CDRL #7, Telemetry and Command Requirements Document CDRL #5</p>	
<p><u>Preparation Information:</u> Operations Description Manual contents:</p> <ul style="list-style-type: none"> A. Overview and discussion of operations concept B. Description of unique factors associated with the operation of the Observatory C. Overview of Internal and External Observatory interfaces D. Unique ground system logistics, software, software maintenance, and sustaining engineering required for sustained Observatory operations E. Sample operational scenarios F. Operation of the Observatory and all Spacecraft subsystems G. Contingency scenarios and procedures H. Redundancy management I. State of health maintenance J. Listing of operations limits, cautions, and constraints. 	

<p><u>Title:</u> Engineering Change Proposals (ECPs), Deviations and Waivers</p>	<p><u>CDRL #:</u> 14</p>
<p><u>Reference:</u> SOW Section 4.3.1.5</p>	
<p><u>Use:</u></p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u></p> <p>The Contractor shall prepare and submit Class I Engineering Change Proposals (ECPs). All ECP's shall contain, in addition to the change description, sufficient information in the form of attachments, drawings, test results, etc., to allow NASA's GSFC to evaluate the total impact of the proposed change.</p> <p>For the purposes of this DID, a Class I ECP is a change that:</p> <ul style="list-style-type: none"> A. affects any NASA Contract specification, mission requirement or interface requirement B. affects schedules of end item deliverables to the Project C. impacts Government Furnished Equipment <p>The Government may direct the Contractor to prepare ECPs under the "Changes" clause of the contract.</p> <p>The Contractor shall allow to the Government access to Class II changes.</p> <p>Safety related waivers and deviations shall be submitted in accordance with Rapid III MAR section 3.2.5 and CDRL MA 3-9</p> <p>Waivers and deviation related to Material Review Board (MRB) actions shall be submitted in accordance with the Rapid III MAR section 2.2.2 and CDRL MA 2-2.</p>	

<p><u>Title:</u> S/C Requirements Review (SSR) Information Requirements</p>	<p><u>DID FOR CDRL #:</u> 15A</p>
<p><u>Reference:</u> SOW Section 4.3.1.4.1</p>	
<p><u>Use:</u> To define the required information content of the PDR.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u> The Contractor shall provide, at a minimum, the following data and information.</p> <p><u>System Level:</u></p> <ol style="list-style-type: none"> 1. Mission Design overview showing a mature understanding of the mission objectives and the approaches that will be used to carry out the mission together with definition of roles and responsibilities. 2. Mission performance requirements allocation and subsystem flow-down 3. Resource allocations and margins (telemetry, commands, power, weight, data storage, processor capability, etc.) 4. Preliminary ICDs (instrument, ground system) ready for signature 5. Performance verification approach and rationale 6. Core Spacecraft integration and test plan 7. Observatory integration and test plan 8. QA program applications, status, issues 9. Flight operations plan overview 10. Mission ground support equipment (GSE) plan. 11. Approach for the next milestone review 	

12. I&T software requirements, description

13. Flight software requirements

Subsystem level (including flight software):

1. Requirements flow-down specifications to each subsystem

2. GSE overview

<u>Title:</u> S/C Preliminary Design Review (PDR) Information Requirements	<u>DID FOR CDRL #:</u> 15B
<u>Reference:</u> SOW Section 4.3.1.4.2	
<u>Use:</u> To define the required information content of the PDR.	
<u>Related Documents:</u>	
<p><u>Preparation Information:</u> The Contractor shall provide, at a minimum, the following data and information:</p> <p><u>System Level:</u></p> <ol style="list-style-type: none"> 1. Mission Design overview showing a mature understanding of the mission objectives and the approaches that will be used to carry out the mission together with definition of roles and responsibilities. 2. Mission performance requirements allocation and subsystem flow-down 3. Resource allocations and margins (telemetry, commands, power, weight, data storage, processor capability, etc.) 4. ICDs (instrument, ground system) ready for signature 5. Performance verification approach and rationale 6. Core Spacecraft integration and test sequence rationale 7. Observatory integration and test sequence and rationale 8. QA program applications, status, issues 9. Orbit, orbit maintenance, and flight dynamics analysis 10. Flight operations overview and status 11. Mission ground support equipment (GSE) 12. Approach for the next milestone review 13. I&T software requirements, description, status, verification. 14. Flight software requirements, description, development and verification plan, status <p style="text-align: center;">(continued on next page)</p>	

<p><u>Title:</u> S/C Preliminary Design Review (PDR) Information Requirements (cont'd)</p>	<p><u>DID FOR CDRL #:</u> 15B (cont'd)</p>
<p><u>Preparation Information: (cont'd)</u></p> <p><u>Subsystem level (including flight software):</u></p> <ol style="list-style-type: none"> 1. Requirements flow-down specifications to each subsystem component (box) 2. Performance verification and validation 3. Preliminary design details of mission-specific elements 4. GSE <p><u>Specific Analysis and Margins:</u></p> <ol style="list-style-type: none"> 1. Stress and dynamics 2. Loads determination 3. Communication links 4. Thermal flight predictions 5. Power balance (end-of-life and battery Depth of Discharge (DOD)) 6. Worst case 7. Data flow, Storage and loading 8. Pointing budgets including attitude control simulation results 9. Flight dynamics, orbit insertion, maintenance, disposal 10. Radiation, EMC, ESD, magnetics 11. Failure mode and effects update 	

Title: S/C Critical Design Review (CDR) Information Requirements	<u>DID FOR CDRL #:</u> 15C
<u>Reference:</u> SOW Section 4.3.1.4.3	
<u>Use:</u> To define the required information content of the CDR.	
<u>Related Documents:</u>	
<u>Preparation Information:</u> The Contractor shall provide, at a minimum, the following data and information: <u>System Level:</u> <ol style="list-style-type: none"> 1. Mission Design overview showing a mature understanding of the mission objectives and the approaches that will be used to carry out the mission together with definition of roles and responsibilities. 2. Mission performance requirements allocation and subsystem flow-down 3. Resource allocations and margins (telemetry, commands, power, weight, data storage, processor capability, etc.) 4. ICDs (instrument, ground system) ready for signature 5. Performance verification approach and rationale 6. Core Spacecraft integration and test sequence rationale 7. Observatory integration and test sequence and rationale 8. QA program applications, status, issues 9. Orbit, orbit maintenance, and flight dynamics analysis 10. Flight operations overview and status 11. Mission ground support equipment (GSE) 12. Approach for the next milestone review 13. I&T software requirements, description, status, verification. 14. Flight software requirements, description, development and verification plan, status 	

<p><u>Title:</u> S/C Critical Design Review (CDR) Information Requirements (cont'd)</p>	<p><u>DID FOR CDRL #:</u> 15C (cont'd)</p>
<p><u>Preparation Information: (cont'd)</u></p> <p><u>Subsystem level (including flight software)</u></p> <ol style="list-style-type: none"> 1. Requirements flow-down specifications to each subsystem component (box) 2. Performance verification and validation 3. Final design details of mission-specific elements 4. GSE <p><u>Specific Analysis and Margins</u></p> <ol style="list-style-type: none"> 1. Stress and dynamics 2. Loads determination 3. Communication links 4. Thermal flight predictions 5. Power balance (end-of-life and battery DOD) 6. Worst case 7. Data flow, Storage and loading 8. Pointing budgets including attitude control simulation results 9. Flight dynamics, orbit insertion, maintenance, disposal 10. Radiation, EMC, ESD, magnetics 11. Failure mode and effects update 	

<p><u>Title:</u> Instrument Integration Readiness Review (IIRR) Information Requirements</p>	<p><u>DID FOR CDRL #:</u> 15D</p>
<p><u>Reference:</u> SOW Section 4.3.1.4.4</p>	
<p><u>Use:</u> To define the required information content of the IIRR.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u> The Contractor shall present at the IIRR:</p> <ol style="list-style-type: none"> 1. The summary of results of Core Spacecraft Integration and Test in preparation for payload. 2. Resource allocations and margins (telemetry, commands, power, weight, data storage, processor capability, etc.) 3. A resolution plan for all failures, anomalies, and malfunctions encountered during system testing 4. Any remaining open integration issues and their proposed resolution 5. The readiness to perform Instrument integration (e.g. staffing, facilities, GSE, procedures, resources, etc.) 6. Plans to proceed to Pre-Environmental Review (tests, activities, facilities, resources, schedule, flow) 7. I&T software readiness and verification status 8. Flight software development and verification status 	

<p><u>Title:</u> Observatory Pre-Environmental Review (PER) Information Requirements</p>	<p><u>DID FOR CDRL #:</u> 15E</p>
<p><u>Reference:</u> SOW Section 4.3.1.4.5</p>	
<p><u>Use:</u> To define the required information content of the PER.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u> The Contractor shall present at the PER:</p> <ol style="list-style-type: none"> 1. The results of Instrument Integration and the status of the Observatory 2. A resolution plan for all failures, anomalies, and malfunctions encountered during Instrument integration 3. Review of all environmental test plans and procedures 4. Present detailed thermal vacuum and thermal balance test plans showing the Observatory in the chamber, the hot and cold plates and shrouds, optical or thermal targets, RF coupling, star camera and sun sensor stimulators, Quartz Crystal Monitors (QCMs), cold finger, planned test profile, cleaning and out-gassing plan. 5. The structural qualification/acceptance plan, showing the final modal analyses and analyses of results from the Coupled Loads Analysis (performed by launch service provider). 6. Define the predicted test limits for the components of the Core Spacecraft and instrument payload for: <ul style="list-style-type: none"> -Vibration -Thermal-Vacuum, Balance 7. Justify that the planned test environments adequately demonstrate the Observatory Performance requirements without presenting a hazard, and without degrading Observatory performance and lifetime 8. Present the plans to proceed to the PSR (e.g. tests, activities, facilities, staffing, resources, schedule, flow) 	

<p><u>Title:</u> Observatory Pre-Shipment Review (PSR) Information Requirements</p>	<p><u>DID FOR CDRL #:</u> 15F</p>
<p><u>Reference:</u> SOW Section 4.3.1.4.6</p>	
<p><u>Use:</u> To define the required information content of the PSR.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u> The Contractor shall present the following at the PSR:</p> <ol style="list-style-type: none"> 1. Results of all the environmental tests, end-to-end tests, and the latest Observatory comprehensive performance test and comparison against requirements. 2. A resolution plan for all failures, anomalies, and malfunctions remaining open. 3. Flight software verification results. 4. Any remaining open issues under the DO and their proposed resolution. 5. Shipping plans and documentation status (e.g. shipping lists, manifests, containers, handling, transport, etc.). 6. Observatory documentation status (e.g. final configuration lists, trend data, test reports, mass properties, system safety plan, life-limited items, equipment logs, cleanliness certification, and any other necessary documents). 7. Receiving point plans - arrival time and place, storage, handling, points-of-contact, mechanical and electrical test plans and procedures. 8. Detailed plans of the launch support (e.g. activities, facilities, staffing, resources, schedule, flow). 9. Readiness of flight operations procedures and personnel. 10. Ground network compatibility RF test results and open issues with plan for closure. 11. Review of mission & launch simulations plans. 	

<p><u>Title:</u> Observatory Acceptance Review (OAR) Information Requirements</p>	<p><u>DID FOR CDRL #:</u> 15G</p>
<p><u>Reference:</u> SOW Section 4.3.1.4.7 & 4.3.7.3</p>	
<p><u>Use:</u> Define the Required content for the OAR.</p>	
<p><u>Related Documents:</u></p>	
<p><u>Preparation Information:</u> The Contractor shall present the following at the OAR:</p> <ol style="list-style-type: none"> 1. The OAR shall be in a presentation format with facing page text in associated with each slide. 2. A timeline summary of all events following liftoff of the launch vehicle through the completion of on-orbit performance verification and readiness for handover to the operations team shall be included. The indicated performance of the Observatory in response to those events in comparison to the predicted performance. 3. A summary of the operating performance of each subsystem and component of the Observatory. 4. A summary of all performance discrepancies and their closure status. All issues potentially affecting mission success shall be addressed. The more significant issues shall be discussed in the greatest detail. 5. A summary of the status of all deliverables including all required documentation. 	

(End of SOW DIDs)

Note: The Safety and Mission Assurance CDRL and DIDs are contained with the Rapid III MAR document.