

# **Contract Data Requirements List (CDRL)**

## **Attachment J-2**

July 15, 2008

Revision: Final

NASA Glenn Research Center  
CLEVELAND, OHIO

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
draft	Modified CDRL from MRDOC contract	4/12/2007
Initial	Incorporated New CDRL and Revisions	6/24/2008
Final	Minor changes to the CDRL for grammer, due dates, references, etc	7/15/2008

**SECTION 1 - Contract Data Requirements****1.1 Scope**

- a) The Contract Data Requirements List (CDRL) is the basic contractual document, which governs data required by and for the contract.
- b) The contractor shall furnish data described by the Data Item Descriptions (DIDs) included herein and listed on the Contract Data Requirements Lists (CDRLs) for each item of data requested as a deliverable in the Delivery Order. DIDs that are not called out in a specific Deliver Order Statement of Work will not be required for that Delivery Order.
- c) All data shall be prepared, maintained, and delivered to NASA in accordance with the requirements of this document, Attachment J-5.

**1.2 Contract Data Requirements List (CDRL)**

The CDRLs provide a complete listing of the data requirements of the contract. Each CDRL contains the following:

- a) The data item number, which corresponds to the data item description number.
- b) The data item title.
- c) The data item approval code defined as follows:
  1. Code NDA [NASA Document with NASA Approval]: The initial submission and all subsequent changes require approval of the NASA contracting officer or designee; Class I changes (definition: no change to technical scope or cost) require this approval prior to implementation.
  2. Code A [Approval]: The initial submission and all subsequent Class 1 changes require approval of the NASA contracting officer or designee prior to implementation
  3. Code I [Information]: Deliverables are sent to NASA for information purposes only. NASA will request changes on deliverables where errors or omissions are noted through the use of Review Item Discrepancies (RID), if necessary.
  4. Code S [Surveillance]: Document and/or data need not be delivered to NASA but should be made available for information upon request or during surveillance activities.

Delivery Orders instructions may supersede these approval codes.

**1.3 Data Items Description**

- a) Each data requirement listed on the CDRL is defined by a DID.
  1. The DID describes the purpose and required content of the data item, and provides specific format and preparation instructions as necessary. Each DID page has a "Reference" item box. This reference item box may refer to a standard or a guidance document or may be empty. Some DIDs will mandate the format and standard to be used and will be identified in the "Preparation Instructions"; otherwise the reference is for guidance purposes. The "Related Documents" item box refers to other data deliverables that will most likely have supporting information that should be referenced with minimal duplication of information.
  2. In many DIDs, the contractor shall propose the standard to be used that meets the DID item requirement most cost effectively. Much of the information requested in the DIDs may already exist in contractor documentation and format processes. The Government strongly encourages the contractor to utilize existing documents and formats whenever it will meet the requirements of the DID.

3. A proposed standard is expected for each and every CDRL DID. In some cases, a single standard may be applicable to more than one CDRL item, and, therefore, may be proposed in response to multiple CDRL items. If no standard exists, indicate how you will generate one.

#### **1.4 Distribution and Delivery**

The contractor shall distribute and deliver data according to contract requirements and provisions.

An electronic copy of the transmittal letter and the deliverable document master copy will be deposited into the Government's electronic storage drop box and notification of document drop shall be provided by e-mail to:

SpaceDOC  
Configuration Management Office  
(E-mail address to be supplied with the DO)

Copies of the transmittal letter, deliverable document signature pages and electronic copy of the entire document shall be provided to:

NASA Project Manager  
(Address to be supplied with the delivery order)

Copies of the transmittal letter only, without the enclosures shall be provided to:

NASA Glenn Research Center  
SpaceDOC Contracting Officer (CO)  
MS 500-306  
21000 Brookpark Rd.  
Cleveland, OH 44135

NASA Glenn Research Center  
SpaceDOC Contracting Officer Technical Representative (COTR)  
MS 77-7  
21000 Brookpark Road  
Cleveland, OH 44135

##### **1.4.1 Definition of Deliverables**

The following defines the content of the items identified above and shall be provided for each data item submission:

- a) Original Document – Is the official final document which is signed in ink by all parties and maintained by the contractor's Configuration Management organization. The contractor retains signed originals until the completion of the project, when all original document records are transferred to the Government for archiving. With the exception of drawings, electronic signatures are not accepted as approval designations.
- b) Master Copy - Is the official file copy submitted in the form in which it is intended to be distributed and will be signed by the contractor's Configuration Management organization. The Master Copy is suitable for reproduction and is a copy of the original, signed document.
- c) Copies - The number of printed media copies of each document, if applicable, shall be specified in the delivery order and shall be delivered in a condition suitable for immediate distribution.
- d) Electronic Data Delivery - Formats for electronic media delivery are defined in paragraph 1.5 of this document, Attachment J-5. Delivery of electronic media data items shall occur per the same delivery schedule as printed media.

### 1.4.2 Deliverable Fidelity

The following defines the document fidelity used to describe the delivered product:

a) Document Formats:

1. The NDA document is formatted as a NASA document with an appropriate cover sheet and have a NASA approval signature entry, identifying NASA's approval signatures. These documents shall be submitted for NASA review and approval. For NASA-formatted documents, the cover page shall contain only the NASA logo and NASA/GRC address, the document title and number, revision status, and the date of the document release, unless specific guidance to deviate from that format for a particular project has been provided by the government. NASA signature approvals will be limited to the COTR and the applicable NASA Project Manager, unless otherwise specified in the Delivery Order instructions.
2. Non-NASA Documents Requiring Government Approval, but do not require the NASA Approval format. Identified on the CDRL as A by the corresponding DID. The NASA signature is included on the document signature page with the following heading, "Reviewed by and Approved". These documents should also identify NASA involvement in the document change process. These documents shall be submitted for NASA review and approval. NASA signature approvals will be limited to the COTR and the applicable NASA Project Manager, unless otherwise specified in the Delivery Order instructions.
3. Non-DID Items are documentation deliverables not identified in the CDRL, but are called out in an individual delivery order and specified as requiring NASA approval. For these documents, the Government will provide the Contractor with DIDs or a description of the requirement and acceptance criteria with the delivery order request. As a NASA approved document, the document must also specify NASA's involvement in the document change process.

b) Documents

1. Draft: Format and structure of the document is complete. The document details are being developed and should reflect current design/concept. To Be Determined (TBD) items are allowed, even to the extent that an entire section can be a TBD, provided no concept has been developed for that area.
2. Preliminary: All sections are addressed and significant detail provided. Some level of TBDs is acceptable where data is not yet available. Whenever possible, TBDs should include a "bracketed" value that reflects the best current thinking for a particular value or approach. Example: TBD [120 C].
3. Final: The document is complete. TBDs are allowed only on a case-by-case basis with approval of the Government project manager. Updates to the "final" document are controlled and classified as document revisions.
4. Current: Documents specifically called out in the SOW or CDRL that the Contractor is required to update periodically to reflect changes and re-submit to the Government for review.

c) Drawings

1. Working Level: Draft drawings in the early development stage. Geometrically complete but may be missing dimensions, labeling, and notes.
2. Baseline: A version of a design that has been established as a basis for reference, for a specified purpose, at a specified point in time. It is controlled and traceable. A baseline may or may not be an approved version of the design.

3. Released: A version of a design that has been approved for a specified purpose, at a specified point in time. It is controlled and traceable. The design version shall be reviewed and approved by all responsible individuals before being released.

#### 1.5 Delivery Media

- a) The contractor will keep all documents and data in native format. 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 master, a reproducible copy or the record copy shall be reproduced for distribution as printed copies. The reproducible copies shall be made from the original signed document that will show actual signatures in lieu of electronic signatures.
  2. Electronic - Data that is recorded in word processors, computerized data processing systems, or electronic storage devices. Electronic copies should have an indication of the signature and the date signed.
- b) The contractor shall maintain native formats of all data. The electronic data delivery shall be in the following formats:
  1. Portable Data Format (PDF) - The preferred format, documents may be delivered via a PDF format that is readable by the latest Adobe Acrobat PDF reader (currently version 6.0).
  2. MS Word - The preferred format for word processing documents is in Microsoft Word format that is version 2003 or higher and is both MS Windows and Mac OS compatible.
  3. MS PowerPoint - The preferred format for presentation documents is in Microsoft PowerPoint format that is in version 2003 or higher.
  4. Drawing formats are defined in the appropriate DID.
- c) Any unique documentation delivery (in hardcopy or electronic format) instructions shall be specified in the delivery order. Additionally, all DO and CDRL data that has been generated electronically, shall be delivered via electronic transfer into the Government's electronic storage drop box.

#### 1.6 Documentation Change Procedures

- a) The contractor shall issue documentation change notices (DCNs) whenever minor (Class II) changes or updates occur in final versions of data items that have been delivered to NASA.
- b) Change tracking shall be used to indicate changes or updates when the document needs to be reviewed again by NASA.
- c) When major (Class 1) changes to a document are made, a complete revision of the document shall be issued and delivered to NASA in accordance with the original instructions for the data item. Any changes to documents requiring NASA approval shall first be submitted to NASA for approval before the changes become effective.
- d) Documentation title pages should reflect that Government approval is pending until Government approval has occurred. Upon Government approval, the contractor will revise the title page and signature page will be revised by the contractor to reflect the final, approved version. Current versions of documents shall be made available to the Government via the contractor CM system. The contractor will notify the Government that the final version with updated title page and signature page has been posted in the contractor CM system.

## 1.7 Approval of Documentation

### 1.7.1 Types of Approvals

There are three types of NASA approvals that can be exercised in accordance with the following descriptions:

- a) NASA Formatted Documents with Government Approval: CDRL DID's developed as a NASA document with NASA approval signatures, identified on the CDRL as NDA by the corresponding DID. Typically documents requiring this approval are distributed to the International Space Station and Human Research Project Office or project customers; are documents that identify high level system requirements, verification plans and reports, integration agreements, interface control documents, integration schedules, safety documentation, or operations protocols.
- b) Non-NASA Documents Requiring Government Approval: CDRL DID's requiring NASA approval, but do not require the NASA Approval format, identified on the CDRL as A by the corresponding DID. These documents are typically contract-level documents describing contractor processes or internal design activities that require NASA approval; they do not have to be identified as a NASA document, however require a NASA approval signature.
- c) Non-DID Items: Documentation deliverables not identified in the CDRL, but are called out in an individual delivery order and specified as requiring NASA approval. These documents may be unique deliverables not specified in the CDRL, with significant scope that require NASA approval. For those documents, the Government will provide the Contractor with DIDs or a description of the requirement and acceptance criteria with the delivery order request. Additionally, any documents specified in the incentive fee criteria or contractor responses to design review Request for Action (RFA) and RIDs will require NASA approval. As a NASA approved document, the document must also specify NASA's involvement in the document change process.

### 1.7.2 Process for Document Approval

Document approval is provided by NASA if the requirements specified in the DID are met, and the document fidelity meets the definition in Section 1.4. Any documentation with a requirement for NASA approval shall be in accordance with the following:

- a) Documents (draft, preliminary and final) may be submitted to the Government for approval either as part of a review package, or on an individual basis. If submitted as part of a review package, the Government will provide approval, approval with modification, or disapproval of each document within 30 calendar days of the review. If documents are submitted individually, or resubmitted following a disapproval, within thirty (30) calendar days after receipt of the document and/or data, the TR or COTR shall provide (in writing or other agreed to process with the Contractor) to the Contractor whether the documents are "Approved", "Disapproved", or "Approved as Noted".
- b) Government approvals of Draft and Preliminary documents with an NDA or A approval code shall be provided to the Contractor in writing, but not via signature on the document signature pages. The document signature pages will be used only for approvals of Final level documents.
- c) For documents that are "Disapproved" or "Approved as Noted", rationale for rejection or conditional acceptance is provided to the Contractor, who shall have thirty (30) calendar days, or later for Draft or Preliminary level documents as specified by the Government, after receipt to correct the document and returned it to the Government. At that point, the Government has another 30 days to approve the document, and the approval process is repeated.
- d) In the event that documents or data marked "Approved" or "Approved as Noted," reflect information which is not in full conformance with the contract requirements, the Contractor

shall notify the Contracting Officer immediately, since any approval of documents or data is not to be construed as a change in contract requirements.

- e) Approval by the Government shall not be construed as complete approval, but will indicate only that the general method or data is satisfactory. Approval of the documents or data will not relieve the Contractor of the responsibility for any error that may exist. If previously approved portions of a document are disapproved by the Government at a later date due to reason other than requirement changes (editorial, format, programmatic), an impact assessment will be performed by the contractor.

Typically for documents provided for design review, the Government will screen the documents for acceptability and will notify the Contractor in writing whether they are approved for submittal to the design review process. The Government will also provide general comments for those documents considered not acceptable. Any document screened and considered not acceptable will be updated by the contractor prior to the review, or as agreed between the contractor and Government. This screening should take place generally within 15 calendar days of document receipt to allow the Contractor time for document improvements.

Contractor deliverables, requiring Government approval, are considered to be received on time provided that; 1) the document is received by the NASA Delivery Order Project Manager on or before the contractual due date; and 2) that the document is approved by the Government during the initial review and approval process described in paragraph "1.7 a)" above.

#### **1.8 RID and RFA Disposition Process:**

Review Item Discrepancies (RIDs) are generated as part of the project design review process on documents submitted for the design review. RIDs should be limited to requirements issues, methodology or process issues, or requirements compliance issues. Editorial comments to documents should be provided in written format to the contractor, outside the RID process. Prior to the review, the Government Project Manager shall determine the set of "RID-able" documents for the review. This listing should be provided to the contractor four (4) weeks prior to the review.

Request for Action (RFAs) are also generated as part of the project design review process and are generally identified by the Design Review Panel. RFA's are significant issues, either being specific to a single requirement or may address a broad range of requirements/process issues.

RIDs are to be processed in the following manner:

1. The Government is to submit to the Contractor all RIDs and RFAs requiring the contractor's response within 30 calendar days of the completion of the design review presentation.
2. The contractor shall have up to 30 calendar days upon receipt of each issue to assess, document, and submit their position regarding the validity of each concern. The contractor's submittal will identify the proposed action to address each individual RID finding or justify the contractor's position that a specific RID is invalid. The Government will identify out of scope RIDs that require impact assessments. Additional out of scope RIDs, or RIDs that will result in contract cost or delivery schedule impacts, discovered by the contractor will be identified for the Government's assessment.
3. Government has 30 calendar days upon receipt of the Contractor's response to finalize the action plan and notify the contractor. The action plan will identify whether the response will be accepted or rejected, the rationale for disposition, and the action to be taken. The response can be a spreadsheet, or similar data management tool, that clearly identifies each of the issues and the actions to be taken for each.
4. Within 30 calendar days of the completion of the action plan, both the Government and the contractor will take the necessary steps to incorporate any changes required to the contract documentation due the accepted action.
5. The Contractor will notify the Government when the action plan for accepted RIDs has been completed.
6. The RID and RFA is officially closed by the Government.

<b>CONTRACT DATA REQUIREMENTS LIST</b>		
<b>DID #</b>	<b>Title*</b>	<b>Submission NDA/A/I/S</b>
<b>CONTRACTUAL DATA</b>		
CD-01	CONTRACTOR FINANCIAL MANAGEMENT REPORTING	A
CD-02	EARNED VALUE MANAGEMENT REPORTING	I
CD-03	TECHNICAL REPORTING AND MANAGEMENT REVIEWS	I
CD-04	AUTOMATED INFORMATION SECURITY PLAN	A
<b>PROGRAM MANAGEMENT</b>		
PM-01	SPACEDOC MANAGEMENT PLAN	A
PM-02	RISK MANAGEMENT PLAN	A
PM-03	SOFTWARE MANAGEMENT AND DEVELOPMENT PLAN	A
PM-04	CONFIGURATION MANAGEMENT PLAN	A
PM-05	Engineering Change Proposals (ECPs), Deviations, Waivers and Level 1 Problem Report and Corrective Action Report	A
PM-06	Contractor Delivery Order Work Plan	A
PM-07	Software Sustaining Engineering Plan	A
PM-08	Software Version Description Document	A
PM-09	Systems Engineering Management Plan	A
<b>PRODUCT ASSURANCE</b>		
PA-01	PRODUCT ASSURANCE PLAN	A
PA-02	System Safety Plan	A
PA-03	System Safety Hazard Analysis	S
PA-04	Fracture Control Plan	I
PA-05	Safety Compliance Data Package	NDA
PA-06	Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	NDA
PA-07	Problem Report and Corrective Action Plan	A
PA-08	Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	I
PA-9	Contamination/Cleanliness Control Plan	S
PA-10	SOFTWARE ASSURANCE PLAN	A
PA-11	SAFETY AND HEALTH PLAN	A
PA-12	Problem Report and Corrective Action Report	S
PA-13	Reliability Report(s)	S
PA-14	Limited Life Items List	S
PA-15	System Maintainability/Availability Analysis	A
PA-16	Fastener Control Plan	S
<b>REQUIREMENTS</b>		
R-01	Systems Requirements Document	NDA
R-02	Interface Definition Document & Interface Control Document	NDA
R-03	Payload Interface Agreement & Annexes	NDA
R-04	Software Requirements Document	NDA
R-05	Software Interface Control Document	NDA

\* Contract Wide Documents are identified in UPPER CASE lettering.

<b>CONTRACT DATA REQUIREMENTS LIST</b>		
<b>DID #</b>	<b>Title</b>	<b>Submission NDA/A/I/S</b>
<b>DESIGN</b>		
D-01	Review Presentation Package	I
D-02	Engineering Trade and Analysis Data	S
D-03	Baseline System Description (Baseline Concept Description)	NDA
D-04	Product Drawings	I
D-05	Accommodations Handbook	NDA
D-06	Software Design Document	A
D-07	Safety-Critical Structures Data Package	NDA
D-08	Fracture Control Summary Report	A
D-09	Worst-Case Analysis	I
D-10	Parts-Stress Analysis	I
<b>VERIFICATION</b>		
V-01	Master Requirements and Verification Compliance Plan Master Requirements and Verification Compliance Matrix/Summary	NDA
V-02	Individual Item Verification Test/Demonstration Procedure	I
V-03	Individual Item Verification Report	NDA
V-04	Software Verification and Validation Plan	I
V-05	Integration Data Package (CoFR)	NDA
V-06	As Built Configured Item List	I
V-07	On-orbit Performance Acceptance Test Matrix/Plan	NDA

<b>CONTRACT DATA REQUIREMENTS LIST</b>		
<b>DID #</b>	<b>Title</b>	<b>Submission NDA/A/I/S</b>
<b>OPERATIONS</b>		
OP-01	Integrated Logistics Support Plan	NDA
OP-02	Operator's Manual	A
OP-03	Operations Plan	NDA
OP-04	Launch Site Operations and Test Procedures	I
OP-05	Data Delivery Plan	A
OP-06	TSC Security Plan	NDA
OP-07	Procedures	I
OP-08	Training and Certification Plan	A
OP-09	Firmware Support Manual	A
OP-10	Decommissioning Plan	A
OP-11	Concept of Operations	A

<b>Title:</b> Contractor Financial Management Reporting	<b>DID No.:</b> CD-01
<b>Reference:</b> NPG 9501.2D NASA Contractor Financial Management Reporting Contract Provision F.X Financial Management Reports	
<b>Purpose:</b> To provide data necessary for reporting costs, projecting costs, evaluation of Contractor cost and fee data and planning, monitoring, and controlling project resources.	
<b>Related Documents:</b> CD-02 Earned Value Management CD-03 Technical Reporting and Management Reviews	
<b>Preparation Information:</b>  The report shall be in accordance with the NFS 1852.242-73 entitled "NASA Financial Management Reporting (NASA Form 533 reports) and NPG 9501.2D entitled "NASA Contractor Financial Management Reporting. NPG 9501.2D provides basic requirements and instructions to assist in the preparation of Contractor Financial Management Reports (NASA Form 533 reports). The document information can be found at: <a href="http://ifmp.nasa.gov/codeb/library/forms.htm">http://ifmp.nasa.gov/codeb/library/forms.htm</a>  The Contractor 533 reporting structure shall include 1) a summary at the contract level, and 2) individual reports for each Delivery Order issued. Delivery Order reports shall be consistent with each Delivery Order WBS and Delivery Order schedule. At the initiation of each Delivery Order, the Contractor and Government shall meet to establish the detail of 533 reporting that will be required by the Government. The Government will meet monthly with the Contractor project team associated with each Delivery Order to review progress against the schedule and resource plan, and to assure the Contractor is effectively managing to the Delivery Order project plan baseline.  The contractor shall perform semi-annual Estimate to Complete (ETC) reviews and submit your ETC changes with the March and September Quarterly reports.  Variance Reporting: The Contractor shall provide a monthly assessment of each Delivery Order project variance item. Variance Reporting on either schedule or cost plan performance (per the 533) shall be reported monthly and provided at a Delivery Order WBS level approved by the Government and will be based on cumulative expenditures compared to the baseline plan. Variance Reporting shall include rationale for variance, current and future impact to Delivery Order project plan, and corrective action planned.  FOR DELIVERY ORDER COST VARIANCES: Variances of +/- 10% or any variance that is +/- \$25K regardless of the percentage shall be assessed and reported monthly. FOR DELIVERY ORDER SCHEDULE VARIANCES: Variances at the WBS level specified in the DELIVERY ORDER SOW of +/- 10% and milestone variances of +/- 2 months shall be assessed and reported monthly.  Types of variances include the following: <ol style="list-style-type: none"> <li>1. Actual Cost and Hours versus Plan.</li> <li>2. Lateral or vertical shift in planned resource utilization in support of performance between consecutive reports.</li> <li>3. Anticipated overruns or underruns.</li> </ol> The Contractor shall continue to maintain the following requirements: <ol style="list-style-type: none"> <li>1. Unfilled Orders Outstanding <ul style="list-style-type: none"> <li>• Reporting of unfilled order in column 10 of the NF 533M is optional, as directed by the NASA Contracting Officer. Amounts of unfilled orders shall, however, always be included in the values shown in columns 8 and 9 of the reports, as appropriate.</li> </ul> </li> </ol>	

The amount of unfilled orders outstanding is the difference between cumulative costs incurred to date and amounts obligated to suppliers and subcontractors. A prime or subcontractor's unfilled orders include open purchase orders (including negotiated changes), against which materials have not been received nor services rendered, and the difference between a subcontractor's actual costs reported by the prime and fund limitations for the subcontractor. A fund limitation is often less than the total estimated amount to be purchased, just as the amount reported in block 4, "Fund Limitation", may be less than that reported in block 3, "Contract Value", for the prime contract.

2. A Reconciliation of Changes from the original negotiated Delivery Order baseline shall be included as part of the Contractor's Narrative Remarks for the month in which the changes occur. Changes shall be reconciled first to the present Delivery Order value by including only negotiated changes (supplemental agreements) and then to the Contractor's Estimated Final Cost by including changes authorized but not finalized. If the Contractor's Estimated Final Cost includes any overruns or underruns, they should be fully identified and explained. In addition, the Contractor may have proposed changes which have not been approved by NASA but for which tentative costs have been determined. These items should be reported as changes "Under Consideration but not Authorized".
3. New change order direction to Delivery Orders may require identification of the cost effect on subdivisions of work. The Contractor shall identify shifting work from one WBS item to another. A current contract/Delivery Order change log shall also be provided on a monthly basis.

There are many other factors that may influence the final cost on a contract/Delivery Order. Significant items of this nature should also be included under this section of the report. The following examples are typical:

1. Pending union negotiations (e.g., changes in pay, fringe benefits).
2. Changes in the Contractor's organizational structure
3. Business backlog, e.g., changes in customer mix, product
4. Changes in manufacturing processes.
5. Changes in policies affecting the following:
  - a. Subcontracting (makes or buys decisions)
  - b. Fixed asset improvement programs
  - c. Direct/indirect method of charging
  - d. Cost centers
  - e. Accounting or estimating methodologies

The requirements of this DID shall be flowed down to the major Subcontractors. Detailed Subcontractor 533 reporting shall be provided directly to the Government.

<b>Title:</b> Earned Value Management Reporting	<b>DID No.:</b> CD-02
<b>Reference:</b> NFS 1852.242-73 NASA Contractor Financial Management Reporting Clause TBD Financial Management Reports Clause TBD Technical Reports and Management Reviews	
<b>Purpose:</b> To provide comprehensive performance measurement information which integrates costs, schedule and technical performance.	
<b>Related Documents:</b> SpaceDOC Surveillance Plan CD-01: Contractor Financial Management Reporting CD-03: Technical Reports and Management Reviews	
<b>Preparation Information:</b>  A. <u>EVM Planning</u> . For work identified by the Government as having EVM reporting requirements, the Contractor shall include with their Delivery Order Proposal for Government negotiation an EVM Plan including the following: <ol style="list-style-type: none"> <li>1. a Work Breakdown Structure (WBS) at a level of detail necessary to achieve integrated cost, schedule, and performance-oriented management insight for the work executed under the Delivery Order work statement,</li> <li>2. a task activity network schedule and month-by-month time-phased cost plan including cost-loaded task activities and associated milestones,</li> <li>3. a proposed work measurement scheme for determining earned value (e.g. discrete effort, apportioned effort, Level of Effort, etc.) (This work measurement scheme once approved by the Government will be the basis for determining earned value.) (Note: for this contract earned value for an activity shall not exceed 80% until such activity is completed.)</li> </ol> <p>(Note: The WBS shall map directly into the Delivery Order's task activity network schedule and 533 financial report see CD-01.)</p> <p>Major sub-contract efforts shall be included in the above.</p> <p>Upon negotiation, the EVM Plan included in the Delivery Order will serve as the baseline for performance measurement. The EVM Baselines shall be subject to configuration management and shall not change without Government approval. The negotiated EVM Plan shall be in-place within 30 days of Delivery Order start, or within 30 days of a government approval to re-baseline. Re-baseline will occur only with contract change or under Government direction.</p> B. <u>Monthly EVM Status</u> . 1. During the course of the Delivery Order execution, the Contractor shall <u>submit monthly</u> the WBS-based Delivery Order schedule in its entirety, with associated work measurement assessments. In addition, each of the following shall be provided (see table below for description/definition): <ol style="list-style-type: none"> <li>a. Planned Value (PV), b. Actual Cost (AC), c. Earned Value (EV), d. Cost Performance Index (CPI) and e. Schedule Performance Index (SPI).</li> <li>2. Detailed variance explanations shall be provided as follows:             <ul style="list-style-type: none"> <li>for CPI's and SPI's <math>\geq 0.95</math>, <u>no variance explanation</u> required (color code GREEN),</li> <li>for CPI's and SPI's <math>\geq 0.90</math> and <math>&lt; 0.95</math>, include <u>detailed variance explanations</u> (color code YELLOW),</li> <li>for CPI's and SPI's <math>&lt; 0.90</math>, include <u>detailed variance explanations</u> (color code RED),</li> </ul> </li> </ol>	

Formula	Acronym	Description
	PV	Planned Value (value of planned milestones)
	AC	Actual Cost
	EV	Earned Value (value of completed milestones)
PV = BCWS	BCWS	Budgeted Cost of Work Scheduled
AC = ACWP	ACWP	Actual Cost of Work Performed
EV = BCWP	BCWP	Budgeted Cost of Work Performed
EV - AC = CV \$	CV\$	Cost Variance
CV / EV = CV %	CV%	Cost Variance %
EV / AC = CPI	CPI	Cost Performance Index
EV - PV = SV \$	SV\$	Schedule Variance
SV / EV = SV %	SV%	Schedule Variance %
EV / PV = SPI	SPI	Schedule Performance Index

3. The Contractor's Delivery Order project team shall meet monthly with the Government to review progress against the EVM baseline, and to assure the Contractor is effectively managing to the baseline.

<b>Title:</b> Technical Reporting and Management Reviews	<b>DID No.:</b> CD-03
<b>Reference:</b>	
<b>Purpose:</b> To provide a monthly report that will be used to measure the Contractor's progress in completing the activities required by the contract.	
<b>Related Documents:</b> CD-01 Financial Management Reporting PM-02: Risk Management Plan	
<p><b>Preparation Information:</b></p> <p>A. Delivery Order Level Reporting</p> <p>The Contractor shall deliver Monthly Technical Reports for each delivery order – The reports shall contain as a minimum; schedule, technical accomplishments, problems/issues/risks and mitigation strategies, and near-term activities and the EVM reporting when required in accordance with CD-02.</p> <p>B. Contract Level Reporting/Reviews</p> <p>The Contractor shall deliver:</p> <ol style="list-style-type: none"> <li>1. Monthly Technical Report Summary - a. a listing of delivery orders with problems and/or issues not resolved within the three (3) preceding reporting periods including associated performance improvement plans, and b. a listing of delivery orders with SPI or CPI less than 0.90 (color coded RED) including associated improvement plans.</li> <li>2. Quarterly Management Review – The contractor shall attend a quarterly management review with the Government and present: <ol style="list-style-type: none"> <li>i. a summary of contract activities associated with delivery orders which have met the criteria for B. above during any month of the preceding quarter,</li> <li>ii. particularly challenging accomplishments</li> <li>iii. anticipated challenges for the following quarter and</li> <li>iv. a contract cost, schedule and performance summary.</li> </ol> <p>In addition, the Quarterly Management Review agenda may include presentation by the Government regarding: COTR issues, management issues, and Contracting Office issues.</p> </li> </ol> <p>All written reports shall be submitted within 15 calendar days of the close of the Contractor's accounting month.</p>	

<b>Title:</b> Automated Information Security Plan	<b>DiD No.:</b> CD-04
<b>Reference:</b> NFS 18-4.470-4(b) Submission of Security Plan for Unclassified Automated Information Resources NPD 2810, NASA Information Technology Security Program. Public Law 100-235, Computer Security Act of 1987.	
<b>Purpose:</b> The purpose of the plan is to describe the management and technical controls required to implement and operate an effective Information Technology (IT) Security process for the SpaceDOC contract at the Glenn Research Center.	
<b>Related Documents:</b> OP-06: TSC Security Plan	
<b>Preparation Information:</b> <ul style="list-style-type: none"> <li>A. This plan shall address the security measures and program safeguards that will ensure that all information systems and resources acquired and utilized in the performance of the contract by contractor and subcontractor personnel are in accordance with NFS 18-4.470-4(b).</li> <li>B. The plan includes procedures and responsibilities for implementing the Information Technology (IT) Security process for the SpaceDOC contract team.</li> <li>C. The plan complies with all NASA Information Technology (IT) Security and security management regulations applicable to the SpaceDOC Contract.</li> <li>D. An existing corporate security plan may suffice.</li> </ul> <p>FINAL – due 60 days after contract award or after contract modification or change in company processes affecting plan</p>	

<b>Title:</b> SpaceDOC Management Plan	<b>DID No.:</b> PM-01
<b>Reference:</b> NPR: 7120.5D, NASA Space Flight Program and Project Management Processes and Requirements NPR: 7120.8, NASA Research and Technology Program and Project Management Requirements	
<b>Purpose:</b> The SpaceDOC Management Plan shall describe the contract implementation approach, including the systems and processes, to provide overall coordination of contract management activities. It describes the structure and environment within which the contract and subcontract management operates.	
<b>Related Documents:</b> PM-02: Risk Management Plan; PM-03: Software Management and Development Plan; PM-04: Configuration Management Plan; PM-09: System Engineering Management Plan; PA-01: Product Assurance Plan; CD-05: Earned Value Management Plan	
<b>Preparation Information:</b> <p>The Contractor shall provide information giving NASA insight into staffing, organizational structure, approaches and processes used to manage activities across the SpaceDOC contract. The plan shall cover all aspects of contract and subcontract management for the SpaceDOC contract including, but not limited to, the following:</p> <ol style="list-style-type: none"> <li>a. Narrative and graphical descriptions of the management approaches used to accomplish and monitor contractual tasks including the establishment and implementation of a review board process</li> <li>b. Narrative description of roles and responsibilities of responsibilities of the contract's key personnel</li> <li>c. Management approach for Delivery Order work plan development and execution</li> <li>d. Management approach to routinely review project Delivery Orders (DOs) internally to address cost, schedule, technical progress, concerns, and issues including: <ul style="list-style-type: none"> <li>• Management approach to processes, plans and procedures for cost, schedule, and technical baseline control and systems engineering including a process for change order review, approval and implementation</li> <li>• Controls applicable to any tasks and activities exceeding established cost or schedule plans including requirements for providing recovery plans</li> <li>• Description of performance reporting to NASA in preparation for major milestone reviews</li> </ul> </li> <li>e. Management support system method, tools, and implementation</li> <li>f. Methods for providing government insight, data accessibility, and/or deliverables</li> <li>g. Approach to interfaces with other contractors or entities that are necessary and pertinent to the accomplishment of contractual tasks, including such things as data, analyses, equipment, software deliverables, schedules, interfaces, and other technical/managerial interactions.</li> <li>h. Approach to establishing and implementing agreements and/or cooperative relationships with associate contractors or with any other parties necessary for the completion of the work under this contract.</li> <li>i. Risk methodology and assessment of risks inherent in the management approach, including a process for incorporating lessons learned from previous applicable contracts and continuous improvements</li> <li>j. Acquisition strategy including a description of the procurement process and the make/buy decision process</li> <li>k. Approach to the establishment and management of subcontracts</li> <li>l. Description of the approach for providing regularly scheduled Contract level reviews</li> </ol>	

- m. Approach to property management of items procured under and in support of the SpaceDoc contract that includes bonded storage of flight hardware components.
- n. Description of facility usage in support of the SpaceDoc contract
- o. Approach to data rights and intellectual property (IP), describing what patents, copyrights, trademarks, and trade secrets shall be delivered to the Government and the cost of such data/IP. Approach to how licensing agreements will be negotiated and how that data/IP will be treated, specifically identifying any requested special license agreements
- p. Approach to periodically assess the SpaceDOC contract operations to identify opportunities to streamline the processes, procedures, and organization to provide greater responsiveness and reduced schedule and cost.
- q. Strategy and methodology for ensuring an efficient and effective transition of management and technical responsibilities from the incumbent contractor during the transition period, as described in Section TBD, Government/Contractor Design Transition Plan

This Plan shall be included as a separate document.

Draft – Due with proposal submittal

Preliminary – Due 60 days after contract award

Final – Due 60 days after review and comment of the preliminary Plan by the CoTR or his designee

<b>Title:</b> Risk Management Plan	<b>DID No.:</b> PM-02
<b>Reference:</b> NPG 7120.5D, NASA Program and Project Management Processes and Requirements NASA Continuous Risk Management Course ( <a href="http://arioch.gsfc.nasa.gov/302/Risk/RMPPage.htm">http://arioch.gsfc.nasa.gov/302/Risk/RMPPage.htm</a> )	
<b>Purpose:</b> The purpose of risk management is to identify risks early in the program so that appropriate abatement plans can be implemented to reduce the consequences of the risk or likelihood that the risk will occur. This document provides the overall approach, coordination, structure, and environment within which risk management processes for the SpaceDOC contract reside and addresses how NASA risk requirements are to be implemented by the Contractor through the Delivery Order implementation. This document describes the methodologies and processes used to identify, analyze, control and communicate the Delivery Order's risks. The identification, characterization, mitigation plan, and mitigation responsibilities associated with specific risks are described and specific risk abatement strategies or contingency planning processes are discussed.	
<b>Related Documents:</b> PM-01: SpaceDOC Management Plan, PM-06: Contractor Delivery Order Plan	
<b>Preparation Information:</b> <p>The Risk Management Plan documents the process that the Contractor will follow to manage risk throughout the life cycle of the item covered in the Delivery Order and provide government insight to risk management. "Risk" refers to anything that can prevent a team from meeting the Delivery Order objectives. All forms of risk shall be managed. These include technical (hardware and software), programmatic, supportability, cost, and schedule risks.</p> <p>The Risk Management Plan shall provide descriptions of the processes to provide management at all levels with 1) a disciplined system for early identification of technical uncertainties, 2) a disciplined assessment of current project status, 3) key indicators of mission success and 4.) methods and procedures for integrating this process with NASA's approach to Continuous Risk Management. The plan shall describe the basis for taking action to control risk and for measuring the effectiveness of that action.</p> <p>The plan shall as a minimum cover:</p> <ol style="list-style-type: none"> <li>a.) Risk identification – The process to determine and define all risks.</li> <li>b.) Risk analysis – The process to convert risk data into decision-making information. This process should include estimating the probability, impact and time frame of the risks, eliminating duplicates, identifying key decision points, and grouping similar risks, and prioritizing them according to consequences.</li> <li>c.) Risk planning – The process to develop mitigation options and decide what to do with the risks.</li> <li>d.) Risk tracking – The process to acquire, compile and report risk status data, including risk indicators and mitigation actions. Appropriate risk metrics shall be identified so that the Government can evaluate the quality of the risk management.</li> <li>e.) Risk control – The process covering decisions to re-plan mitigation, close risks, invoke contingency plans or continue to track risks. The plan shall define roles and responsibilities, typical milestones/reviews, and describe the key risk control activities.</li> <li>f.) Communications and documentation – Present in all the above processes, this is the means by which the output of the processes is documented and communicated to all team members.</li> </ol> <p>The plan shall also identify the information to be documented for each risk. For risks having both a high probability and high impact/severity, the plan shall require, as a minimum, the following:</p> <ol style="list-style-type: none"> <li>(1) Description of the risk</li> <li>(2) Primary consequence should the undesirable event occur</li> <li>(3) Estimate of probability of occurrence and the fidelity of the estimate</li> <li>(4) Significant cost impacts, given its occurrence</li> <li>(5) Significant schedule impacts, given its occurrence</li> <li>(6) Potential mitigation measure not already taken and the cost to implement them</li> <li>(7) Characterization of the risk as acceptable or unacceptable with rationale.</li> </ol>	

This Plan shall be included as a separate document.

Draft – Due 30 days after contract award

Preliminary – Due 60 days after contract award

Final – Due 30 days after review and comment on the preliminary plan by the CoTR or his designee

<b>Title:</b> Software Management and Development Plan	<b>DID No.:</b> PM-03
<b>Reference:</b> GRC Software Development Manual; NASA-STD-2100-91 NASA Software Documentation Standard (NASA-DID-M00 through M700)	
<b>Purpose:</b> To establish specific software management policies, schedules and budget and define the processes and environment by which these policies and practices will be implemented.	
<b>Related Documents:</b> PA-11: Software Assurance Plan PM-01: SpaceDOC Management Plan PM-02: Risk Management Plan PM-04: Configuration Management Plan	
<b>Preparation Information:</b> <p>The Contractor Software Management and Development Plan shall provide detailed information on relative schedules, activities, resources, and procedures necessary for successful planning and implementation of all software (flight, ground, support). The plan shall also include a description of the needed development environment (equipment and software) as well as the chosen standards, languages, procedures, guidelines, software development lifecycle, techniques, verification approach (including what simulations and/or test environments and resources are needed), and milestones for developing and delivering software, including the support software.</p> <p>This plan shall include an indication of the control level and types of software to be developed and the corresponding level of development and management activities such as risk management, configuration management, internal and external reviews, problem reporting and corrective actions, training, metrics, software safety and assurance planning including audits, expected verification and validation levels, delivery/installation plans and procedures including the data acceptance package procedure, and internal and external communications and reporting mechanisms.</p> <p>Draft – Due 60 days prior to SRR  Preliminary – Due midway between SRR and PDR  Final– Due 60 days before ATP and /or PDR, update as required 30 days after ATP and/or PDR</p>	

<b>Title:</b> <b>Configuration Management Plan</b>	<b>DID No.: PM-04</b>
<b>Reference:</b> MIL-STD-973 Configuration Management NASA-STD-2100-91 NASA Software Documentation Standard ISO 10007 Quality Management - Guidelines for Configuration Management NPR 7150.2 NASA Software Engineering Requirements (Software Configuration Management Requirements only)	
<b>Purpose:</b> To identify and describe the Contractor processes and methods for Configuration Management (CM) to be used during the implementation of the contract and project/Delivery Orders. This plan establishes the basis for a uniform and concise CM practice for all contractor-provided hardware/software elements and selected documentation in a manner that is responsive to appropriate, applicable requirements.	
<b>Related Documents:</b> PM-01: Contractor Project Plan PA-01: Product Assurance Plan PM-03: Software Management and Development Plan PM-05: Engineering Change Proposals (ECPs), Deviations and Waivers	
<b>Preparation Information:</b> <p>The CM plan shall describe the Contractor's configuration management system in terms of applicable requirements, planned implementation methods, configuration verification methods, schedules, and organizational structure as well as management tools to be used by the Contractor in the execution of this CM effort. The CM plan shall also describe the functions, responsibilities, and authority for the accomplishment and implementation of configuration management to be performed during the full term of the contract. The CM plan shall include both hardware and software aspects of configuration managements. The plan shall specify the Contractor's management policies and identify, by specific reference, standard practices and detailed work instructions to be used in implementing the configuration management process. This plan shall include, but is not limited to, the following:</p> <ol style="list-style-type: none"> <li>a. CM Organization (objectives, organizational structure, authorities and responsibilities (individual and organizational))</li> <li>b. CM Interfaces with oversight and control of work and assurance of integrated configurations (Government and major subcontractors)</li> <li>c. CM System Description (CM Standards, CM requirements stated or implied in particular, those driven by a flight carrier, Processes, Software CM processes, etc.)</li> <li>d. CM Tools (software tools, techniques, and equipment necessary for the implementation of the specified software configuration management activities)</li> <li>e. CM Status Accounting (access to accurate, timely information about the product and its documentation, reports of status to the Government or its auditors, verifiable trace for all deliverable end item configurations)</li> <li>f. Inventory Management (tracks flight equipment, GSE equipment, and other operational support hardware, etc.)</li> <li>g. CM Schedule (sequence and coordination for the identified CM activities and for all events affecting the CM plan's implementation)</li> <li>h. CM maintenance information (identifies the activities and responsibilities necessary to ensure continued CM planning during the lifecycle of the contract)</li> </ol> <p>Draft – Due 60 days after contract award  Preliminary – Due 90 days after contract award  Final – Due 30 days after review and comment on the preliminary plan by the CoTR or his designee</p>	

<b>Title:</b> Engineering Change Proposals (ECPs), Deviations, Waivers and Level 1 Problem Report and Corrective Actions (PRACAs)	<b>DID No.:</b> PM-05
<b>Reference:</b> MIL-STD-973 Space Assurance Requirements and Guidelines (SARG) - Section 8. SSP30223 – Problem Reporting and Corrective Action for the Space Station Program CxP 70068 - Constellation Program Problem Reporting Analysis and Corrective Action Methodology	
<b>Purpose:</b> To document proposed changes to Government requirements or deliverables (Engineering Change Proposal) or to request specific authorization to deviate from a particular Government controlled requirement before the fact (Deviation) or accepting a departure from a particular Government controlled requirement after occurrence (Waiver). To document Level 1 PRACAs for submittal to the International Space Station (ref. SSP30223).	
<b>Related Documents:</b> PM-01: SpaceDOC Management Plan PA-13: PRACA Report PM-04: Configuration Management Plan PA-07: Problem Report and Corrective Action Plan	
<b>Preparation Information:</b>  Classification of Change Proposals The Contractor must designate each change proposal as either a Class I or Class II change.  Class I designation is assigned to changes that affect: <ul style="list-style-type: none"> <li>• fit, form, function, external ICDs or physical characteristics (weight, balance, etc) of the end item;</li> <li>• NASA approved and controlled documents (as identified in the Delivery Order (e.g., science or engineering requirements) or applicable requirements documentation);</li> <li>• contractual cost, schedule or milestones;</li> <li>• safety, reliability, maintainability; interchangeability of the affected system or subsystems;</li> <li>• change that is associated with a previously accepted and/or delivered End Item;</li> <li>• software compatibility;</li> <li>• Government Furnished Equipment.</li> </ul> Class II designation is assigned to changes not in the above categories (editorial change is one example of a Class II change).  <u>Documentation of Change Proposals</u>  The Contractor shall document each Engineering Change Proposal (using MIL-STD-973, ECP forms DG 1692 and DD1692-1 as guidelines). This document should describe the applicable requirement, the nonconformance, the reason for and affect of the nonconformance, the proposed corrective action (if any), and the reason(s) for approving the request. In addition to a description of the proposed change, the ECP shall contain sufficient information (as attachments, drawings, test results, etc.) to enable evaluation by NASA (or other oversight auditors) of the total impact of the proposed change.  The Contractor shall log and track each ECP from initiation to final disposition and closure within the Configuration Control system.  <u>Delivery of ECPs</u>  The Contractor shall deliver each Class I change proposal to NASA for review and disposition. Class II change proposals need not be delivered to NASA but the status and disposition of all ECPs shall be accessible for review by NASA at scheduled reviews.	

NASA may direct the Contractor to prepare ECPs under the "Changes" clause of the contract.

Each ECP shall be expeditiously delivered for review to minimize the impact of delays during review and disposition of change requests. In its ECP, the Contractor shall recommend a process cycle in the context of the complexity of the work and the specific guidelines and requirements of the Delivery Order.

#### Delivery of Level 1 PRACAs

The Contractor shall deliver each Level 1 Problem Report and Corrective Action (PRACA) to NASA for approval prior to submittal to funding program. The Contractor shall develop each Level 1 PRACA (PA-07) using their closed-loop problem reporting system in accordance with the requirements specified in SSP30223, Problem Reporting and Corrective Action for the Space Station, or equivalent for the specific program or similar equivalent for the associated program.

#### Review and Disposition

Waivers and deviations shall be handled using MIL-STD-973 as a guide. The Contractor shall establish a Change Control Board (Engineering Change Board) to process Class II ECPs and to provide recommendations on Class I ECPs. ECPs, Deviations, Waivers, and Level 1 PRACA Reports are provided to NASA for approval.

<b>Title:</b> <b>Contractor Delivery Order Work Plan</b>	<b>DID No.: PM-06</b>
<b>Reference:</b>	
<b>Purpose:</b> This document provides an integrated overview of the Contractor approach to accomplish the work defined in the NASA provided Delivery Order. The Delivery Order Work Plan defines the contractor's approach, technical plan to accomplish the deliverables, defines the management and reporting structure, and the associated schedule and resource requirements. The Delivery Order Work Plan provides details on the technical task, proposed resources, and applicable requirements necessary to accomplish the Delivery Order. It clearly identifies all deliverables and provides a detailed development schedule with associated resource requirements. The Delivery Order work plan shall include the Contractor approach to performance reporting on technical progress, schedule adherence, and budget maintenance and analysis.	
<b>Related Documents:</b> CD-01: Contractor Financial Management Reporting CD-02: Earned Value Management Reporting CD-03: Technical Reporting and Management Reviews PM-01: SpaceDOC Management Plan PM-02: Risk Management Plan PM-03: Software Management and Development Plan PM-04: Configuration Management Plan PM-09: Systems Engineering Management Plan PA-01: Product Assurance Plan	

**Preparation Information:**

The following provides the requirements on the content and organization of the Delivery Order Work Plan. Where separate detailed planning documents are to be prepared (as defined by the Delivery Order) on specific management functions, this document should include a summary of their content and a reference to them.

## 1.0 Technical Approach

- 1.1 Development Approach - Summary reflecting Contractor proposed overall approach for implementing the task or project. Describe the overall development approach that includes: interpretation of task requirements; identifying all ground units, flight units and test articles, simulators, software development, and support hardware; a flow diagram to clarify development and test approach to be used; key features and/or critical elements; and summary of and rationale for any proposed significant work elements (e.g., specialized test hardware development, engineering hardware development, alternative approach, etc.) believed essential by the Contractor for successful and cost effective implementation of the task but not explicitly called out in the Delivery Order.
- 1.2 Requirements Baseline - List or reference the requirements levied on the Delivery Order Work Plan and discuss how these are flowed down to lower levels by summarizing the requirements allocation process.
- 1.3 Technology/Risks - Indicate any existing feasibility issues or proof-of-concept issues that must be taken into account in the development requiring additional testing along with any requirements that offer significant technical challenge or risk of failure. Describe the technology assessment, development, management, and acquisition strategies needed to achieve the Delivery Order's objectives. Describe any opportunities for leveraging on-going technology efforts.
- 1.4 Logistics - Identify where the major project functions, such as hardware build, testing, integration, etc., will take place and describe the facilities, special services, vehicles, systems, and major equipment necessary to satisfy the identified logistic requirements. The spares philosophy with quantity anticipated should also be identified.
- 1.5 Mission Operations, Training and Data Management - Describe the operations, training, and data management approaches to the extent they are understood at the time. This should also include a summary of the Contractor approach for managing documentation, technical data and data deliverables in the context of the Delivery Order.
- 1.6 Safety - Define the ground and mission safety requirements of the project. Safety implications related to implementation of the task should be described with any apparent or implied key flight safety issues.
- 1.7 Product Assurance - Define the overall product assurance requirements of the project. Provide an overview of the product assurance approach and its relationship to the contract's overall Product Assurance Plan.

## 2.0 Management Approach

- 2.1 Management - Document the plan to monitor and control the Delivery Order requirements, technical design, schedule, and cost to achieve the objectives levied by NASA. Describe the performance measures in objective, quantifiable and measurable terms. Describe how the Contractor plans to report technical, schedule, and cost status to NASA, including frequency and detail or reporting. Include a description of the systems engineering management approach in accordance with PM-09. Provide the approach for implementing Earned Value Management (EVM) if applicable or other appropriate means to monitor and report on cost status and budget analysis.

- 2.2 Organization - Description of organizational elements and specific individuals to be given responsibility for major work elements of the task on the contractor team. Provide an organizational chart of the project that identifies key positions on the project and key external interfaces.
- 2.3 Work Breakdown Structure - Description (charts and descriptive dictionary) reflecting the Contractor Work Breakdown Structure (CWBS) for organizing the technical elements and essential support for the Delivery Order; it should be based (primarily) on deliverable hardware/software elements and sub-elements; the level of detail shall be adequate to support the allocation of personnel and costs and to define a logical schedule through design, implementation, delivery and operation phases (as appropriate for the Delivery Order. The CWBS structure should relate to line items on the master schedule and to the resources section.
- 2.4 Risk Management – Summarize how the Contractor will implement continuous risk management and the process to identify, monitor, and mitigate risks in accordance with PM-02
- 2.5 Acquisition Plan – Identify all major proposed acquisitions in the relation to the CWBS and provide summary information on each. Describe all agreements for collaborative and/or cooperative relationships that support the Delivery Order.
- 2.6 Review Plan – Summarize the approach to conducting reviews for the delivery order content including peer reviews if appropriate. Describe the reporting requirements for reviews to be conducted along with the names, purposes, content and timing of the critical milestone reviews.
- 2.7 Data Management Plan – Description of the management approach for data generated and captured during execution of the Delivery Order. Include descriptions of how the data will be generated, processed, distributed, analyzed and archived.
- 2.8 Documentation - Provide a project documentation tree that includes all governing, hardware development, mission integration, and safety documentation. Describe the configuration management approach in accordance with PM-04
- 2.9 Schedule - Provide an overall project master schedule that is consistent with the CWBS, identifies key milestones for each chosen CWBS element, and is logically phased to address all aspects of the Delivery Order.
- 2.10 Resources - Specify the funding and personnel requirements needed for execution of the Delivery Order against the CWBS. Select appropriate CWBS level to be the cost reporting level. Identify any use to be made of other facilities for which another entity will be financially responsible.

Final – Due at Delivery Order definitization

<b>Title:</b> Software Sustaining Engineering Plan	<b>DID No.:</b> PM-07
<b>Reference:</b> NASA STD 2100-91 (NASA Software Documentation Standard) NASA-DID-M300 NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards	
<b>Purpose:</b> This document provides sustaining engineering and supporting operation of the software and firmware as installed in the overall system in terms of activities, methods and approach, controls, and support environment requirements. It is important to address activities after delivery of the software and firmware and prior to initiation of sustaining engineering and operations for the software and firmware in question.	
<b>Related Documents:</b> PM-03: Software Management and Development Plan PM-04: Configuration Management Plan	
<b>Preparation Information:</b> <p>This document shall describe the methods to be used to specify modifications or new functional requirements. Also describe how to translate these requirements into design and how to integrate and test the new release in any system using the software or firmware being modified.</p> <p>This document shall also describe the process by which change requests are to be submitted, classified and analyzed, dispositioned, and scheduled in any entity containing the software or firmware being changed. Include the process for tracking and maintaining software and firmware revisions in the configuration management system for all entities using the software and firmware in question. Include classification categories for requests and any variations in the process. Describe all associated products and reports.</p> <p>This document shall also describe the engineering process, methods, etc., to be used to incorporate approved change requests. Include a description of maintenance procedures for developing on-site and remote diagnostics. Include the method for producing documentation updates (including user support materials) to accompany a release and for distributing them to all operators and end users concerned.</p> <p>This document shall describe the process interfaces between sustaining engineering (maintenance) engineers and configuration management, assurance, and operator organizations. Describe interfaces with the user community and how releases are generated and delivered.</p> <p>This document shall describe the training plan for sustaining engineering, operations, and other support personnel.</p> <p>For recommended document outline see NASA-STD-2100-91</p>	

<b>Title:</b> Software Version Description Document	<b>DID No.:</b> PM-08
<b>Reference:</b> NASA STD 2100-91 (NASA Software Documentation Standard) NASA-DID-P500 NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards	
<b>Purpose:</b> This document provides a precise description of the particular version of software/firmware being released.	
<b>Related Documents:</b> D-09: System Configuration Document PM-04: Configuration Management Plan	
<b>Preparation Information:</b> <p>Whether the delivered entity is at the system, rack, CSCI or CSC level, this document shall include a complete, precise description of the software and firmware being delivered for this entity, the CM'd version numbers of the software and firmware being released, the location of the software and firmware source, object and executable code, and all utility and support software and hardware equipment that is not part of the entity version but is required to load, operate, and maintain this version. For software and firmware that was not developed but purchased, identify the software and firmware by vendor, product name, version, patch number, service pack number, signature information, etc. This document shall contain a precise description of each target processor in the entity being released including vendor, product name, configuration, version, serial number, etc. and which software executables are running on the target.</p> <p>For recommended document outline see NASA-STD-2100-91</p>	

<b>Title:</b> Systems Engineering Management Plan	<b>DID No.:</b> PM-09
<b>Reference:</b> NPR 7123.1A (NASA Systems Engineering Process and Requirements)	
<b>Purpose:</b> This document provides a single, integrated technical planning document for the conduct and management of the required technical effort. The plan is to be used by the technical team responsible for generating technical work products to integrate and manage the full spectrum of technical activities required to engineer the system.	
<b>Related Documents:</b> PM-06: Contractor Delivery Order Work Plan PM-01: SpaceDOC Management Plan	
<b>Preparation Information:</b> SEMP preparation guidance is provided in detail in NPR 7123.1A, Systems Engineering Process and Requirements. SEMIP information maybe incorporated into the project's plan and tailored according to the project requirements. The general structure of the SEMIP contains the following sections: <ul style="list-style-type: none"> <li>a. Purpose and Scope</li> <li>b. Applicable Documents</li> <li>c. Designated Governing Authority</li> <li>d. Technical Summary</li> <li>e. Technical Effort Integration</li> <li>f. Common Technical Processes Implementation</li> <li>g. Technology Insertion</li> <li>h. Additional SE Functions and Activities</li> <li>i. Integration with the project Plan Resource Allocation</li> <li>j. Waivers</li> <li>k. Appendices</li> </ul> Each of these sections is describe in some detail in NPR7123.1A.	

<b>Title:</b> Product Assurance Plan	<b>DID No.:</b> PA-01
<b>Reference:</b> GRC Product Assurance Manual (PAP #100) GRC Space Assurance Requirements and Guidelines (SARG) CxP 70059 - Constellation Program Integrated Safety, Reliability and Quality Assurance (SR&QA) Requirements	
<b>Purpose:</b> Documents the assurance approach the contractor intends to use and helps the Government understand how the contractor will assure the safety, quality and reliability of space experiment systems and components.	
<b>Related Documents:</b> PA-02: System Safety Plan PA-06: Materials Identification and Usage List; Material Usage Agreement (MUA) PA-07: Problem Reporting and Corrective Action PA-11: Software Assurance Plan	
<b>Preparation Information:</b> <p>This document will define the contractor's plan to apply relevant assurance principles and techniques to ensure the FCF or Delivery Order will be successfully accomplished and the applicable SARG requirements will be satisfied. The plan shall include, but not be limited to, the following information:</p> <ul style="list-style-type: none"> <li>a) Reliability - A detailed description of how each specified Reliability management, engineering, and EEE parts control task will be performed or complied with in performance of the hardware development.</li> <li>b) Quality Assurance - Identify all elements of the quality assurance organization, and describe the objectives, implementation policies and procedures, and control systems utilized throughout design, development, fabrication, delivery, and usage to provide quality products and materials.</li> <li>c) Maintainability - Identify all elements of the maintainability assurance organization, and describe objectives, implementing policies and procedures, and control systems to provide maintainability assurance.</li> </ul> <p>Note that Safety, Materials and Processes, Problem Reporting and Corrective Action, and Software Assurance plans may be included in this plan or prepared as separate documents (see PA-02, PA-06, and PA-07)</p> <p>Note: A general Product Assurance Plan can be established for the contract with each project determining any deviations from that plan.</p> <p>Draft – Due 60 days prior to SRR          Preliminary – Due midway between SRR and PDR          Final – Due 60 days before ATP and /or PDR, update as required 30 days after ATP and/or PDR</p>	

<b>Title:</b> System Safety Plan	<b>DID No.:</b> PA-02
<b>Reference:</b> NPD 8700.1 NASA Policy for Safety and Mission Success NPG 7120.5A Program and Project Management Processes and Requirements NPG 8715.3 NASA Safety Manual Space Assurance Requirements and Guidelines (SARG) - Section 4 NSTS/ISS 13830 Payload Safety Review and Data Submittal Requirements	
<b>Purpose:</b> To define the system safety activities for identifying and eliminating or mitigating hazards. The System Safety Plan provides the Government with an understanding of the Contractor's organized, systematic approach to mitigate safety risks and compliance with the applicable safety requirements.	
<b>Related Documents:</b> PA-01: Product Assurance Plan PA-03: System Safety Hazard Analysis PA-04: Fracture Control Plan PA-05: Safety Compliance Data Package	
<b>Preparation Information:</b> <p>The plan shall define the functions and activities involved with Flight and Ground System Safety. This plan defines the approach to be taken to assure applicable SARG safety requirements will be satisfied. The plan shall include, but not be limited to, the following information:</p> <p>A detailed description of how the system safety requirements shall be established, definition of safety responsibilities, and tasks in sufficient detail to assure compliance with requirements, identification of the safety process outputs, safety milestones, phasing, integration, and product delivery.</p> <p>A detailed description addressing Section 8.1 of NSTS/ISS 13830 that includes defining at what Phases separate or independent Safety Data Packages (SDPs) and reviews will be generated/conducted for both flight and ground and at what Phase integrated SDPs and reviews will be generated/conducted for both flight and ground.</p> <p>The System Safety Plan for an integrated, multi-payload cargo compliment (IMPCC) as defined by Section 8.1 of NSTS/ISS 13830 shall also address the specific activities related to the review of SDPs developed by the payload elements to be integrated into the IMPCC including the timing of such review for both flight and ground. The participation by the IMPCC in the associated safety reviews for the payload elements shall also be addressed for both flight and ground.</p> <p>The plan may be a part of the contractor's Product Assurance Plan (PA-01) or a separate, stand-alone document.</p> <p>Preliminary – Due by SRR  Final - Due by PDR</p>	

<b>Title:</b> System Safety Hazard Analysis	<b>DID No.:</b> PA-03
<b>Reference:</b> GRC Product Assurance Manual (PAI #220) Space Assurance Requirements and Guidelines (SARG) - Section 4.	
<b>Purpose:</b> Conducted to identify applicable hazards and methods to eliminate or control those hazards.	
<b>Related Documents:</b> PA-02: System Safety Plan PA-05: Safety Compliance Data Package	
<b>Preparation Information:</b> <p>This document will identify the potential hazards associated with a space flight payload and define the approaches to be used to control (Phase 1) and verify (Phase 2) the hazards identified. The contractor's report format will be acceptable (although it should be compatible with the requirements of the Safety Compliance Data Package) unless specific forms are required by the Safety Review Panel.</p>	

<b>Title:</b> Fracture Control Plan	<b>DID No.:</b> PA-04
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) SSP-30558 Fracture Control Requirements for Space Station	
<b>Purpose:</b> Documents the contractor's approach to fracture control and helps the Government understand how the contractor will comply with applicable fracture control safety requirements.	
<b>Related Documents:</b> PA-02: System Safety Plan PA-05: Safety Compliance Data Package PA-06: Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	
<b>Preparation Information:</b> <p>This document shall define the overall approach for meeting fracture control requirements, the methodology for identifying fracture critical parts, the methodology for performing crack propagation analysis, the use of nondestructive inspection and testing techniques, and the fracture control activities to be conducted during the various program phases. The plan as a minimum shall address the following areas:</p> <ul style="list-style-type: none"> <li>A) Structural Design</li> <li>B) Material selection, procurement, and storage</li> <li>C) Fabrication process control</li> <li>D) Analysis and Testing</li> <li>E) Quality assurance and nondestructive examination (NDE)</li> <li>F) Payload operations and maintenance</li> </ul> <p>This plan applies to all types of fracture phenomena including fatigue crack initiation, stress corrosion cracking, hydrogen embrittlement, and propagation of cracks due to cyclic or sustained loading.</p>	

<b>Title:</b> Safety Compliance Data Package	<b>DID No.:</b> PA-05
<b>Reference:</b> GRC Product Assurance Manual (PAI # 210, #211) Space Assurance Requirements and Guidelines (SARG) - Section 4. NSTS/ISS 13830 Payload Safety Review and Data Submittal Requirements NSTS 1700.7B plus Addendum Safety Policy & Requirements for Payloads Using STS and ISS	
<b>Purpose:</b> Used in conjunction with the Space Shuttle/ISS Phased Safety Review Process. Helps NASA understand how the contractor will comply with applicable safety requirements. Used to document and defend the identification, control, and verification of all unique safety hazards associated with the installation and operation of the experiment in space.	
<b>Related Documents:</b> PA-02: System Safety Plan PA-03: System Safety Hazard Analysis	
<b>Preparation Information:</b>  This document will identify potential hazards for individual space flight payloads, define the approaches to be used to control the hazards identified and establish the methods by which all hazard controls will be verified. (Note that a Safety Compliance Data Package will be required for each flight payload deliverable (Space Shuttle, ISS), and the contractor shall use the required reporting format required by the carrier.)  Delivered for NASA review and approval 30 days before required submittal date to NASA JSC or NASA KSC.	

<b>Title:</b> Materials and Processes, Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	<b>DID No.:</b> PA-06
<b>Reference:</b> GRC Product Assurance Manual Space Assurance Requirements and Guidelines (SARG)	
<b>Purpose:</b> Documents the Materials and Processes required to ensure the safety of the project through the proper selection, application, processing, inspection and testing of the chosen materials for the flight hardware subsystems and equipment.	
<b>Related Documents:</b> PA-01: Product Assurance Plan PA-04: Fracture Control Plan	
<b>Preparation Information:</b> <p>The Materials and Processes Element may be a part of the Product Assurance Plan or a separate document.</p> <p>The Materials and Processes Element shall address the following topics:</p> <ul style="list-style-type: none"> <li>• Formulating, reviewing and maintaining materials documentation, including a Material Identification and Usage List (MIUL)</li> <li>• Organization, review and approval of Material Usage Agreements (MUA)</li> <li>• Organization, review and approval of Volatile Usage Agreements (VUA)</li> <li>• Fracture Control</li> <li>• Nondestructive Testing</li> <li>• Contamination Control</li> <li>• Coatings and Finishes</li> <li>• Special Processes (Welding , Bonding, Heat Treatment)</li> </ul> <p>The MIUL and MUA element documents shall:  identify material usage (MIUL) and justify the use of non-A-rated materials (MUA) in all space flight hardware. The contractor's report format will be acceptable, but must contain adequate material identification to assist the government in conducting their assessment and issuance of the Material Certification Letter.</p> <p>The MIUL and MUA's must be delivered to NASA GRC at PDR and subsequent major milestone reviews (30 days prior to PSR)</p> <p>Note:  MIUL/MUA's may not be required for some (e.g. sounding rocket) payload deliverables. The Contractor must satisfy NASA that the materials used provide adequate safety margin to receive materials certification. The Contractor shall meet the materials and processes requirements of SSP 30233 for all Space Station payloads.</p>	

<b>Title:</b> Problem Report and Corrective Action (PRACA) Plan	<b>DID No.:</b> PA-07
<b>Reference:</b> GRC Product Assurance Manual (PAI #440) Space Assurance Requirements and Guidelines (SARG) - Sections 7 & 8. Program Requirement for Payload Developers (SSP 50431) SSP30223 – Problem Reporting and Corrective Action for the Space Station Program	
<b>Purpose:</b> Define a system to identify, control, and disposition nonconforming hardware/software and the remedial/corrective actions taken to resolve those problems.	
<b>Related Documents:</b> PA-01: Product Assurance Plan PA-13: Problem Report and Correction Action Report V-11: Integration Data Package	
<b>Preparation Information:</b>  The PRACA system shall describe a documented closed-loop problem reporting system for failures and non-conformances. The system shall include documentation of problem, traceability of material or part, disposition of problem, root cause corrective action, segregation of discrepant material, verification of corrective action, and trending to help prevent similar discrepancies. Describe review process including any review boards and the problem report tracking and distribution process. NASA shall be informed of any reportable problem within 48 hours of occurrence.  A reportable problem is any nonconformance which is, or is suspected of being, a failure, an unsatisfactory condition, an unexplained anomaly, or an overstress occurring during or subsequent to production acceptance testing or qualification testing (i.e. after manufacturing or development).  The problem report should include as a minimum: 1) description of problem; 2) analysis of root cause of problem; and 3) description of corrective action; 4) corrective action follow-up.  Note: Information required as part of the Product Assurance Plan but can be submitted as a separate document. Level 1 PRACA Reports are to be submitted for NASA approval per CDRL DID# PM-05.	

<b>Title:</b> Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	<b>DID No.:</b> PA-08
<b>Reference:</b> GRC Product Assurance Manual (PAI #412) Space Assurance Requirements and Guidelines (SARG) – Section 7 SSP 50431, Space Station Program Requirements for Payloads SSP 30234, Failure Modes and Effects Analysis and Critical Items List Requirements for Space Station	
<b>Purpose:</b> To identify and document failure modes and effects analysis results and to identify critical items of space experiment systems and components which require special risk assessment. This action will support; (1) additional design action, (2) safety analysis to identify hazards, (3) test planning, (4) mission planning, (5) preparation of mandatory inspection points, (6) fault detection and isolation, (7) maintainability analyses and planning, (8) reliability analysis to identify single point failures, (9) logistics planning, and (10) waiver to program requirements.	
<b>Related Documents:</b> PM-02: Risk Management Plan PA-01: Product Assurance Plan PA-02: System Safety Plan	
<b>Preparation Information:</b>  This document will report the results of FMEAs conducted to determine possible failure modes and effects on the local, system, and crew level. Failure Modes shall be categorized according to NASA criticality categories (impact on mission objectives and system safety). The contractor shall use the listed NASA references as analysis requirements. Deviations from the published instructions by NASA should be approved by NASA personnel managing the contract.  The Critical Items List will include item identification, cross-reference to FMEA line items, and retention rationale. Appropriate retention rationale can include design features, historical performance and/or flight success history, acceptance testing, manufacturing product assurance, operational workarounds, maintainability, elimination of undesirable failure modes, and failure detection methods. The retention rationale should demonstrate how risk (probability of occurrence and worst case effects) has been minimized for critical failure modes.  Preliminary – Due for PDR Final – Due for CDR, update as required 60 days after CDR	

<b>Title:</b> Contamination/Cleanliness Control Plan	<b>DID No.:</b> PA-9
<b>Reference:</b> JSC SN-C-0005 Contamination Control Requirements SP-5076 NASA Contamination Control Handbook MIL-STD-1246B Product Cleanliness Contamination Control Program Space Assurance Requirements and Guidelines (SARG) - Section 8 GRC Product Assurance Manual (PAI #612, #615)	
<b>Purpose:</b> Describes the methods and procedures for controlling and assuring limited impact of contamination during hardware development, transportation, flight and storage phases.	
<b>Related Documents:</b> PA-01 Product Assurance Plan	
<b>Preparation Information:</b>  The following items shall be included in the plan:  A) Hardware Control Requirements and design considerations that include surfaces, electrical, optical, and fluids.  B) Facility Requirements and controls  C) Personnel requirements and work area controls  D) Description of what cleanliness control measures will be used.  Preliminary – Due for PDR Final – Due prior to flight hardware development/assembly	

<b>Title:</b> Software Assurance Plan	<b>DID No.:</b> PA-10
<b>Reference:</b> GRC Software Development Manual NASA-DID-M400 Space Assurance Requirements and Guidelines (SARG) GRC Software Product Assurance Procedure GRC-P.2.10.2	
<b>Purpose:</b> Documents the assurance approach the contractor intends to use for software development and helps the Government understand how the contractor will assure the management, safety, and control of the software products.	
<b>Related Documents:</b> PM-04: Configuration Management Plan PA-01: Product Assurance Plan PA-03: Software Management and Development Plan	
<b>Preparation Information:</b> <p>This document will define the contractor's plan to apply software assurance principles and techniques to ensure the Delivery Order will be successfully accomplished and the applicable SARG requirements will be satisfied. The Software Assurance Plan may be part of the Product Assurance Plan (PA-01) or written as a stand-alone document for each task. The Contractor shall use the above references as a guide to preparing this document.</p> <p>(Note that a Software Assurance Plan will be required for each space flight payload deliverable.)</p> <ul style="list-style-type: none"> <li>Draft – Due 60 days prior to SRR</li> <li>Preliminary – Due midway between SRR and PDR</li> <li>Final – Due 60 days before ATP and /or PDR, update as required 30 days after ATP and/or PDR</li> </ul>	

<b>Title:</b> Safety and Health Plan	<b>DID No.:</b> PA-11
<b>Reference:</b> GRC Safety Manual GRC Environmental Manual	
<b>Purpose:</b> To identify all hazards related to tasks to be performed at NASA Glenn Research Center and the corrective action plan to prevent any mishaps. In addition, it should describe the process to ensure regulatory compliance with safety and health regulations.	
<b>Related Documents:</b> 29 CFR 1910	
<b>Preparation Information:</b>  This document will identify the potential hazards to all employees, equipment and property while tasks are performed at NASA Glenn Research Center. The document should provide the processes to be used to mitigate these hazards and to prevent any mishaps while the tasks are in progress. In addition, it should describe the process to ensure regulatory compliance with safety and health regulations. The Safety and Health Plan will cover the contractor's personnel and tasks and the personnel and tasks of its subcontractor's.  The contractor will provide the Safety and Health Plan as part of the submittal to the RFP. Glenn Safety Manual, Chapter 17, Appendix A provides guidance on the contents of a safety and health plan.  Final – Due 60 days after contract award	

<b>Title:</b> Problem Report and Corrective Action (PRACA) Report	<b>DID No.:</b> PA-12
<b>Reference:</b> PA-07: Problem Report and Corrective Action Plan SSP30223 – Problem Reporting and Corrective Action for the Space Station Program	
<b>Purpose:</b> To provide a report, as required, that will be used to understand the Contractor's problem reports being generated and to be aware of the correction actions used by the Contractor to prevent recurrence of the problem.	
<b>Related Documents:</b> PM-02: Risk Management Plan PM-05: Engineering Change Proposals, Deviations, Waivers and Level I PRACAs	
<b>Preparation Information:</b>  The problem report should include as a minimum: 1) description of problem; 2) analysis of root cause of problem; and 3) description of corrective action; 4) corrective action follow-up.  NASA shall be informed of any reportable problem within 48 hours of occurrence. A reportable problem is any nonconformance which is, or is suspected of being, a failure, an unsatisfactory condition, an unexplained anomaly, or an overstress occurring during or subsequent to production acceptance testing or qualification testing (i.e. after manufacturing or development).  The PRACA Report will be developed in accordance with the Contractor Product Assurance Plan. Level 1 PRACA Reports shall be submitted for NASA approval per CDRL DID # PM-05	

<b>Title:</b> Reliability Report(s)	<b>DID No.:</b> PA-13
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) - Section 7 SSP 50431, Space Station Program Requirements for Payloads LeR-W0510.061, Reliability Prediction/Maintainability Assessment/Availability Analyses	
<b>Purpose:</b> Reliability Analysis is utilized by the designers to estimate the reliability of a particular design within mission parameters. Reliability estimates for sub-systems, Orbital Replaceable Units (or Line Replaceable units) are compared to their reliability allocations (design targets). The purpose of the analysis is to identify subsystems or components within the design where reliability improvement is required, areas of risk, and to provide inputs to sparing analysis.	
<b>Related Documents:</b> PA-01: Product Assurance Plan PM-02: Risk Management Plan	
<b>Preparation Information:</b>  The developer shall perform a reliability allocation and prediction analysis. The predicted system level reliability at the elapsed mission time shall be compared to the overall system reliability requirement specified in the Product Assurance Plan. The reliability allocations shall be developed for each subsystem or major component of the system, which are the reliability design goals that must be met for the system to attain its overall reliability requirement. The prediction analysis shall provide a reliability model of the system in terms of a reliability block diagram and shall include the component failure rates and failure rate sources. Components for reliability improvement shall be identified and recommendations can be made for design improvement, higher quality level of parts, sparing, improved cooling capability, additional active or passive redundancy or reduction in planned operating time. If the system is complex and many subsystems are involved, the developer may desire to provide individual reliability prediction analysis reports for each subsystem and a separate Reliability Summary Report for the system level prediction and the Reliability Allocations.  Allocations: 90 days prior to PDR Preliminary Analysis: Due for PDR Revised Analysis: CDR Final: Due for PSR	

<b>Title:</b> Limited Life Items List	<b>DID No.:</b> PA-14
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) – Section 7 SSP 50431, Space Station Program Requirements for Payloads	
<b>Purpose:</b> The Limited Life Items List identifies hardware items that are not expected to operate over the duration of the mission and will require corrective action such as preventative maintenance or calibration. The Limited Life Items List directly supports the development of the Preventative Maintenance Analysis and plan for the system. It will also support: (1) Spares planning, (2) System Safety verification/corrective action for Safety Critical hardware items that are of limited life, (3) test planning, (4) mission planning, (5) preparation of on-orbit maintenance inspections, (6) operational availability analysis, (7) logistics planning, and (8) waiver to program requirements.	
<b>Related Documents:</b> PA-01: Product Assurance Requirements PA-08: Failure Modes and Effects Analysis	
<b>Preparation Information:</b>  Developing the Limited Life Items List  Limited Life Items are defined in section 7.4.2 of the SARG. System hardware parts/components/assemblies are evaluated to determine if their useful life will be less than 125% of their total required operating time planned to support the mission. Such items are limited life items and are documented on the Limited Life Items List.  Data elements that should be considered (and reported) for the limited life items are: Expected operating life, required operating life, duty cycle, and planned corrective action. The limited life items list must also address Limited Storage-Life Items: Items that have a storage life that will be less than their required storage time.  Preliminary – Due for PDR Final – Due for CDR, update as required for PSR	

<b>Title:</b> System Maintainability/Availability Analysis	<b>DID No.:</b> PA-15
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) - Section 7	
<b>Purpose:</b> The System Maintainability/Availability Analysis is utilized by the designers to estimate the steady-state operational availability of a particular design within mission parameters. Operational Availability estimates for sub-systems, Orbital Replaceable Units (ORUs) or Line Replaceable units (LRUs) are compared to their availability allocations (design targets). This analysis serves to identify design risks that could limit ability of the system to operate during the life of the mission and thereby threaten mission success. Specifically, the analysis evaluates the system, subsystems and components to determine where: (1) reliability improvement is required, (2) design changes are needed to improve maintainability, and (3) changes in sparing approach, spares logistics planning, etc. are needed to improve design supportability. (Note that this analysis requires performing and utilizing related analyses, such as, reliability analysis (e.g., PA-14), maintainability analysis, limited life analysis (e.g., PA-15), preventative maintenance analysis, and spares & logistics analysis (e.g., OP-13).)	
<b>Related Documents:</b> SSP 50431, Space Station Program Requirements for Payloads LeR-W0510.061, Reliability Prediction/Maintainability Assessment/Availability Analyses OP-13: Firmware Support Manual PA-14: Reliability Report(s) PA-15: Limited Life Items List	
<b>Preparation Information:</b> <p>This Data Item Deliverable shall document system availability analyses performed by the developer. The predicted steady-state operational availability for the system over the elapsed mission time shall be compared to the specified overall system availability requirement. Availability allocations shall be developed for each subsystem or major component of the system, which represent the availability design/supportability goals that must be met for the system to meet its overall availability requirement. The analysis shall provide an availability model of the system in terms of a reliability block diagram. It shall include the component mean-time-between failures (MTBFs), mean-time-to-repair/replace (MTTRs), and mean-logistics delay times (MLDTs) for each block and their data sources. Components for availability improvement shall be identified and recommendations can be made for design improvement, higher quality level of parts, improved sparing, improved cooling capability, additional active or passive redundancy or reduction in planned operating time. This analysis shall also reflect the results of the developer's maintainability and preventative maintenance analyses, including 1) identifying which components in the system are designated as ORUs/LRUs; 2) how these components will be spared and maintained and 3) how preventative maintenance shall be conducted, especially with respect to limited life items that are safety critical. The analysis shall include a list and schedule of all recommended maintenance activities needed to keep the system equipment operating within performance parameters and keep the entire system operational over the required mission life.</p> <p>Allocation due 90 days prior to PDR.  Preliminary Prediction: to be complete for PDR.  Revised Prediction to be completed 30 days prior to CDR.  Final Prediction at PSR.</p>	

<b>Title:</b> Fastener Control Plan	<b>DID No.:</b> PA-16
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) NSTS/ISS 13830, Payload Safety Review and Data submittal Requirements NASA STD 5017 Design And Development Requirements For Mechanisms	
<b>Purpose:</b> Documents the contractor's approach to fastener control and helps the Government understand how the contractor will comply with applicable fastener control safety requirements for space flight hardware.	
<b>Related Documents:</b> PA-02: System Safety Plan PA-05: Safety Compliance Data Package PA-06: Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	
<b>Preparation Information:</b> This document shall define the overall approach for meeting fastener control requirements. The plan as a minimum shall address the following areas: <ul style="list-style-type: none"> <li>a. Acquisition/supplier control</li> <li>b. Documentation</li> <li>c. Traceability</li> <li>d. Receiving inspection</li> <li>e. Testing</li> </ul> Timing/Purpose: If prepared, provide 30 days before the PDR.	

<b>Title:</b> System Requirements Document	<b>DID No.:</b> R-01
<b>Reference:</b> SSP-41171 International Space Station Program; preparation of program, unique specifications	
<b>Purpose:</b> This document will define the engineering requirements generated from the science requirements (if appropriate), the performance, design, development and verification requirements for the hardware, and the resource requirements, training requirements and quality assurance provisions. This document will also define all requirements needed to successfully develop the hardware that includes interface requirements between the payload and carrier by reference or inclusion.	
<b>Related Documents:</b> R-02: Interface Definition Document and Interface Control Document R-04: Software Requirements Document V-01: Master Requirements and Verification Compliance Plan, etc.	
<b>Preparation Information:</b> <p>List all requirements needed to successfully build the hardware and how they are to be implemented. This document will ensure that all requirements are by definition: quantifiable, verifiable, and specific. The document shall provide detailed information regarding the interface between the payload and the carrier and should provide per the following topics as a minimum:</p> <ul style="list-style-type: none"> <li>a) Missions – Life cycle, operations, crew resources.</li> <li>b) Science Requirements – as they pertain to capability of hardware provided.</li> <li>c) Reliability – Failures Modes Effects Analysis (FMEA), Parts Stress Analysis (PSA), Worst Case Analysis, Reliability Models/Predictions, Limited-Life Items, Problem Report and Corrective Action (PRACA)'s.</li> <li>d) Mechanical Environment – Vibration, shock, acceleration, noise.</li> <li>e) Thermal Environment – flight environment (on-orbit cabin temp, Ascent/Descent temp/press, surface temp), atmospheric pressure.</li> <li>f) EMI/EMC Environment</li> <li>g) Radiation Environment</li> <li>h) Operations</li> <li>i) Mechanical Design Requirements</li> <li>j) Interface Requirements – Thermal, electrical power, command/data handling, Ground Support Equipment (GSE)</li> <li>k) Induced Environment – natural and experiment</li> <li>l) Operational Requirements</li> <li>m) Material Controls – off-gassing, flammability, stress corrosion cracking, materials selection, process selection, fracture control</li> <li>n) Contamination and Cleanliness</li> <li>o) Configuration Control Safety – Safety compliance, verifications (flight &amp; ground handling)</li> <li>p) Quality Assurance (including Software Product Assurance)</li> </ul> <p>Draft – Due for SRR          Preliminary – Due midway between SRR and PDR          Final – Due for PDR, update as required 60 days after PDR</p>	

<b>Title:</b> Interface Requirements Document (IRD) Interface Control Document (ICD)	<b>DID No.:</b> R-02
<b>Reference:</b> SSP57000, Pressurized Payload Interface Requirements Document (ISS Only) SSP57001, Pressurized Payload Interface Control Document Blank Book (ISS Only) NPR 7150.2, NASA Software Engineering Requirements	
<b>Purpose:</b> <p>The purpose of the IRD is to define the interfaces between the payload and the carrier, define payload to carrier interface constraints, and to levy the associated design requirements on the payload. The IRD also establishes commonality with respect to analytical approaches, analytical models, technical data, and definitions for payload integration into carrier.</p> <p>The ICD is used to provide configuration controlled documentation in the form of drawings and/or written records to identify necessary design definitions between one or more systems, elements, subsystems, or computer software configuration items (CSCIs) to provide control of and ensure a compatible interface. The Interface Control Document (ICD) provides the design solutions to the requirements found in the requirements specifications and/or the Interface Requirements Document (IRD); the ICDs are companion documents that serve to communicate and control interface design decisions.</p>	
<b>Related Documents:</b> R-01: System Requirements Document R-04: Software Requirements Document	
<b>Preparation Information:</b> <p>The IDD shall provide the definitions and requirements that control the design of all interfaces between the carrier and the payload. The IDD shall be utilized as the basis for the development of the ICD. The ICD shall provide detailed information regarding the payload interfaces to the carrier. The data provided by the payload/instrument, in the form of written words, drawings, and schematics, will be incorporated into a combined payload and carrier ICD for applicable signatures.</p> <p>The payload to carrier interfaces are defined per the following topics as a minimum:</p> <ol style="list-style-type: none"> <li>A. <u>Physical Requirements</u> - such as mass properties, structural/mechanical, carrier interfaces during launch and landing, on-orbit carrier interfaces, footprint, clearance envelope, drill template, alignment, orientation, fields-of-view (optical, thermal, glint, RF), including tolerances; electrical connectors regarding sex (plug or receptacle), type, orientation, pin assignments, clocking and backshell type, cable locations/runs; thermal control coatings, blankets, heat flow and operating limits; microgravity quasi-steady state and transient sources.</li> <li>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, power quality, power handling capability, source impedance limits, remote power controller overload limits, electrical power consuming equipment.</li> <li>C. <u>Software</u> - such as codes, processors, memory storage, application description, uses, data transfer and command protocols.</li> <li>D. <u>Payload Environmental</u> - such as vibration, shock, acoustic, EMI/EMC, ESD, thermal, contamination, purges, air and water-cooling, pressure/vacuum.</li> <li>E. <u>Safety</u> - such as pyrotechnics, energy storage, trip-over, hazardous materials or processes, fire detection and suppression, gas interface, ionizing radiation, air and water thermal control.</li> <li>F. <u>Ground Support Equipment</u> - such as mechanical, electrical, test specific, targets, simulators.</li> <li>G. <u>Ground System Interface</u> - Data formats, communications protocols, data rates; compression algorithms, error detection and correction schemes; antenna patterns, EIRP, G/T, beam width, frequency, polarization; command and telemetry formats; scenarios for data transmission, operations,</li> </ol>	

- maintenance; number and types of downlinks.
- H. Operational Factors - such as ground contacts needed per day, data storage capacity and
  - I. compression, general flight rules and limitations, real-time downlink, post-test downlink, ground support personnel training during operation.
  - J. Training Simulators - crew training

Show sufficient detail on both sides of each interface to provide a clear picture of the resultant mated interface. For example, 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.

Draft - Due for SRR

Preliminary - Due midway between SRR and PDR

Final - Due for PDR, update as required 60 days after PDR

<b>Title:</b> Payload Interface Agreement (PIA) and Annexes	<b>DID No.:</b> R-03
<b>Reference:</b> SSP-52000-PDS Payload Data-Sets Blank Book SSP-52000-PIA-PRP Rev A: Payload Integration Agreement Blank Book for Pressurized Payloads	
<b>Purpose:</b> To develop a unique Payload Integration Agreement (PIA) for International Space Station (ISS) facility class and rack level pressurized payloads. The PIA is the Payload Developer (PD) and International Space Station Program (ISSP) agreement on the responsibilities, tasks and requirements that directly relate to the assignment and integration of the payload into the ISS. The PIA further defines the roles and responsibilities, technical requirements, and integration schedules to launch, operate, and return an ISS pressurized payload.	
<b>Related Documents:</b> R-02: Interface Definition Document and Interface Control Document	
<b>Preparation Information:</b> <p>The PIA for ISS payloads shall be developed, in accordance with SSP-52000-PIA-PRP, with three separate parts as follows: main volume, the addendum, and the data sets. The main volume of the PIA describes the static requirements and the general roles and responsibilities of the parties involved in the integration and de-integration, pre-launch and post-landing processing, transportation and the on-orbit operation of the payload. More specifically, it contains information pertaining to specific reviews, schedules, hardware commitments and protocols required to manifest the payload. The addendum documents the tactical parameters, dynamic requirements, schedules, and commitments associated with specific transportation flights and on-orbit increment operations. Information in the addendum will be provided for each increment while the payload is on-orbit. Finally, the data sets contain the engineering, integration, and operational details required and agreed upon by the implementing organizations. Data sets define, on an increment and flight-specific basis, the engineering, integration and operational details of the requirements in the Addendum. Data sets will be updated, as agreed to by the implementing organizations, to meet increment and flight-specific needs. For details of the payload integration processes, see SSP 50200-01, Station Program Implementation Plan, Volume 1: Space Station Program Management Plan through SSP 50200-10, Station Program Implementation Plan, Volume 10: Sustaining Engineering.</p> <p>Draft – Due for SRR          Preliminary – Due midway between SRR and PDR          Final – Due for PDR, update as required 60 days after PDR</p>	

<b>Title:</b> Software Requirements Document	<b>DID No.:</b> R-04														
<b>Reference:</b> NASA STD 2100-91 (NASA Software Documentation Standard) NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards SSP 52050, ISPR to ISS Software Interface Control Document, Part 1 SSP 57002, Payload Software Interface Control Document Template															
<b>Purpose:</b> This document specifies in detail the requirements of the system Computer Software Configuration Item (CSCI). It includes the function and performance, interfaces, and qualification requirements.															
<b>Related Documents:</b> PA-04: Fracture Control Plan PA-10: Software Assurance Plan D-06: Software Design Document R-01: System Requirements Document V-01: Master Requirements and Verification Compliance Plan, etc.															
<b>Preparation Information:</b> <p>The Software Requirements Document defines the specific requirements to be satisfied throughout the implementation of the software requirements for the system CSCI. The information contained within the document provides the technical requirements to be implemented by the CSCI and enables the development team to assess whether or not the completed CSCI complies with the requirements of the system. The data included in this document provides the criteria for acceptance of the integrated software configuration. The document shall provide detailed information regarding the payload software per the following topics as a minimum; Flight Experiment Commanding Software, Diagnostics Software, Crew Interface Software, Ground Control Software, Experiment Monitoring Software, Safety and Reliability Software (e.g. fail safe, fault tolerance), Communication Interface Software, Software Simulation (check software without hardware), and Ground-based experimentation Software.</p> <p>A general organization of the document is outlined below and should be used as a guideline only:</p> <table border="0"> <tr> <td>Introduction</td> <td></td> </tr> <tr> <td>Applicable Documents</td> <td>[List of documents referenced in the document]</td> </tr> <tr> <td>Requirements</td> <td>[List all system functional and performance requirements]</td> </tr> <tr> <td>Qualification Requirements</td> <td>[Describes qualification requirements necessary to establish that the above requirements have been met]</td> </tr> <tr> <td>Notes</td> <td></td> </tr> <tr> <td>Appendices</td> <td></td> </tr> <tr> <td>Glossary</td> <td>[Acronym list and definition of terms]</td> </tr> </table> <p>Preliminary – Due at PDR  Final – Due at CDR</p>		Introduction		Applicable Documents	[List of documents referenced in the document]	Requirements	[List all system functional and performance requirements]	Qualification Requirements	[Describes qualification requirements necessary to establish that the above requirements have been met]	Notes		Appendices		Glossary	[Acronym list and definition of terms]
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<b>Title:</b> Software Interface Control Document	<b>DID No.:</b> R-05
<b>Reference:</b> NASA STD 2100-91 (NASA Software Documentation Standard) NASA-DID-M300 NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards	
<b>Purpose:</b> This document provides detailed design specifications for interfaces between this software/firmware entity and its external users as well as its internal interfaces. The purpose of the software/firmware interface detailed design is to record the physical design information for the interfaces to the software and firmware. This includes the data types, physical data format or layout, message descriptions, data transmissions, and protocols and priorities	
<b>Related Documents:</b> D-06 Software Design Document R-04 Software Requirements Document, R-01 System Requirements Document	
<b>Preparation Information:</b> This document shall describe each external and internal interfaces for the software and/or firmware entity for which this document is provided. Internal interfaces shall be described to the next lowest logical entity (e.g. if this document is for a rack entity consisting of multiple CSCI entities, the external interfaces are relative to the rack and external entities, and the internal interfaces are between the rack's CSCI entities). For each interface, the details of the interface shall be described, including: <ul style="list-style-type: none"> <li>a. (Interface Name/Identifier) External or Internal, Type and Purpose.</li> <li>b. Data Transmission Interfaces. Provide a detailed specification of the data records and elements transmitted across the interface in such terms as: Unique identifier for each record and data element, description and purpose of each record and data element, source and destination for each record or single data element transmission, data type and (if appropriate) unit of measure, limit and range of values, accuracy, precision (in terms of significant digits). If shared memory is used, then define the purpose for the shared memory, and the shared memory location(s) used for transmissions across the interface.</li> <li>c. Message Interface Descriptions. Identify each message transmitted across the interface and specify the assignment of data elements to each message. Provide cross references between data elements and messages, as a two-way sorted list.</li> <li>d. Interface Priority Specify the relative priority of this interface and of each message transmitted across it.</li> <li>e. Interface Communication Protocols. Identify the protocol for the interface by name and describe its technical details in terms of the following: fragmentation and reassembly of messages, message formatting, error control and recovery procedures, including fault tolerance features, synchronization, including connection establishment, maintenance, termination, and timing, flow control, including sequencing, and buffer allocation, data transfer rate, whether periodic or aperiodic, and minimum interval between transfers, routing, addressing, and naming conventions, transmission services, including priority and grade, status, identification, notification, and other reporting features, security, including encryption, user authentication, compartmentalization, and auditing</li> </ul> <p>The interface design shall be traceable to interface requirements.</p> <p>For recommended document outline see NASA-STD-2100-91</p>	

<b>Title:</b> Review Presentation Package	<b>DID No.:</b> D-01
<b>Reference:</b> NASA NPR 7123.1A	
<b>Purpose:</b> The Review Presentation Package is for providing a viewgraph presentation and associated documentation to meet the requirements of the specific review (i.e. PDR, CDR, PSR, etc.)	
<b>Related Documents:</b>	
<b>Preparation Information:</b> The Review Presentation Package for each review shall summarize the information in the key document deliverables and the requirements of the review as described in the SOW and/or Delivery Order. The Review Presentation Package shall provide to the review panel the necessary information to make a determination to proceed in the hardware and software development. As an example, the Phase 1 Safety Review shall provide a presentation package that includes a description of the payload system, subsystems and the Hazard Reports. The Review Presentation Package shall be prepared and distributed to the Government no later than 2 weeks prior to the review.	

<b>Title:</b> Engineering Trade and Analysis Data	<b>DID No.:</b> D-02
<b>Reference:</b> PM-02: Risk Management Plan	
<b>Purpose:</b> This report documents the trades and engineering analysis performed during the design stages of the project. Alternative approaches will be captured for possible future use during the development of the project. The analysis data may also be required to provide the carrier and ground system teams with payload interface data, models, and analysis needed to assist them in their designs and preparations to support the payload for launch and mission operations.	
<b>Related Documents:</b> R-03: Payload Interface Agreement & Annexes	
<b>Preparation Information:</b> The trade study report shall contain a description of the trade studies performed and the candidate concepts that were considered. This description shall include the trade off factors considered such as, affordability, technology, operations, infrastructure, content, risk, and potential procurement strategies. The results of the systems analyses and lifecycle costing analysis shall be included in this trade study report. Trade study results of risk assessment shall be included in this report if performed.	

<b>Title:</b> Baseline System Description (Baseline Concept Description)	<b>DID No.:</b> D-03
<b>Reference:</b> AFMC Pamphlet 800-62	
<b>Purpose:</b> A working document that provides a comprehensive overview of the system, describing key requirements and problems, proposed solutions and overall system and subsystem descriptions through an easily understood format of pictures and narrative. The BCD, and then the BSD, is the single, authoritative summary document that describes the primary system functions and the technical solutions that defines the system and the interrelationships.	
<b>Related Documents:</b> R-01: System Requirements Document R-02: Interface Definition Document and Interface Control Document D-05: Accommodations Handbook	
<b>Preparation Information:</b>  The Baseline Concept Description (BCD) is utilized in the formative development of the system (hardware and software) that provides an overall description in an easily understood format used by the team and the Government as a communication tool, and as a point of departure for briefings, studies and cost estimates. The document begins as a brief record or overview of the system utilization environments, requirements, boundaries, constraints and general concepts, and evolves, in parallel with system development, into a more complete, formal structure.  The Baseline System Description (BSD) document evolves from the BCD, and documents the overall system design that meets the system requirements and grows in depth as details of the system matures. A general organization of the document is outlined below and should be used as a guideline only. In preparing a BCD/BSD for a specific system, the document must reflect the requirements of that project being documented: <ol style="list-style-type: none"> <li>1. Introduction of System/Problem</li> <li>2. Deployment Concept/Carrier Accommodations</li> <li>3. System Technical Description</li> <li>4. Operations Concept</li> <li>5. Support Concept</li> <li>6. Manufacturing Concept</li> <li>7. Verification Concept</li> <li>8. Design Safety Considerations</li> </ol> <p>Each of the areas should determine the environment, constraints, boundary conditions, interfaces, critical risks, and unknowns.</p> <p>Preliminary: Due for SDR          Final: Due for PDR, convert to BSD for CDR</p>	

<b>Title:</b> Product Drawings	<b>DID No.:</b> D-04
<b>Reference:</b> Mil-Spec DOD-D-1000B ISO 10303 Standard for the Exchange of Product model data	
<b>Purpose:</b> The purpose of the product drawings is to provide to the Government a set of drawings for sustaining engineering or archive purposes. The drawings need to be compatible with the Government standards and interchange format.	
<b>Related Documents:</b> PM-04: Configuration Management Plan D-09: Systems Configuration Document V-13: As Built Configuration List	
<b>Preparation Information:</b>  The product drawings shall be prepared and furnished in accordance with establish drawings standards of ISO-9001 or Military Specification DOD-D-1000B or equivalent. Contractor code identification and documentation numbers will be used, unless otherwise specified in the Delivery Order. An electronic version of the drawings in PDF shall be made available to the Government unless otherwise stated in the Delivery Order. The electronic drawing (model) shall be provided to the Government in native format, upon request. If the Government does not have appropriate software to access the native format an equivalent DXF or STEP interchange format will be required.  The product drawings and associated lists shall provide engineering definition sufficiently complete to enable a competent manufacturer to produce and maintain quality control of item(s) to the degree that physical and performance characteristics are interchangeable with those of the original design without recourse to additional design data.  The product drawing types shall include, as applicable, parts list, detail and assembly drawings, interface control data, diagrams, performance characteristics, critical manufacturing limits, and details of new materials and processes. The product drawings shall include detail processes, i.e., not published or generally available to industry, when essential to design and manufacture; performance ratings; dimensional and tolerance data; critical manufacturing assembly sequences; input and output characteristics; diagrams; mechanical and electrical connections; physical characteristics, including form and finish; details of material identification; inspection, test, and evaluation criteria; necessary calibration information; and quality control data.  Flight Drawings, 90% complete release drawings for CDR Release drawings prior to any fabrication	

<b>Title:</b> Accommodations Handbook	<b>DID No.:</b> D-05
<b>Reference:</b>	
<b>Purpose:</b> This document is the primary source of system data, interfaces and requirements levied upon each user for experiment design and integration. The document shall provide information to users of the subject hardware/software system including descriptions of the interfaces, resources, capabilities, performance characteristics, and constraints provided by or due to the subject system. This document will provide guidelines and assistance to payload developers or users who must integrate hardware/software subsystems with the subject system and should provide support for the design, fabrication, and the operation of user hardware/software that is accommodated within or utilized with the subject system. For complex systems (e.g., facility class hardware), this handbook should contain a comprehensive description of capabilities, interfaces, and operations providing potential users with adequate detail to confidently approach conceptualization of experiments.	
<b>Related Documents:</b> R-01: System Requirements Document R-02: Interface Definition Document and Interface Control Document D-03: Baseline System Description	

**Preparation Information:**

The Accommodations Handbook provides information on the system design, capabilities, performance characteristics, and constraints to enable users to design experiment hardware to be accommodated by the system. The handbook will provide descriptions, definitions and requirements for user interfaces, support systems, operations, environments, and safety aspects of the system so that users can properly design and build payload equipment.

A general organization of the document is outlined below and should be used as a guideline only:

1. Introduction
2. Applicable Documents
3. General Description of the System
4. Accommodations/Resources/Capabilities
5. Interfaces (Mechanical, Electrical, Software, Fluids, Optical, etc.)
6. Support Equipment and Facilities
7. Operating Environments
8. Integration & Verification Requirements/Services
9. Training & Operations
10. Safety Requirements

Items that should be covered in this document within the outline include:

- Auxiliary equipment provided to the user (when applicable; e.g., facility-provided diagnostic subsystems, standard containers, shipping containers, ground terminals, etc.)
- General user design requirements and guidelines (e.g., materials constraints/controls, EMC specifications, environmental test guidelines, etc.)
- Required activities related to user integration and operation of the system (e.g., ground test and pre-launch operations, training requirements, flight operation guidelines post-flight operation guidelines, etc.)
- Services and accommodations provided to the user in support of the design, development, and utilization of the system (e.g., detailed documentation, access to existing hardware (simulators, engineering hardware, custom test equipment, trainers, on-site laboratory support and services, etc.)
- Guidance for user project planning (e.g., recommended schedule template for development, review, test and delivery of documentation, etc.)

This document should reference applicable detailed design requirements and point to the evolution of a negotiated, detailed interface document when applicable.

<b>Title:</b> Software Design Document	<b>DID No.:</b> D-06																						
<b>Reference:</b> GRC Software Development Manual; NASA-STD-2100-91 NASA Software Documentation Standard (NASA-DID-M00 through M700) NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards PM-03: Software Management and Development Plan PA-10: Software Assurance Plan																							
<b>Purpose:</b> This Software Design Document (SDD) is the top-level CSCI design document that describes the functional requirements, interface design, data requirements and architectural design of the system CSCI in sufficient detail to permit coding of the software.																							
<b>Related Documents:</b> R-02: Interface Definition Document and Interface Control Document R-04: Software Requirements Document																							
<b>Preparation Information:</b>  This document establishes the structure and organization of the systems Computer Software Configuration Item (CSCI); allocates the CSCI functions specified in the applicable Software Requirements Document and Interface Control Document to preliminary Computer Software Components (CSC) of the CSCI; and defines the internal and interface requirements of each CSC.  A general organization of the document is outlined below and should be used as a guideline only: <table border="0" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 40%;">A. Introduction</td> <td></td> </tr> <tr> <td>B. System Overview</td> <td>[Purpose of the system and the software]</td> </tr> <tr> <td>C. Applicable Documents</td> <td>[List of documents referenced in the document]</td> </tr> <tr> <td>D. Design Approach and Tradeoffs</td> <td>[Describes rationale for major decisions affecting the design]</td> </tr> <tr> <td>E. Design Model</td> <td>[Interaction Diagrams &amp; Coding notes related to compiler options &amp; problems]</td> </tr> <tr> <td>F. Computer Software Components</td> <td>[Subsection on each Computer Software Component]</td> </tr> <tr> <td>G. Cross Reference to Software Requirements Document</td> <td>[Table which traces each requirement into a specific CSC paragraph number in this document]</td> </tr> <tr> <td>H. Notes</td> <td></td> </tr> <tr> <td>I. Appendices</td> <td></td> </tr> <tr> <td>J. Glossary</td> <td>[Acronym list and definition of terms]</td> </tr> <tr> <td>K. Index</td> <td></td> </tr> </table> <p style="margin-top: 20px;">Preliminary version at PDR  Final (Code-To) version for CDR, update as required 60 days after CDR</p>		A. Introduction		B. System Overview	[Purpose of the system and the software]	C. Applicable Documents	[List of documents referenced in the document]	D. Design Approach and Tradeoffs	[Describes rationale for major decisions affecting the design]	E. Design Model	[Interaction Diagrams & Coding notes related to compiler options & problems]	F. Computer Software Components	[Subsection on each Computer Software Component]	G. Cross Reference to Software Requirements Document	[Table which traces each requirement into a specific CSC paragraph number in this document]	H. Notes		I. Appendices		J. Glossary	[Acronym list and definition of terms]	K. Index	
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<b>Title:</b> Safety-Critical Structures Data Package	<b>DID No.:</b> D-07
<b>Reference:</b> NSTS 1700.7 "For Payloads Using the Space Transportation System" NSTS 1700.7, ISS Addendum "Safety Policy and Requirements For Payloads Using the International Space Station" SSP 52005B "Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures" PA-02: System Safety Plan	
<b>Purpose:</b> This document presents the results of verification activities for Safety-Critical Structures to flight hardware safety requirements.	
<b>Related Documents:</b> PA-05: Safety-Compliance Data Package PA-06: Materials Identification and Usage List; Material Usage Agreement D-11: Fracture Control Summary Report	
<b>Preparation Information:</b> <p>The following provides a summary of the requirements on the content and organization of the Safety-Critical Structures Data Package. Specific requirements are found in SSP 52005B "Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures"</p> <ol style="list-style-type: none"> <li>1. <u>Introduction</u> - a brief description of structures/components being analyzed, load environments used for determining low frequency and random vibration loads, and the Factors of Safety used for analysis and test.</li> <li>2. <u>Reference list</u> - includes all references used in the report or identified in the body of the</li> <li>3. report.</li> <li>4. <u>Mass Properties</u> - weight, cg, mass moment of inertias used in the report shall be documented, including source and date (use control weights unless actual weights have been measured).</li> <li>5. <u>Materials List</u> - List the materials used in this data package and their material properties - modulus of elasticity (E), modulus of rigidity (G) or Poisson's Ratio (<math>\mu</math>), ultimate tensile strength of a material (F<sub>tu</sub>), yield tensile strength of a material (F<sub>ty</sub>), etc., include temperature effects if applicable. Also state the source of the property values listed.</li> <li>6. <u>Safety-Critical Structures List</u> - List all safety-critical structural elements, components, and assemblies, including attachment hardware. For each structural element, this list shall state the Part Number, quantity, material, minimum Margin of Safety, and the page number that contains the calculation of this Margin of Safety. Also indicate which structural elements are also designated as Fracture-Critical.</li> <li>7. <u>Structural Modeling Description</u> - This section shall discuss the load paths, boundary conditions and modeling philosophy. For Finite Element Models, this section shall describe the structural element representations, mass representation, constraints and releases in the model. 3-D views of the model shall be provided. Results of Rigid Body Mode checks shall also be presented.</li> <li>8. <u>Dynamic Analysis Results</u> - This section shall contain the frequencies and mode shape plots of all system modes in the range of interest. It shall also include FEM mass participation results or other analyses which support random vibration or acoustic load factor calculation.</li> <li>9. <u>Load Analysis Results</u> - Describe the loads used in the model and how/why they were chosen (i.e., location in STS, data source, mission phase, structural attachment, and test data).</li> <li>10. <u>Stress Analysis Results</u> - The results of a stress analysis and supporting test results shall be documented. The stress analysis shall be clearly presented such that a structural analyst not involved in the project would be able to understand it. The stress analysis should include the following:             <ol style="list-style-type: none"> <li>i. A sketch of each area being analyzed showing pertinent dimensions and structurally-important details. Drawing number references should also be included. Indicate if drawings are "as built" or "design."</li> <li>ii. A free-body diagram of the structural element being analyzed.</li> <li>iii. The source of the loads used.</li> </ol> </li> </ol>	

- iv. A list of the failure modes to be considered.
  - v. The calculations of Margins of Safety for each failure mode.
  - vi. The minimum Margin of Safety for the structural element or group of elements should be clearly marked.
  - vii. Each page of the analysis should be initialed and dated by both the analyst and the checker. 100% checking is required if the no-test approach is used.
11. Fracture Control Analysis Results – List the reference for the Fracture Control Summary Report.

<b>Title:</b> Fracture Control Summary Report	<b>DID No.:</b> D-08
<b>Reference:</b> SSP 52005B – ISS Payload Flight Equipment requirements and Guidelines for Safety Critical Structures. NASA-STD-5003 Fracture requirements for Payloads Using Space Shuttle FCF Fracture Control Plan – FCF-PLN-0030B PA-02: System Safety Plan PA-04: Fracture Control Plan	
<b>Purpose:</b> Documents the contractor's approach for fracture control analysis and helps the Government understand how the contractor will comply with fracture control safety requirements applicable in the <b>References</b> and <b>Related Documents</b> as listed above and below. This report shall be submitted to the responsible fracture control authority and payload safety review panel prior to the phase III payload safety review.	
<b>Related Documents:</b> NSTS 1700.7 ISS Addendum Safety Policy and Requirements for Payloads Using the International Space Station. NSTS-13830 Payload Safety Review and Data Submittal Requirements for Payloads Using the Space Shuttle – International Space Station. D-10: Safety-Critical Structures Data Package	
<b>Preparation Information:</b> <p>This document shall define the overall approach for meeting the fracture control requirements, listing of all fail-safe, fracture critical and low risk parts, stress analysis results and assumptions, methodology for performing crack propagation analysis, the use of nondestructive inspection and testing techniques, and the fracture control activities to be conducted during the various program phases. The acceptance Fracture Summary Report and data package should consist of as a minimum the following areas:</p> <ol style="list-style-type: none"> <li>a) List of all fail-safe, fracture critical and low risk parts</li> <li>b) Summary of structural stress analysis results of elastic stresses for which the maximum elastic stresses are used for crack growth analysis</li> <li>c) List of available fracture mechanics material and newly developed fracture mechanics properties used for crack growth analysis.</li> <li>d) Crack model selections and assumptions</li> <li>e) Nondestructive examination (NDE) and initial flaw size selections</li> <li>f) Identification of the cyclic loading conditions and assumptions</li> <li>g) Summary of crack growth/damage tolerance or test results including as a minimum, the summary of fracture analysis data</li> <li>h) Records of Non-Destructive Evaluation (NDE) inspection or proof test</li> <li>i) Waiver/Deviation Records (affecting integration, safety)</li> <li>j) Payload operations and maintenance on board the ISS</li> </ol> <p>This fracture control analysis summary report shall apply to all types of fracture phenomena including fatigue crack initiation, stress corrosion cracking, hydrogen embrittlement, and propagation of cracks due to cyclic or sustained loadings.</p>	

<b>Title:</b> Worst-Case Analysis	<b>DID No.:</b> D-09
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) – Section 7 PA-02: System Safety Plan	
<b>Purpose:</b> Worst-Case circuit design analysis is a design task that evaluates circuit designs to assure that components and circuits can support safety and mission critical functions when subjected to worst-case circuit parameter variations. Supports: (1) Safety and reliability of electrical circuits (2) overall system reliability (3) elimination of circuit overheating or fire.	
<b>Related Documents:</b> SSP 50431, Space Station Program Requirements for Payloads PA-08: Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL)	
<b>Preparation Information:</b>  Worst-Case Analysis General Method  Worst-Case Analysis has to be performed on all circuits that carry power or data signals that support safety and mission critical functions. The analysis considers the most sensitive design parameters that could be subject to variations and could degrade performance. The analysis should consider all circuit parameters set at worst case limits and worst case environmental stresses for the function or operation being evaluated. Depending on mission parameters and part selection methods, part parameter values typically include temperature, voltage, frequencies, part type and design, aging effects from the environment, variability from cumulative effects of radiation or variability due to manufacturing. The analysis should indicate if circuit performance can be maintained under worst case conditions.  Final Worst-Case Analysis should be completed by Phase III Safety Review	

<b>Title:</b> Parts-Stress Analysis	<b>DID No.:</b> D-10
<b>Reference:</b> Space Assurance Requirements and Guidelines (SARG) – Section 7 PA-02: System Safety Plan	
<b>Purpose:</b> Parts-Stress Analysis is a design task that evaluates electrical and mechanical parts to assure that the parts can operate at the most stressful values that result from specified performance and environmental requirements on the system design. Supports: (1) Deliberate design practice for Safety and reliability of all parts. (2) overall system reliability (3) elimination of part failures and increases operational life with minimal drifting of performance outputs.	
<b>Related Documents:</b> SSP 50431, Space Station Program Requirements for Payloads D-10: Safety-Critical Structures Data Package D-12: Worst-Case Analysis	
<b>Preparation Information:</b>  Parts-Stress Analysis General Method  Parts-Stress Analysis typically considers the different stresses, under which, a part (electrical or mechanical) has to be operate under. These are typically, but are not limited to, temperature, voltage, current, pressure, torque, speed, angular speed, mechanical stresses, power, vibration, shock, etc. Parts, depending upon their design, particular application, and environmentally induced stresses can withstand various types of stress (as a population) over some statistical distribution. In this analysis, it should be demonstrated that the parts are rated for the types and magnitudes of stress that will be encountered.  Analysis to be completed by CDR	

<b>Title:</b> Master Requirements and Verification Compliance Plan Master Requirements and Verification Compliance Matrix/Summary	<b>DID No.:</b> V-01
<b>Reference:</b> SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only) SSP-57011 Payload Verification Program Plan (ISS Only)	
<b>Purpose:</b> <p>The plan shall provide for overall hardware and software verification and requirements compliance for qualification and acceptance of the hardware and software. The plan should utilize block diagrams that outline the groups of verification activities to be performed and the sequence of testing. (The purpose of the plan is to determine if the appropriate tests/verifications will be performed and determine a ROM for the time (schedule), facilities and personnel required to perform the verifications/tests.) Software details should be included in the Software Verification &amp; Validation Plan (V-04), unless the contractor chooses to incorporate them in this plan.</p> <p>The matrix shall summarize all design requirements, including applicable science, payload/hardware interface, carrier, safety and environmental testing requirements. The requirements matrices shall document the derivation of requirements from their source, hardware and software compliance to the requirements, and the hardware/software capabilities to meet the requirements. The verification portion of the matrix shall document the method of verification and a summary of results (i.e. Pass, Fail, Inconclusive). The matrix shall also identify the test report where the detail results can be found. The document also notes any deficiencies between hardware/software capabilities and the science requirements. The document also records any waivers that are granted in cases where the hardware/software cannot meet the requirements and the rationale for granting the waivers. <u>Note: Individual test procedures will document each test in detail and the Master Requirements and Verification Compliance matrix will summarize results and tracking of requirements/performance.</u></p>	
<b>Related Documents:</b> R-01: System Requirements Document V-04: Software Verification & Validation Plan R-02: Interface Definition Document and Interface Control Document R-03: Payload Interface Agreement and Annexes D-03: Baseline System Description (Baseline Concept Description) (if applicable)	
<b>Preparation Information:</b> <p>The Master Requirements and Verification Compliance Plan/Matrix shall contain the external (science, carrier, operations, safety and quality) requirements, derived requirements, system requirements, subsystem, and component requirements for qualification and acceptance of the hardware and software. The plan should reflect a document outlining all applicable activities and the rationale for performing the test/analysis/inspection/demonstration or combination of these methods. The Master Requirements and Verification Compliance Plan (coupled with the matrix) should include as a minimum the following:</p> <ul style="list-style-type: none"> <li>• Derivation of all technology/program/science requirements to engineering (including software) requirements (System Requirements and Specification Documents should be used as a reference). The BSD (if applicable) can be referenced to show design implementation.</li> <li>• All verifications required for vehicle/carrier integration</li> <li>• Flight Payload/hardware to Vehicle/Carrier Attach Fitting Integration</li> <li>• Cleanliness, Control and Monitoring</li> <li>• All safety requirements</li> </ul> <p>For environmental testing portion of the Plan, the following should be included as a minimum:</p>	

- EMI/EMC/ESD Test (conducted and radiated)
- Vibration Test
- Acoustics Test
- Toxic Off-gassing
- Thermal Cycling Test
- Thermal Vacuum Test , if applicable
- Leak and Pressure Test, if applicable
- Corona Test, if applicable
- Thermal Balance Test (thermally map subsystems and verify performance and reliability).

For performance requirements portion of the Plan, the following should be included as a minimum:

- End-to-End Functional Tests, including commanding and communications
- Final Comprehensive Performance Tests and Acceptance Tests
- Mass Properties Measurements
- Optical and Mechanical Alignments

***Master Requirements and Verification Compliance Plan & Matrix***

Preliminary is required at PDR.

Final is required at CDR.

Revisions as required at VRR/TRR.

Status of verifications (summary) and "as run" environmental test procedures at PSR.

<b>Title:</b> Individual Item Verification Test/Demonstration Procedure	<b>DID No.:</b> V-02
<b>Reference:</b> SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only) SSP-57011 Payload Verification Program Plan (ISS Only)	
<b>Purpose:</b> For test and demonstration verification requirements found in the Master Requirements and Verification Compliance Plan/Matrix (V-01), provide detailed, step-by-step procedures to perform the verifications.	
<b>Related Documents:</b> Master Requirements and Verification Compliance Plan/Matrix (V-01) Individual Item Verification Report (V-03) Software Verification and Validation Plans (V-04)	
<b>Preparation Information:</b>  For each individual requirement identified in the Master Requirements and Verification Compliance Plan/Matrix (V-01) that is to be verified by test or demonstration, provide a detailed step-by-step procedure (set up much like a checklist) to accomplish the verification. Multiple requirements can be covered in one procedure. These step-by-step procedures shall be entirely consistent with the information in the standardized forms and table found in the Master Requirements and Verification Compliance Plan/Matrix (V-01). They shall be of a common format with the other Individual Item Verification Test/Demonstration Procedures (V-02). Each procedure shall include drawings, graphics, tables and other information that is applicable to conduct the verification and interpret the results. A given requirement may require two detailed plans -- one for pre-launch verification and one for on-orbit acceptance.  The procedures shall be written and structured to facilitate quality assurance surveillance activities during verification activities.	

<b>Title:</b> Individual Item Verification Report	<b>DID No.:</b> V-03
<b>Reference:</b> SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only) SSP-57011 Payload Verification Program Plan (ISS Only)	
<b>Purpose:</b> For verification requirements found in the Master Requirements and Verification Compliance Plan/Matrix (V-01) and per the related Individual Item Verification Test/Demonstration Procedure (V-02), document in detail the results of verification activities. Such data will be used to demonstrate compliance with applicable requirements.	
<b>Related Documents:</b> V-01: Master Requirements and Verification Compliance Plan/Matrix V-02: Individual Item Verification Test/Demonstration Procedure V-04: Software Verification and Validation Plans PA-05: Safety Compliance Data Package D-07: Safety-Critical Structures Data Package D-08: Fracture Control Summary Report	
<b>Preparation Information:</b> <p>Each Individual Item Verification Report shall describe the verification results and shall be prepared in a manner that relates each result to the requirement(s) being satisfied. The following information shall be included:</p> <ul style="list-style-type: none"> <li>• Verification objective(s) (including Requirement Number)</li> <li>• Description (as applicable) of: test setup; and/or analysis approach; and/or inspection technique/criteria</li> <li>• Identification of item(s) verified (name, part number, and serial number) as well as any differences from the flight configuration.</li> <li>• Copy of "as performed" procedure (e.g., could append "as performed" Individual Item Verification Test/Demonstration Procedure, V-02), if a test or demonstration.</li> <li>• Summary of appropriate Product Assurance Procedures (including calibration procedures) used.</li> <li>• Correlation of verification results with the requirements</li> <li>• Summary of deviations from nominal results, failures, difficulties, corrective actions, failure reports, and nonconformance reports.</li> <li>• Performance data, plots, pictures, and location of raw data and calibration curves as generated during the verification activity.</li> <li>• Conclusions and recommendations.</li> <li>• Signed approval by the Quality organization</li> </ul> <p>Verification Reports are due 45 days after completion of the test/analysis/inspection.</p>	

<b>Title:</b> Software Verification and Validation Plans	<b>DID No.:</b> V-04
<b>Reference:</b> IEEE-12207 Software Engineering Standards (where applicable) Software Engineering Institute Capability Maturity Model SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only) SSP-57011 Payload Verification Program Plan (ISS Only)	
<b>Purpose:</b> Provide identification of software interface and performance requirements along with descriptions of verification and validation methodologies that will be used to assure successful implementation.  This document(s) is a subset of the documents described in DID V-01 in scope, content, and level of detail. .  Note: Individual test procedures (DID V-02) will document each test in detail and the overall Verification and Validation matrix (DID V-01) will summarize results and tracking of requirements/performance.	
<b>Related Documents:</b> PA-10: Software Assurance Plan V-01: Master Requirements and Verification Compliance Plan, etc. V-02: Individual Item Verification Test/Demonstration Procedure V-03: Individual Item Verification Report	
<b>Preparation Information:</b>  Analysis, inspection, test, or a combination of those (and other software unique) methods shall be used to verify successful implementation of each relevant software requirement. All verifications shall be completed prior to launch of hardware or launch/upload of software. Some verifications may have to be repeated on-orbit and will be captured in the On Orbit Performance Acceptance Test Matrix/Plan and individual test procedures called out in DID V-07.  Preparation of the Software Verification and Validation Plan (V-04) documents shall be in accordance with the applicable standards and in accordance with the software development process being used. To the extent possible, the software verification and validation documents should maintain a similar appearance and format to DID V-01, as applicable. At the option of the contractor, software verification and validation plans may be folded into the V-01 documents because verification may often involve interaction of both hardware and software.  Preliminary is required for PDR Final is required for CDR Revisions as required for VRR/TRR Status of verifications (summary) and "as run" test procedures at SAR, FRR and PSR.	

<b>Title:</b> Integration/Acceptance Data Package (Certificate of Flight Readiness)	<b>DID No.:</b> V-05
<b>Reference:</b> GRC Product Assurance Manual (PAI #332) SSP 52054 - ISSP Payloads Certification of Flight Readiness Implementation Plan, Generic (ISS Only) Space Assurance Requirements and Guidelines (SARG) - Section 8	
<b>Purpose:</b> Describes the deliverables required for submittal to the Government to certify that the delivered system (including hardware, software, ground equipment, and other items comprising the system) is fully suitable for its intended mission, will perform as required, and is ready for Government acceptance. The acceptance data package shall meet the requirements to obtain COFR for the flight payload. Government review and approval of all deliverables described in the plan should lead to formal, final Government acceptance of the system.	
<b>Related Documents:</b> V-01: Master Requirements and Verification Compliance Plan, etc V-02: Individual Item Verification Test/Demonstration Procedure V-03: Individual Item Verification Report V-04: Software Verification and Validation Plan V-06: As Built Configured Item List	
<b>Preparation Information:</b> The Acceptance Data Package should consist of the following pertaining to the hardware history: <ul style="list-style-type: none"> <li>a) Index Page: identifies deliverable item name, type of hardware, content of package, and appropriate deliverable data package approval signatures and date</li> <li>b) DD250/1149 (or other recognized government shipping document)</li> <li>c) Component/Equipment Historical Logs for Limited Operating/Age Sensitive Items</li> <li>d) Identification of the As-Built Configuration</li> <li>e) Waiver/Deviation Records (affecting integration, safety)</li> <li>f) Failure Reports/Corrective Action Record/Unexplained Anomalies</li> <li>g) Maintenance Instructions</li> <li>h) Verification Test Reports identified as Acceptance Criteria activities in the Verification Plans</li> <li>i) Unplanned/Deferred Work (exception basis only)</li> <li>j) Cleanliness Certification</li> <li>k) <b>Developer Certification</b></li> <li>l) Open Items from Phase III Ground Safety Review</li> <li>m) MSDS – Material Safety Data Sheets</li> <li>n) Pressure Vessel data</li> <li>o) Program Listing (software)</li> <li>p) Version Description Document (software)</li> <li>q) User's Guide or System Operating Manual (software)</li> </ul> <p>ISS Payloads shall meet the requirements of SSP-52054, "ISSP Payloads Certification of Flight Readiness Implementation Plan, Generic." All other payloads shall meet the specific COFR requirements of the carrier.</p>	

<b>Title:</b> As Built Configured Item List	<b>DID No.:</b> V-06
<b>Reference:</b> GRC Product Assurance Manual (PAI #420, #450) Space Assurance Requirements and Guidelines (SARG) – Section 7 & 8 GRC Microgravity Science Division Operating Instruction, OP-6700-4 SSP 41170 - ISSP Configuration Management Requirements PA-01: Product Assurance Plan PM-04: Configuration Management Plan	
<b>Purpose:</b> To document the component items that make up the delivered assemblies and provide traceability to EEE parts used in flight hardware. The document shall be used to (1) determine if a latent problem is in the payload/hardware as discovered elsewhere in the industry, (2) to help evaluate on-orbit issues should any arise, and (3) to review against the GIDEP failure experience data and NASA parts advisories and provide traceability to EEE parts lot data codes needed for GIDEP review.	
<b>Related Documents:</b> D-03: Baseline System Description D-04: Product Drawings	
<b>Preparation Information:</b> As Built Configured List shall be prepared, maintained, and updated by the developer in accordance with the developer's configuration control system and shall include an EEE Parts Identification List in compliance with SARG and MSD OI EEE Parts Policy. The As Built Configured Lists shall be prepared for the space flight delivered hardware such as, Trainers, Qualification Units and all Flight Systems, as appropriate. The subject list should include all of the electrical and mechanical parts contained in the payload and provide the following information for each item as a minimum: <ul style="list-style-type: none"> <li>• Name/Nomenclature</li> <li>• Manufacturer</li> <li>• Item number</li> <li>• Serial number</li> <li>• Quantity</li> <li>• As built drawing number, including latest revision letter and change notice</li> <li>• Software Identification and version</li> <li>• Location in the system</li> <li>• Note any approved deviations or waivers affecting the installed configuration item</li> </ul> Final: PSR	

<b>Title:</b> On Orbit Performance Acceptance Test Matrix/Plan Individual On Orbit Performance Acceptance Test Procedures	<b>DID No.:</b> V-07
<b>Reference:</b> PA-01: Product Assurance Plan R-01: System Requirements Document SSP 41172 – ISSP Qualification and Acceptance Environmental Test Requirements	
<b>Purpose:</b> Describes how the delivered system (including hardware, software, ground operations support equipment, operational procedures, and other items comprising the system) is fully suitable for its intended mission and will meet its performance acceptance criteria. Successful completion of the on orbit activities described in the test matrix/plan should lead to formal, final Government acceptance of the system. The plan should utilize block diagrams that outline the groups of tests to be performed, the sequence of testing and the required flight and flight support equipment required. The plan should also reference what (The purpose of the plan is to determine if the appropriate tests/verifications will be performed and determine a ROM for the on orbit time (schedule), and crew time required to perform the verifications/tests.) Individual On Orbit Performance Acceptance Test Procedures will document each test in detail.	
<b>Related Documents:</b> V-01: Master Requirements and Verification Compliance Plan	
<b>Preparation Information:</b> <p>The On Orbit Performance Acceptance Test Plan/Matrix shall describe how the contractor will use on orbit operational tests and special tests to confirm that the deployed system is fully suitable for its intended mission and will meet its performance criteria and is fully operational. The On Orbit Performance Test Matrix/Plan shall describe the specific tests to be performed upon deployment on the flight vehicle/carrier (such as ISS or FCF) and the initial integration/operations. Emphasis shall be given to verification of requirements that are difficult/inconclusive to verify via ground tests or analysis, and validation that the system is operational. The on orbit test matrix/plan shall include as a minimum the following:</p> <ol style="list-style-type: none"> <li>1. Operational testing with the initial (for series hardware) on-orbit component(s) to validate overall performance             <ol style="list-style-type: none"> <li>a. Interface testing with vehicle/carrier (such as ISS or FCF) – (operational, mechanical, electrical and software) which should include test scenarios on commanding, data handling, downlinking and operations at the Glenn Telescience Center (if applicable)</li> <li>b. If deemed necessary, flight support equipment (such as a calibration component) may be employed to further validate performance requirements that may not be tested during the initial science test points</li> </ol> </li> <li>2. Testing to validate microgravity disturbance levels generated by the system and subsystems.             <ol style="list-style-type: none"> <li>a. Testing to verify overall microgravity level experienced at the science phenomenon</li> </ol> </li> <li>3. Testing to validate thermal performance (thermally map subsystems and demonstrate performance).</li> <li>4. Testing for power quality and performance of subsystems</li> <li>5. Any additional on orbit testing that is required for acceptance</li> </ol> <p>Note: These tests should be a subset of tests (with on orbit environment taken into account documented for pre-flight Verification Plan (V-01)). These tests should be ordered to minimize risk to components (i.e. perform tests at system level first and gradually add components.)</p> <p><b>On Orbit Performance Acceptance Test Matrix/Plan</b>  <u>Draft</u> is required at PDR.  <u>Preliminary</u> is required at CDR.  <u>Final</u> is required at VRR/TRR.          Results of ground tests (refer to V-01) shall be presented at FRR/PSR along with revisions to plan based on results of ground tests</p>	

***Individual On Orbit Performance Acceptance Test Procedures***

Preliminary Plans are required at VRR/TRR.

Final procedures are required at FRR/PSR.

Update Procedures as required prior to launch.

***Final Disposition***

At the Acceptance Review a summary of all the On Orbit performance data (as run On Orbit Acceptance Test Procedures) shall be presented and the Government shall make a final disposition within 60 days of the Acceptance Review.

<b>Title:</b> Integrated Logistics Support (ILS) Implementation Plan	<b>DID No.:</b> OP-01
<b>Reference:</b> NHB 6000.1D Requirements for Packaging, Handling, and Transportation for Space Systems NMI 5350.1A Maintainability and Maintenance Planning Policy SSP 50018 Space Station Packaging and Configuration Requirements MIL-STD-1388-1A Logistics Support Analysis SSP 50277 Payload ILS Guidelines SSP 50431	
<b>Purpose:</b> Document establishes the processes and specific plans for implementation of the ILS activities during development, testing, and operational phases. It is intended to be a blueprint for the logistics infrastructure needed to support operations and the transfer of logistics responsibilities among Contract Exhibits.	
<b>Related Documents:</b> OP-04: Launch Site Operations and Test Procedures PA-01: Product Assurance Plan PA-08: Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL) PA-13: Reliability Reports PA-14: Limited Life Items List PA-15: System Maintainability/Availability Analysis R-01: System Requirements Document	
<b>Preparation Information:</b> <p>The data provided in the plan should address the following activities as a minimum with a schedule for accomplishment of key tasks that meet project milestones:</p> <ul style="list-style-type: none"> <li>A. Logistics Analysis - For preliminary document, develop summary of logistics needs. For final document, develop detailed implementation plan, describing the logistics actions needed to transport spares (up and down) and provide temporary on-orbit storage per the maintenance requirements of a project.</li> <li>B. Maintenance/Maintainability – describe the details of on-orbit and ground maintenance actions required and maintainability requirements and processes that ensure proper maintainability in the design.</li> <li>C. Supply Support - describe the approach for the provisioning, procurement, inventory, warehousing and distribution of all spare and repair parts. Develop database for tracking actual lists of spares, location, and configuration, available upon onset of project operations.</li> <li>D. Packaging, Handling, Storage &amp; Transportation - describe all of the processes and special provisions necessary to support packaging, preservation, environmental controls and monitoring equipment, storage, handling, and transportation of flight hardware and support equipment, including spares and repair parts.</li> <li>E. Logistic Support Facilities and Equipment - describe all of the processes required for the identification and acquisition of all Ground, Flight, and Orbital Support Equipment and facilities required to support on-orbit and ground functions.</li> <li>F. Expected Roles and Responsibilities</li> <li>G. Technical data and documentation</li> <li>H. Logistics Management Responsibility Transfer – between Contract Exhibits</li> <li>I. Contractor Logistics Support (CLS) – post launch responsibilities</li> </ul> <p>Preliminary: for CDR          Final: for PSR</p>	

<b>Title:</b> Operator's Manual	<b>DID No.:</b> OP-02
<b>Reference:</b> OP-03: Operations Plan	
<b>Purpose:</b> The Operator's manual is an instruction and reference manual for the hardware and software user to initiate, operates, configure, maintain, calibrate, and monitor equipment.	
<b>Related Documents:</b> OP-08: TSC Training Manual	
<b>Preparation Information:</b> Operator's Manual contents: <ul style="list-style-type: none"> <li>A. Overview of the equipment in terms of its functions, initialization, maintenance, calibration, shutdown, and restart procedures that includes operation of all equipment subsystems.</li> <li>B. Operation procedures and generic information such as Cadre ID, voice loop definition, phone numbers, pages, call signs and description of operations staff functions.</li> <li>C. Overview of equipment interfaces to other equipment.</li> <li>D. Description of overall function of the hardware and software along with relevant information, including all options, restrictions, and limitations.</li> <li>E. Step-by-step procedures for performing set-up, initialization, maintenance, calibration, operation, shutdown, restart, tear down, and replacement of the software and hardware.</li> <li>F. Description of any unique factors associated with the operation of the equipment.</li> <li>G. Description of inputs, including user inputs and pertinent system inputs. User inputs shall be described in terms of commands, data, and options. System inputs include inputs that may effect the user's utilization of the equipment.</li> <li>H. Description of subsystem outputs, including their destination information.</li> <li>I. Unique system logistics, software, software maintenance, and sustaining engineering required for sustained equipment operations.</li> <li>J. Contingency scenarios and procedures that includes step-by-step shut-down procedures for both normal and abnormal shut-down of a function.</li> <li>K. Error messages and corrective actions to be taken by the operator.</li> <li>L. Redundancy management.</li> <li>M. State of health monitoring, tracking, and tie to pertinent maintenance procedures.</li> <li>N. Listing of operations limits, cautions, and constraints, and corrective actions to be taken by operator.</li> </ul>	

<b>Title:</b> Operations Plan	<b>DID No.:</b> OP-03
<b>Reference:</b> NPG 7120.5A, NASA Program and Project Management Processes and Requirements	
<b>Purpose:</b> To describe the plan for supporting the flight operations of the payload or facility on the International Space Station or Shuttle. Also included is the method to provide anomaly resolution support during the mission.	
<b>Related Documents:</b> PM-06: Contractor Delivery Order Work Plan	
<b>Preparation Information:</b>  Operations Plan contents:  A. Description of roles and responsibilities and plans to support the operations of the payload.  B. Description and designation of any ground systems and responsibilities needed for payload operations. Include a discussion on how they will be supplied, maintained and operated.  C. Description of overall management approach, work breakdown structure, configuration management approach, and training approach  D. Plan for anomaly identification, investigation, and resolution process.  E. Plan for periodic performance assessments to determine payload viability.  F. Description of complement of skills needed to provide required support and method utilized by the Contractor to provide these resources.  G. Description of ISS resources required during the operations and timeline for usage.	

<b>Title:</b> Launch Site Operations and Test Procedures	<b>DID No.:</b> OP-04
<b>Reference:</b> Launch Vehicle Payload Planner's Guides as applicable	
<b>Purpose:</b> (1) To provide a detailed understanding of the launch site activities, operations and testing planned for a particular mission, (2) to define the launch site support requirements and (3) to obtain launch site procedure approvals.	
<b>Related Documents:</b> OP-01: Integrated Logistics Support Plan	
<b>Preparation Information:</b>  Describe all aspects of the activities at the launch site beginning with arrival of the payload, including final testing and preparations, 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 the applicable launch site "test and inspection plans" requirements and the "ground operations plan" requirements.  The plan shall include as a minimum: <ul style="list-style-type: none"> <li>A. Description of proposed sequence of ground processing operations</li> <li>B. Description of proposed facilities, ground support equipment, and personnel required</li> <li>C. Equipment placement and personnel area requirements</li> <li>D. Specific operations, procedures, and instructions to integrate, test, and check out the payload</li> <li>E. Summary of types of inspection and verification procedures</li> <li>F. Explanation of schedule and personnel contingency methods</li> <li>G. Description of roles and responsibilities</li> <li>H. Summary of specific safety, security, reliability and quality assurance procedures for pre-launch processing including any special requirements for hazardous systems</li> <li>I. Description of cleanliness methods, purge gasses and lines, and garments</li> <li>J. Description of any specific communication links needed between locations at the launch site to perform testing and to support the payload on the launch vehicle up to the point of launch.</li> <li>K. Description of processing operations required for post-landing</li> </ul>	

<b>Title:</b> Data Delivery Plan	<b>DID No.:</b> OP-05
<b>Reference:</b>	
<b>Purpose:</b> To define the activities, methods, and schedule for obtaining, processing, evaluating the data integrity, archiving, and delivering the science and hardware performance data.	
<b>Related Documents:</b> OP-02: Operator's Manual	
<b>Preparation Information:</b>  This plan shall describe and define all aspects of the science mission evaluation and data management requirements that include real-time requirements and the off-line activities.  Suggested content consists of: <ul style="list-style-type: none"> <li>A. Introduction</li> <li>B. Mission Description and Objectives</li> <li>C. Facility Overviews - Describe experiment hardware and data gathering equipment</li> <li>D. End-to-End Operational Data Flow - Describe the on-board and ground data flow that will be used during the mission.</li> <li>E. Post Mission Data Processing - Describe the post mission data processing to be performed, where the processing will be performed, and when those data products are to be delivered.</li> <li>F. Archives - Define the data archives that will be used, data to be archived, length of time the data will be stored.</li> <li>G. Experiment/Carrier Relationship</li> <li>H. Roles &amp; Responsibility</li> </ul>	

<b>Title:</b> TSC Security Plan	<b>DID No.:</b> OP-06
<b>Reference:</b> NMI 1600.2a, NASA Security Program	
<b>Purpose:</b> To provide security management planning and processes for the TSC facility and infrastructure (computers, network, etc.)	
<b>Related Documents:</b> CD-04: Automated Information Security Plan	
<b>Preparation Information:</b>  Suggested contents (but not limited to):  A. Roles and responsibilities of key personnel B. Information security controls C. Incident response D. Awareness training E. Facility access control F. Computer access control G. Foreign national security H. Personnel security controls I. Intrusion detection J. Visitor policy	

<b>Title:</b> Procedures	<b>DID No.:</b> OP-07
<b>Reference:</b> OP-02: Operator's Manual	
<b>Purpose:</b> To provide the user a detailed understanding of the operation of the equipment. Operation may include maintenance, calibration, set-up, initialization, changeout, shut-down, restart, tear-down, nominal and off-nominal situations.	
<b>Related Documents:</b>	
<b>Preparation Information:</b> Describe all aspects of the activities necessary to operate a particular piece of equipment. The procedure shall include as a minimum: <ul style="list-style-type: none"> <li>A. Purpose of the procedure.</li> <li>B. Description of participants and their roles and responsibilities involved in the procedure.</li> <li>C. Description of proposed facilities, tools, and other support equipment, as well as material and parts with identification specifications, required to complete the procedure.</li> <li>D. Referenced documentation.</li> <li>E. List of Pre-requisite procedures to have been completed, prior to the start of the procedure.</li> <li>F. Equipment configuration information, (both subject equipment and any interface equipment necessary) including the pre-requisite initial state of equipment.</li> <li>G. Step-by-step instructions to complete the procedure, including interim and final configuration drawings, when appropriate.</li> <li>H. Expected feedback or response of the equipment after each step of the procedure.</li> <li>I. Summary of specific safety, security, reliability and quality assurance requirements, as related to the subject procedure.</li> <li>J. Description of end-state of equipment at the conclusion of the procedure.</li> </ul>	

<b>Title:</b> Training and Certification Plan	<b>DID No.:</b> OP-08
<b>Reference:</b> JSC-36307 NASA Training Implementation Plan SSP 50200-07 Station Program Implementation Plan, Volume 7: Training SSP 41184-01 Multilateral Training Management Plan, Volume 1 SSP 41184-02 Multilateral Training Management Plan, Volume 2	
<b>Purpose:</b> To provide a comprehensive approach to training and certification of all personnel, both on-orbit and on the ground, required to operate and/or physical integration of a system.	
<b>Related Documents:</b>	
<b>Preparation Information:</b> Describe an approach, which will address all aspects of the training necessary to integrate and operate a system. The plan shall include as a minimum: <ul style="list-style-type: none"> <li>A. Description of participants involved in the training, and their roles and responsibilities.</li> <li>B. List of types of training to be conducted, including traditional classroom, computer-based training, on-the-job, simulations, etc., and what criteria will be used to select a particular method.</li> <li>C. Description of proposed facilities, tools, and other support equipment, as well as materials and documentation required to implement the training.</li> <li>D. Description of the certification process (i.e. test administration, attendance, self-test, etc.).</li> <li>E. Description of training flow, including any hierarchical relationships.</li> <li>F. Listing of the detailed training curriculum.</li> <li>G. Detailed discussion of the processes and activities, which will be performed to plan, develop, implement, administer, and track the training and certification requirements.</li> <li>H. Describe the recertification process, if one exists.</li> </ul>	

<b>Title:</b> Firmware Support Manual	<b>DID No.:</b> OP-09
<b>Reference:</b> NASA-STD-2100-91 NASA Software Documentation Standard (NASA-DID-P410)	
<b>Purpose:</b> To provide an instruction and reference for the firmware/software programmer to program, support, maintain, and monitor firmware that is part of the software.	
<b>Related Documents:</b> PM-04: Configuration Management Plan PA-11: Software Assurance Plan	
<b>Preparation Information:</b> <p>The Firmware Support Manual describes the ROM devices and support equipment and software required for reprogramming. It does not need to provide information regarding the design and implementation within the device. That information is contained in the Software Detailed Design document.</p> <p>This manual shall minimum contains:</p> <ol style="list-style-type: none"> <li>1. Introduction and purpose</li> <li>2. Devices (Physical description, Installation and Replacement, Limitation)</li> <li>3. Programming Tools (Equipment, Software package, Programming Procedures)</li> <li>4. Safety and Security Implication.</li> </ol> <p>Due at ADP</p>	

<b>Title:</b> Decommission Plan	<b>DID No.:</b> OP-10
<b>Reference:</b> TBD	
<b>Purpose:</b> Define the end-of-life for the hardware and associated documentation. The plan should also define the archiving of the data and final reports required.	
<b>Related Documents:</b>	
<b>Preparation Information:</b>  TBD	

<b>Title:</b> Concept of Operations Document	<b>DID No.:</b> OP-11
<b>Reference:</b> TBD	
<b>Purpose:</b> To define an operations concept for the project that describes the flight and ground operations.	
<b>Related Documents:</b> OP-03: Operations Plan	
<b>Preparation Information:</b>  This document identifies the operational scenarios that apply to project.  Suggested content includes:  A. Introduction B. Reference documents C. Document organization D. Pre-increment support scenarios beginning with requirements definition and ending with operational certification E. Increment support scenarios during operations start-up, nominal operations, and off-nominal operations F. Post-increment scenarios for systems deactivation and reconfiguration to support future operations G. Acronym list H. Glossary of terms	