Space Flight Systems Development and Operations Contract III (SpaceDOC III)

Contract Data Requirements List (CDRL)

January 6, 2022

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
Draft	**Draft CDRL for SpaceDOC III**	**1/6/23**

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 Description (DID) included herein and listed on the Contract Data Requirements List (CDRL) for each item of data requested as a deliverable in the Base Order (BO) /Delivery Order (DO). DIDs that are identified as Contract Level (noted in ALL CAPS) will be required to be delivered as part of the proposal and/or shortly after contract award. DIDs that are not contract level and not called out in a specific Base Order/Delivery Order Statement of Work will not be required.

c) All data shall be prepared, maintained, and delivered to NASA in accordance with the requirements of this document.

1.2 Contract Data Requirements List (CDRL)

The CDRL provides a complete listing of the data requirements of the contract. The CDRL contains the following:

a) 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.

2. Code A [Approval]: The initial submission and all subsequent 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 immediately made available for information upon request or during surveillance activities.

Base Order/Delivery Order instructions may supersede these approval codes with COR approval.

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 cases, the contractor shall propose the standard to be used that meets the DID 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, the contractor shall indicate how they 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 III
Configuration Management Office
(E-mail address to be supplied)

For BO/DO level DID's, copies of the transmittal letter, deliverable document signature pages, and electronic copy of the entire document shall be provided to:

NASA Project Manager
(Address and e-mail address to be supplied with the BO/DO)

For BO/DO level DID's, copies of the transmittal letter only, without the enclosures shall be provided to CO and COR at the emails below. For the contract level DID's, an electronic copy of the entire document shall be provided to CO and COR at the emails below:

SpaceDOC III Contracting Officer Paige E. Foreman
Paige.E.Foreman@nasa.gov

SpaceDOC III Contracting Officer Representative (COR)
(Address and e-mail address to be supplied with the BO/DO)

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 electronically 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.

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) Electronic Data Delivery - Formats for electronic media delivery are defined in paragraph 1.5 of this document.

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 has 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 COR or the applicable NASA Project Manager, unless otherwise specified in the BO/DO 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, "Accepted by". 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 COR or the applicable NASA Project Manager, unless otherwise specified in the BO/DO instructions.

   3. Information (I) and Surveillance (S) documentation deliverables do not require NASA format or NASA approval.

   4. Non-DID Items are documentation deliverables not identified in the CDRL but are called out in an individual BO/DO 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 BO/DO 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 and TBRs are acceptable where data is not yet available. Whenever possible, TBRs should include a "bracketed" value that reflects the best current thinking for a particular value or approach. Example: TBR [120 C]. A table of TBDs and TBRs with expected closure date will be included in an appendix of the document

   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. Baselined: 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 original 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. When data necessitates the use of Hard Copy media, the data shall be scanned from the original at a resolution to convey the same detail as the original and delivered to NASA as electronic media in Portable Document Format (PDF) file format. Scanned Electronic media showing actual signatures may be used in lieu of electronic signatures.

2. Electronic - Data that is generated into a software application and can be stored in 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 Adobe Acrobat PDF reader or any Microsoft Office 365 product format or later. Microsoft Project 2016 or later.
2. Drawing formats are defined in the appropriate DID.

c) Any unique documentation delivery instructions shall be specified in the BO/DO. Additionally, all BO/DO and CDRL data shall be delivered via electronic transfer into the Government's electronic storage drop box.

1.6 Documentation Change Procedures

The contractor shall issue Documentation Change Notices (DCNs) whenever changes or updates occur in final versions of data items that have been delivered to NASA.

a) Change tracking shall be used to indicate changes or updates when the document needs to be reviewed again by NASA.

b) When major 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.

c) 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 DIDs 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 BO/DO manager, they 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 DIDs 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 BO/DO 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 BO/DO request. Additionally, any documents specified in the 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.

Accepted forms of signature are defined as a traditional signature (electronic or ink) or an e-mail from the signatory stating approval of the document. The e-mail shall be attached to the document.

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 1.4.2. 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 COR will provide (in writing or other agreed to process with the Contractor) to the Contractor whether the documents are "Approved", "Disapproved", or "Approved with modifications".

b) Government approvals of Draft and Preliminary documents with an NDA or an approval code will 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 with modifications”, rationale for rejection or conditional acceptance is provided to the Contractor, who shall have thirty (30) calendar days, 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 with modifications," 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.

f) In the event that after 30 days no response is received from the Government, a delinquent document or data report will be generated and sent to the COR. The COR will provide in writing to the Contractor whether the documents or data are “Approved”, “Disapproved”, or “Approved with modifications”. If no response is received after thirty (30) calendar days of submitting the report, the Contractor may consider the document approved.

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 BO/DO 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 above.

1.7.3 Non-Deliverable Document Requirements

The development of space flight hardware requires certification of the hardware in meeting the numerous requirements (quality, safety, materials, etc.). Some of the documentation that is obtained in the build process must be retained (electronic or physical) to support final certification of the hardware for flight (Acceptance Data Packages (ADPs), Verification Reports, Certification of Flight Readiness (CoFR) Documentation). The documentation is not delivered to the Government in a DID however, the documentation, such as material certifications, inspection reports, vendor certifications, etc. shall be retained by the contractor and made available to the Government by request.

Best practices shall be used to allow for ease of obtaining these records in a timely manner when necessary, such as an audit or failure investigation.

CONTRACT DATA REQUIREMENTS LIST		
DID #	**Title** *	**Submission NDA/A/I/S**
CONTRACTUAL DATA		
CD-01	CONTRACTOR FINANCIAL MANAGEMENT REPORTING	A
CD-02	TECHNICAL REPORTING AND MANAGEMENT REVIEWS	I
CD-03	INFORMATION TECHNOLOGY SYSTEM SECURITY PLAN	A
CD-04	INFORMATION TECHNOLOGY SECURITY MANAGEMENT PLAN	A
PROGRAM MANAGEMENT		
PM-01	SPACEDOC III MANAGEMENT PLAN	A
PM-02	RISK MANAGEMENT PLAN	A
PM-03	Software Management and Development Plan	A
PM-04	CONFIGURATION AND DATA MANAGEMENT PLAN	A
PM-05	Engineering Change Proposals (ECPs)	A
PM-06	Contractor Base Order / Delivery Order Work Plan	A
PM-07	Software Maintenance Plan	A
PM-08	Software Version Description Document	A
PM-09	SYSTEMS ENGINEERING MANAGEMENT PLAN	A
PM-10	Waivers and Deviations	A
PM-11	ORGANIZATIONAL CONFLICTS OF INTEREST (OCI) PLAN	A
PRODUCT ASSURANCE		
PA-01	SAFETY AND MISSION 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 Data Package	A
PA-06	Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	A
PA-07	Problem Report and Corrective Action (PRACA) Plan	A
PA-08	Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	I
PA-09	Contamination/Cleanliness Control Plan	S
PA-10	Software Assurance Plan and Metrics	A
PA-11	SAFETY AND HEALTH PLAN	A
PA-12	Nonconformance 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
PA-17	Lessons Learned Report	I
PA-18	Probabilistic Risk Assessment (PRA) Report(s)	I
REQUIREMENTS		
R-01	System Requirements Document	NDA
R-02	Interface Requirements Document (IRD)	NDA
R-03	Payload Interface Agreement (PIA) Main Volume, Addendums and Data Sets	A
R-04	Software Requirements Document	NDA
R-05	Software Interface Design Document	A
R-06	Interface Control Document & Interface Definition Document	NDA

* Contract Level Documents are identified in UPPER CASE lettering.

CONTRACT DATA REQUIREMENTS LIST		
DID #	Title*	Submission NDA/A/I/S
DESIGN		
D-01	Review Presentation Package	I
D-02	Engineering Trade and Analysis Data	S
D-03	Baseline System Description (Baseline Concept Description)	A
D-04	Product Drawings	I
D-05	Accommodations Handbook	A
D-06	Software Design Description	A
D-07	Safety-Critical Structures Data Package	A
D-08	Fracture Control Summary Report	A
D-09	Parts-Stress Analysis	I
VERIFICATION		
V-01	Master Requirements and Verification Compliance Plan Master Requirements and Verification Compliance Matrix/Summary	A
V-02	Individual Item Verification Test/Demonstration Procedure	I
V-03	Individual Item Verification Report	A
V-04	Software Verification and Validation Plan	I
V-05	Acceptance Data Package (ADP)	A
V-06	As Built Configured Item List	I
V-07	On-orbit Performance Acceptance Test Matrix/Plan Individual On Orbit Performance Acceptance Test Procedures	A
V-08	SIMULATION SOFTWARE VERIFICATION AND VALIDATION PLAN	A
OPERATIONS		
OP-01	Integrated Logistics Support Plan (ILSP)	A
OP-02	Operations Handbook	A
OP-03	Mission Operations Plan	A
OP-04	Launch Site Operations and Test Procedures	I
OP-05	Science and Engineering Data Management Plan	A
OP-06	Procedures	I
OP-07	Training and Certification Plan	A
OP-08	Decommissioning/Disposal Plan	A
OP-09	Operations Concept	A

* Contract Level Documents are identified in UPPER CASE lettering.

Title: CONTRACTOR FINANCIAL MANAGEMENT REPORTING	**DID No :** CD-01

Reference:

- NFS 1852.242-73 NASA Contractor Financial Management Reporting
- NPR 9501.2E NASA Contractor Financial Management Reporting
- GRC 52.242-96 NASA CONTRACTOR FINANCIAL MANAGEMENT REPORTING – SUPPLEMENTAL REQUIREMENTS (JUN 2021)

Purpose:

To provide monthly data necessary for reporting costs, projecting costs, evaluation of Contractor cost and fee data and planning, monitoring, and controlling project resources.

Related Documents:

- CD-02 Technical Reporting and Management Reviews

Preparation Information:

The report shall be in accordance with the NFS 1852.242-73 entitled "NASA Financial Management Reporting (NASA Form 533 reports) as supplemented by GRC 52.242-96 NASA Contractor Financial Management Reporting and NPR 9501.2E entitled "NASA Contractor Financial Management Reporting. NPR 9501.2E provides basic requirements and instructions to assist in the preparation of Contractor Financial Management Reports (NASA Form 533 reports). NPR 9501.2E may be accessed through the NODIS Library at http://nodis3.gsfc.nasa.gov/

533 reporting is required at the Base/Delivery Order level and summarized at the CLIN 0001-0014 and contract levels.

533M reporting:

1. The Contractor 533 reporting structure for each individual Base/Delivery Order and for CLINs 0001-0014 and contract level summaries shall be in accordance with GRC 52.242-96 entitled NASA Contractor Financial Management Reporting – Supplemental Requirements. Variance reporting is as follows:

VARIANCE REPORTING REQUIREMENTS

Title of Variance	Definition	Threshold +/-
Actual vs. Estimated Cost	Any variance at the total contract level between a previous estimated month-specific expenditure and the actual expenditure reported for the same month. For example: The March 533M reported an estimated total contract expenditure for April of $100K, and subsequent April 533M reported actual total contract costs of $88K, which is a variance of 12%	10%
Actual vs. Planned to Date	Any variance at the total contract level between the planned cost to date and the actual cost to date	The lesser of 10% or $100K
Contractor Final Estimate vs. Contract Value	Any variance at the total contract level between the contractor's current final cost estimate and the current contract value.	The lesser of 5% or $100K
	(Additional variance reporting requirements may be added at the discretion of the Contracting Officer)	

2. The Contractor 533 reporting structure shall include 1) a summary at the contract level, 2) a summary at the CLIN level and 3) individual reports for each Base/Delivery Order issued. Base/Delivery Order reports shall be consistent with each Base/Delivery Order WBS and Base/Delivery Order schedule. Base/Delivery Order reports do not need boxes 3, 4, 5 and 9b to be completed on the 533. At the initiation of each Base/Delivery Order, the Contractor and Government shall meet to establish the detail of 533 reporting that will be required by the Government.

3. For the CLIN 0001 and 0014 summary level reports, the FFP orders can be reported as a single row.

FOR BASE AND DELIVERY ORDER SCHEDULE VARIANCES: Milestone variances of +/- 2 months shall be assessed and reported monthly.

The Contractor shall continue to maintain the following requirements:

1. Unfilled Orders Outstanding for Base Orders and Delivery Orders
   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. 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 Base/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 Base/ 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 Base/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 Base/Delivery Order change log shall also be provided on a monthly basis.

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

Due: The due date for the 533 Monthly and 533 Quarterly reports shall be the earlier of:
(A) 10 working days following the close of the contractor accounting period for the 533 Monthly report (or)
(B) 5 working days following the issuance of any voucher or invoice for contract operations cost reimbursement or Fee for the invoice service period that coincides or corresponds to the accounting period for the 533 Monthly report.

Title: TECHNICAL REPORTING AND MANAGEMENT REVIEWS	**DID No.:** CD-02

Reference:
- NASA/SP-2010-3403

Purpose:
To provide a monthly report that will be used to measure the Contractor's progress in completing the activities required by the contract.

Related Documents:
- CD-01 Contractor Financial Management Reporting
- PM-02: Risk Management Plan

Preparation Information:

A. Base and Delivery Order Level Technical Reporting

The Contractor shall deliver Monthly Project Reports for each base and delivery order – The reports shall contain as a minimum; schedule, technical accomplishments, issues/risks/concerns (with mitigation strategies).

1. Schedule data shall include
    a. A Report of contract milestones and other agreed upon tasks with explanations of proposed date changes.
    b. A look-ahead to upcoming schedule activities or milestones for the upcoming reporting period(s)
    c. Identification of critical path to the next base or delivery order milestone
    d. Project Schedules shall:
        i. Include critical path and near-term activities.
        ii. Be in accordance with the scheduler's handbook NASA/SP-2010-3403
2. Technical Accomplishments data shall include
    a. Describe the technical work that was completed during the reporting month including supporting photos and figures as available.

3. Issues, Risks, Concerns data shall include
    a. Identification of obstacles or challenges that are already present (issues) with proposed resolution(s).
    b. Identification of potential obstacles that may arise (risks) as well as mitigation strategies.
    c. Identification of concerns that may not rise to the level of a formal risk.
    d. Risk overview shall be in accordance with PM-02.

B. Contract Level Reporting/Management Reviews

The Contractor shall deliver:

1. Monthly Technical Report Summary - a listing of base and delivery orders with cost, schedule, and performance issues not resolved within the three (3) preceding reporting periods including associated issue resolution plans.
2. Monthly Management Review – The contractor shall attend a monthly management review with the Government and present:
    a. a summary of contract activities associated with base and delivery orders which have met the criteria for B.1. above during any month of the preceding quarter,
    b. key technical accomplishments
    c. anticipated challenges for the following month and
    d. a contract cost, schedule, and performance summary, including.
        i. Funds remaining on each BO and DO
        ii. BOs and DO’s at risk of exceeding their contract value
        iii. Milestones at risk of exceeding the agreed upon dates

iv. Key personnel changes

Due: Monthly - All written reports shall be submitted by the 15th day of the month following the month being reported. The final report shall be submitted within 30 days after the completion of the effort under the contract. In addition, the schedule shall be updated NLT 30 calendar days after a CCR or contract MOD.

Title: INFORMATION TECHNOLOGY SYSTEM SECURITY PLAN	**DID No :** CD-03

Reference:

- Space Policy Directive 5 Cybersecurity Principles for Space Systems
- Executive Order 14028, Improving the Nation's Cybersecurity
- Federal Information Security Modernization Act of 2014
- NIST SP 800-53 Rev. 5 Security and Privacy Controls for Information Systems and Organizations
- NIST SP 800-37 Risk Management Framework for Information Systems and Organizations
- NIST SP 800-137 Information Security Continuous Monitoring (ISCM) for Federal Information Systems and Organizations
- FIPS 199 Standards for Security Categorization of Federal Information and Information Systems
- FIPS 200 Minimum Security Requirements for Federal Information and Information System
- FIPS 140-3 Security Requirements for Cryptographic Modules
- NPR 2810.1F Security of Information and Information Systems
- NPD 2810.1E NASA Information Security Policy
- NPR 7150.2D NASA Software Engineering Requirements
- NPD 1382.17K NASA Privacy Policy
- ITS-HBK-2810.19-01 Operational Technology
- ITS-HBK-AAStep0.v1.0.0 Step 0: Prepare Policy
- ITS-HBK-AAStep1.v1.0.0 Step 1: Categorize Policy
- ITS-HBK-AAStep2.v1.0.0 Step 2: Select Policy
- ITS-HBK-AAStep3.v1.0.0 Step 3: Implement Policy
- ITS-HBK-AAStep4.v1.0.0 Step 4: Assess Policy
- ITS-HBK-AAStep5.v1.0.0 Step 5: Authorize Policy
- ITS-HBK-AAStep6.v1.0.0 Step 6: Monitor Policy
- ITS-HBK-2810.05-2B System and Service Acquisition
- ITS-HBK-2810.09-01 Incident Response and Management
- ITS-HBK-2810.14-03D System and Information Integrity
- ITS-HBK-1382.07-01 Privacy Awareness and Training

Purpose:

The purpose of the plan is to document the cybersecurity controls employed for all information systems and resources used in support of the SpaceDOC III contract.

Related Documents:

Non applicable

Preparation Information:

The Information System Security Plan shall include, at a minimum, the following:
Documentation of the security measures implemented for each information system used in support of or in the execution and delivery of the SpaceDOC III contract. At a minimum, this documentation shall include the following elements:

a) General description of the information system.
b) Security controls consistent with NIST SP 800-53 rev.5.
c) Processes and documentation for risk identification, mitigation, and acceptance
d) Identification and documentation of an authorizing official to grant an Authority to Operate (ATO) to the information system, as well as the authority to approve risk mitigation and acceptance for the information
e) Identification and documentation of the security roles and assigned individuals to those roles, such as but not limited to the information system owner, the information system security officer, and the chief information security officer.
f) Periodic review cycle and frequency for NASA insight of cybersecurity documentation including cyber risk mitigation processes.
g) Opportunity for a periodic site validation visit, annually at a minimum.
h) Any supporting documentation, including system diagrams, boundary conditions, and dependencies
i) Process for third party audit of systems to include providing NASA a summary report.

Preliminary – Due 6 months after contract award
Submission Frequency: As required for any significant update or changes to the system; with a documented annual review at a minimum

Title: INFORMATION TECHNOLOGY SECURITY MANAGEMENT PLAN	**DID No :** CD-04

Reference:

- NFS 18-.470-4(b)
- NPD 2810.1E NASA Information Security Policy
- NPR 2810.1F Security of Information and Information Systems and associated handbooks
- Federal Information Security Management Act of 2002 ("FISMA", 44 U.S.C. § 354); amended by Federal Information Security Modernization Act of 2014

Purpose:

This plan shall describe the processes and procedures that will be followed to ensure appropriate cybersecurity controls are used to protect the confidentiality, integrity and availability of NASA data that is developed, processed, stored, or transmitted under the SpaceDOC III contract at the Glenn Research Center.

Related Documents:

Non applicable

Preparation Information:

The Information Security Management Plan shall include, at a minimum, the following:

a) Contractor's information security POC(s) and roles and responsibilities for the POC(s).
b) Process for meeting security authorization requirements, including development and maintenance of IT security plans, implementation and validation of controls, security assessments, remediation, authorization, and continuous monitoring for any corporate owned system processing NASA data, including but not limited to ITAR, EAR, and PII sensitive information.
c) Process for ensuring the supply chain risk mitigation.
d) Process for information security incident management and response, including coordination with NASA Security Operations Center (SOC).
e) Process for ensuring personnel screening include the steps for performing appropriate verifications through background checks commensurate with the sensitivity of work being performed.
f) Process for addressing foreign national access to company-owned or NASA-owned data.
g) Process for sharing executive summaries resulting from audits of corporate owned IT Systems.
h) Process for the use of mobile devices, mobile media, the encryption at rest, marking of media, and sanitization methods employed to protect NASA data.
i) Process for ensuring all subcontractors abide by the IT security management approaches proposed through this DID.

Preliminary – Due 30 days after contract award
Final – Due 60 days after contract award or after contract modification or change in company processes affecting plan

Title: SPACEDOC III MANAGEMENT PLAN	**DID No.:** PM-01

Reference:

- NPR: 7120.5, NASA Space Flight Program and Project Management Processes and Requirements
- NPR: 7120.8, NASA Research and Technology Program and Project Management Requirements

Purpose:

The SpaceDOC III 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.

Related Documents:

- PM-02: Risk Management Plan
- PM-03: Software Management and Development Plan
- PM-04: Configuration and Data Management Plan
- PM-09: Systems Engineering Management Plan
- PA-01: Safety and Mission Assurance Plan

Preparation Information:

The Contractor shall provide information giving NASA insight into staffing, organizational structure, approaches, and processes used to manage activities across the SpaceDOC III contract. The plan shall cover all aspects of contract and subcontract management for the SpaceDOC III contract including, but not limited to, the following:

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

b. Narrative description of roles and responsibilities of the contract's key personnel

c. Management approach for Base Order and Delivery Order work plan development and execution

d. Management approach to routinely review project Base Orders (BOs) and Delivery Orders (DOs) internally to address cost, schedule, technical progress, concerns, and issues including:
   - 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
   - Controls applicable to any tasks and activities exceeding established cost or schedule plans including requirements for providing recovery plans
   - Description of performance reporting to NASA in preparation for major milestone reviews

e. Management support system method, tools, and implementation

f. Methods for accommodating Government surveillance.

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.

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.

i. Assessment of risks inherent in the management approach, including a process for incorporating lessons learned from previous applicable contracts and continuous improvements

j. Acquisition strategy including a description of the procurement process and the make/buy decision process

k. Describe Contractor to Subcontractor interfaces. Describe how communication between the Contractor's technical representatives and the Subcontractor's technical counterparts would be facilitated while maintaining contractor supervisory controls (at both the overall contract and project levels). Describe the processes to be utilized for determining when a subcontract should be utilized and managing the subcontractor's costs and products.

l. Description of the approach for providing regularly scheduled Contract level reviews

m. Description of facility (office, manufacturing, testing, etc.) capabilities in support of the SpaceDOC III contract

n. Approach to data rights and intellectual property (IP). Approach to how licensing agreements will be negotiated and how that data/IP will be treated, specifically identifying any requested special license agreements.

o. Approach to managing NPR 7120.8 and NPR 7120.5 projects

This Plan shall be included as a separate document.

Draft – Due with proposal submittal
Preliminary – Due 60 days after contract award
Final – Due 30 days after review and comment of the preliminary Plan by the COR or their designee

Title: RISK MANAGEMENT PLAN	**DID No :** PM-02

Reference:
- NPR 8000.4, Agency Risk Management Procedural Requirements

Purpose:
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. The Risk Management Plan provides the overall approach, coordination, structure, and environment within which risk management processes for the SpaceDOC III contract reside and addresses how NASA risk requirements are to be implemented by the Contractor through the Base and Delivery Order implementation.

This document describes the methodologies and processes used to identify, analyze, control, and communicate the Base and 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.

Related Documents:
- PM-01: SpaceDOC III Management Plan
- PM-06: Contractor Base Order/Delivery Order Work Plan

Preparation Information:

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 Base and Delivery Order and provide government insight to risk management. "Risk" refers to anything that can prevent a team from meeting the Base and Delivery Order objectives. All forms of risk shall be managed. These include technical (hardware and software), programmatic, supportability, cost, and schedule risks.

The Risk Management Plan shall provide descriptions of the processes to provide management at all levels including 1) a disciplined system for early identification of technical uncertainties, 2) a disciplined assessment of current project status, 3) key indicators of mission success, 4) methods and procedures for integrating this process with NASA's approach to Continuous Risk Management, and 5) tools to be used to store and track risks. The plan shall describe the basis for taking action to control risk and for measuring the effectiveness of that action. This plan shall address any differences in NPR 7120.8 risk management strategy vs. NPR 7120.5 where risk mitigation should be balanced with the need to conduct challenging research and technology development that will realize significant gains.

The plan shall as a minimum cover:

a.) Risk identification – The process to determine and define all risks.

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.

c.) Risk planning – The process to develop mitigation options and decide what to do with the risks.

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.

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.

f.) Communications and documentation – The process by which terms a – e are communicated and documented and communicated to all team members.

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:

(1) Description of the risk
(2) Primary consequence should the undesirable event occur
(3) Estimate of probability of occurrence and the fidelity of the estimate

(4) Significant cost impacts, given its occurrence
(5) Significant schedule impacts, given its occurrence

(6) Significant safety impacts, given its occurrence
(7) Potential mitigation measure not already taken and the cost to implement them
(8) Characterization of the risk as acceptable or unacceptable with rationale.

Preliminary – Due 60 days after contract award
Final – Due 30 days after review and comment on the preliminary plan by the COR or their designee

Note: Project unique Risk Management Plans may be required, as specified by individual BO/DOs

Title: Software Management and Development Plan	**DID No :** PM-03

Reference:

- NPR 7150.2 NASA Software Engineering Requirements
- GRC-SW-TPLT-SMP Software Management Plan Template
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

To establish specific software management policies, schedules and budget and define the processes and environment by which these policies and practices will be implemented. This plan is to cover new software development, modification, reuse, re-engineering, maintenance, and all other activities resulting in software products.

Related Documents:

- PA-10: Software Assurance Plan and Metrics
- PM-01: SpaceDOC III Management Plan
- PM-02: Risk Management Plan
- PM-04: Configuration and Data Management Plan

Preparation Information:

The Contractor Software Management and Development Plan shall provide detailed information on activities, resources, and procedures necessary for successful planning and implementation of all software (flight, ground, support). For NASA Class A and B software, the Plan must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, SDP-SMP – Software Development – Software Management Plan. For Class C, D, and E software, the Plan must contain at least the following:

- a high level software description and classification of each software CSCI per NPR 7150.2 Appendix E,
- at least one cost estimate,
- a schedule of activities with deliverables, milestones, and reviews with completion criteria,
- a description of the needed development and configuration management environments (equipment and software)
- the chosen standards, languages, procedures, guidelines, software development lifecycle, and techniques,
- the verification approach (including what simulations and/or test environments and resources are needed),
- and milestones for developing and delivering software, including the support software.

Note that per the definition of software in NPR 7150.2, this Plan covers computer programs, source code, source code listings, design details, algorithms, processes, flow charts, firmware, formulae, and related material that would enable the software or a functionally equivalent software to be reproduced, recreated, or recompiled, regardless of the form
or media on which such information is recorded

Draft – Due 60 days prior to SRR
Preliminary – Due midway between SRR and PDR
Final– Due 60 days before PDR, update as required 30 days after PDR

Title: CONFIGURATION AND DATA MANAGEMENT PLAN	**DID No.:** PM-04

Reference:

- NASA-STD-005 NASA Configuration Management (CM) Standard
- ISO 10007 Quality Management - Guidelines for Configuration Management
- NPR 7150.2 NASA Software Engineering Requirements (Software Configuration Management Requirements only)
- MIL-HDBK-61 Configuration Management Guidance
- ANSI/EIA 649-B-2011 Configuration Management Standard GEIA-859, “Data Management Standard”

Purpose:

To identify and describe the Contractor processes and methods for Configuration Management (CM) to be used during the implementation of the contract and project/Base and Delivery Orders. This plan establishes the basis for a uniform and concise CM practice for all contractor-provided hardware/software/firmware elements and selected documentation in a manner that is responsive to appropriate, applicable requirements.

Related Documents:

- PM-01: SpaceDOC III Management Plan
- PA-01: Safety and Mission Assurance Plan
- PM-03: Software Management and Development Plan
- PM-05: Engineering Change Proposals (ECPs)

Preparation Information:

The CM/DM plan shall describe the Contractor’s configuration and data management system in terms of applicable requirements, planned implementation methods, configuration management and planning, configuration identification, configuration change management, configuration status accounting, configuration verification and audit, schedules, and organizational structure as well as management tools to be used by the Contractor in the execution of this CM effort. The CM/DM 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/DM plan shall include hardware, software, and firmware aspects of configuration and data management. 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:

a. CM Organization (objectives, organizational structure, authorities, and responsibilities (individual and organizational))
b. CM approach for managing subcontractor CM activities
c. CM interfaces to the Government CM function, including insight into major subcontractors
d. CM System Description (CM Standards, CM requirements stated or implied in particular, those driven by a flight carrier, Processes, Software CM processes, etc.)
e. CM Tools (software tools, techniques, and equipment necessary for the implementation of the specified software configuration management activities
f. 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)
g. Inventory Management (tracks flight equipment, GSE equipment, and other operational support hardware, etc.)
h. CM Schedule (sequence and coordination for the identified CM activities and for all events affecting the CM plan’s implementation)
i. CM maintenance information (identifies the activities and responsibilities necessary to ensure continued CM planning during the lifecycle of the contract)

The CM/DM Plan shall describe the data management approach for data generated and captured during execution of the Base Orders and Delivery Orders with descriptions of how the data will be generated,

processed, distributed, analyzed and archived. With respect to data management the plan shall:

a. Define the data products to be managed and how they will be managed.
    i. Develop consistent methods of transmitting, processing, and disposition of data
    ii. Develop methods for the receipt of data
b. Describe the control method for non-controlled/configuration managed items (i.e., as-built hardware photos, videos, test data, technical review data, etc.)
c. Define the approach to retention of the data.
    i. The types of records/data requiring retention.
    ii. The retention processes.
d. Define access control to the data.
    i. How to receive and evaluate requests for technical data
e. Define handling of Controlled Unclassified Information (CUI), EAR and ITAR data.
    i. Data must be transmitted by secured means
    ii. Data must be marked in Security Procedures and Guidelines
f. Describe Data Security/Backup Plan.
g. Define Data Formats (documents/drawings).
h. Describe how and what data will be transferred upon completion of the task/contract agreement.
i. Describe how contractual data deliverables will be addressed

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 COR or their designee

Project unique CM/DM Plans may be required, as specified in the individual BO/DOs

Title: Engineering Change Proposals (ECPs)	**DID No :** PM-05

Reference:

- EIA-649 National Consensus Standard for Configuration Management
- NPR 7123.1, NASA Systems Engineering Processes and Requirements

Purpose:

To document proposed changes to Government requirements or deliverables (Engineering Change Proposal).

Related Documents:

- PM-01: SpaceDOC III Management Plan
- PM-04: Configuration and Data Management Plan
- PM-09: Systems Engineering Management Plan

Preparation Information:

Documentation of Change Proposals

The Contractor shall document each Engineering Change Proposal). This document should describe the applicable requirement and the reason(s) for 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.

Delivery of ECPs

The Contractor shall deliver each change proposal to NASA for review and disposition. 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 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 Base or Delivery Order.

Title: Contractor Base Order / Delivery Order Work Plan	**DID No**.: PM-06

Reference:
Non applicable

Purpose:
This document provides an integrated overview of the Contractor approach to accomplish the work defined in the NASA provided Base Order or Delivery Order. The 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 Work Plan provides details on the technical task, proposed resources, and applicable requirements necessary to accomplish the Base Order or Delivery Order. It clearly identifies all deliverables and provides a detailed development schedule with associated resource requirements. The work plan shall include the Contractor approach to performance reporting on technical progress, schedule adherence, and budget maintenance and analysis.

Related Documents:
- CD-01: Contractor Financial Management Reporting
- CD-02: Technical Reporting and Management Reviews
- CD-03: Information Technology System Security Plan
- PM-01: SpaceDOC III Management Plan
- PM-02: Risk Management Plan
- PM-03: Software Management and Development Plan
- PM-04: Configuration and Data Management Plan
- PM-09: Systems Engineering Management Plan
- PA-01: Safety and Mission Assurance Plan
- PA-10: Software Assurance Plan and Metrics
- PA-11: Safety and Health Plan

Preparation Information:

The following provides the requirements on the content and organization of the Contractor Work Plan. Where separate detailed planning documents are to be prepared (as defined by the Base Order or 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 Base Order/Delivery Order (BO/DO). Describe the overall development approach that includes: interpretation of BO/DO 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 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 BO/DO but not explicitly called out in the Base Order / Delivery Order.

1.2 Exceptions, Ground Rules, and Assumptions: Identify key technical ground rules and assumptions, and major constraints in the performance of the Base Order/Delivery Order. Also, the Contractor shall identify any exceptions to the Base Order/Delivery Order SOW.

1.3 Requirements Baseline – List or reference the requirements levied on the Contractor via the Base Order/Delivery Order and discuss how these are flowed down to lower levels by summarizing the requirements allocation process.

1.4 Requirements – Provide the key driving requirements that make for the basis in your overall cost, schedule, staffing, and technical plans.

1.5 Technology/Risks - Indicate any existing feasibility issues or proof-of-concept issues that must be taken into account in the development phase requiring additional testing along with any requirements that offer significant technical challenge or risk of failure, if applicable. Describe how these risks are handled in your determination of BO/DO costs.

1.6 Training and Data Management - Describe any specific training required for proper implementation of the Base Order/Delivery Order. Also, describe any specific data management needs in the overall implementation.

1.7 Safety - Define any key and/or unique ground and flight safety risks of the project.

1.8 Product Assurance - Define any proposed tailoring or changes to the overall Contractor SMAP (DID# PA-01) due to the project specific product assurance approach.

1.9 **Management Approach**Management – Document the plan to monitor and control the BO/ DO requirements, technical design, schedule, and cost to achieve the objectives. Describe key performance measures in objective, quantifiable and measurable terms specific for the Base Order/Delivery Order. Include a description of the systems engineering management approach and methods for cost and schedule control.

1.10Organization - Identifies key positions on the project and key external interfaces, including the use of any subcontractors.

1.11Work Breakdown Structure - Description reflecting the contractor Work Breakdown Structure (WBS) for organizing the technical elements and essential support for the BO/DO; 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. The WBS structure should relate to line items on the master schedule and to the resources section.

1.12Key Facilities - Identify key facilities that will be utilized for the implementation of the Base / Delivery Order requirements, such as hardware build, testing, integration, etc. Identify any proposed usage of Government Provided Facilities.

1.13Acquisition Plan – Identify all major proposed acquisitions in the relation to the CWBS and provide summary information on each that supports the Material costs. Describe all agreements for collaborative and/or cooperative relationships that support the BO/DO.

1.14Review Plan – Summarize key reviews proposed in the implementation of the Base Order/Delivery Order, including any proposed internal reviews beyond those requested by the Government.

1.15Documentation - Provide a project documentation tree that includes all governing, hardware development, mission integration, and safety documentation. Identify any required changes to specified DIDs as part of this Base Order/Delivery Order.

1.16Schedule - Provide an overall project master schedule that is consistent with the WBS and proposed cost that, identifies key milestones for each chosen CWBS element, and is logically phased to address all aspects of the BO/DO.

1.17Resources - A supporting spreadsheet shall be provided that lists the labor hours for each skill mix by WBS by month, the total labor hours and cost by WBS by month. The total individual cost for travel, ODC and materials shall be provided by WBS including basis of estimate. If the workplan is a modification to a previously approved workplan, it should also show monthly deltas for each of the categories listed above from the baseline.

Draft – Due 14 calendar days after receipt of BO/DO SOW
Final – Due at Base Order / Delivery Order definitization

Title: Software Maintenance Plan	**DID No :** PM-07

Reference:

- GRC-SW-TPLT-SMntP Software Maintenance Plan Template
- NASA STD 8719.13 Software Safety NASA Technical Standard
- NPR 7150.2 NASA Software Engineering Requirements
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

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.

Related Documents:

- PM-03: Software Management and Development Plan
- PM-04- Configuration and Data Management Plan

Preparation Information:

For NASA Class A, the Plan must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance Maint – Software Maintenance Plan. For the safety- critical portion of Class B or Class C software, if there is any, the Plan must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance Maint – Software Maintenance Plan. For non-safety-critical Class B software, the plan must contain at least the following:

- Software retirement
- Problem and modification analysis
- Modification implementation
- Software Assurance
- Equipment and laboratories required for software verification and validation
- Updates to documents for modified software components
- Plan for and tracking of operational backup software
- Approach for providing NASA access to the software version description data

DUE: As specified in individual Base / Delivery Orders

Title: Software Version Description Document	**DID No :** PM-08

Reference:

- GRC-SW-TPLT-SVD Software Version Description Template
- NASA STD 8719.13 Software Safety NASA Technical Standard
- NPR 7150.2 NASA Software Engineering Requirements
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

This document provides a precise description of the particular version of software/firmware being released.

Related Documents:

- PM-04: Configuration and Data Management Plan

Preparation Information:

For NASA Class A, B, and the safety-critical portion Class C, D, and E, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, VDD – Version Description Document. For non-safety-critical portion of Class C, D and E software, if there is any, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, VDD – Version Description Document. For non-safety- critical Class C and D software, the document must contain at least the following:

- Full identification of the system and software (e.g., numbers, titles, abbreviations, version numbers, and release numbers)
- Executable software (e.g., batch files, command files, data files, or other software needed to install the software on its target computer)
- Instructions for building the executable software, including, for example, the instructions and data for compiling and linking and the procedures used for software recovery, software regeneration, testing, or modification
- Data integrity checks for the executable object code and source code.
- Software product files (any files needed to install, build, operate, and maintain the software).

DUE: As specified in individual Base / Delivery Orders

Title: SYSTEMS ENGINEERING MANAGEMENT PLAN	**DID No :** PM-09

Reference:

- NPR 7123.1 NASA Systems Engineering Process and Requirements
- SP-2016-6105, NASA Systems Engineering Handbook

Purpose:

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.

Related Documents:

- PM-06: Contractor Base Order/Delivery Order Work Plan
- PM-01: SpaceDOC III Management Plan

Preparation Information:

SEMP preparation guidance is provided in detail in NPR 7123.1, Systems Engineering Process and Requirements. SEMP information may be incorporated into the project's plan and tailored according to the project requirements. The general structure of the SEMP contains the following sections:

a. Purpose and Scope.
b. Applicable Documents.
c. Technical Summary.
d. Technical Effort Integration.
e. Common Technical Processes Implementation.
f. Technology Insertion.
g. Additional SE Functions and Activities.
h. Integration with the Project Plan and Technical Resource Allocation.
i. Compliance Matrix (Appendix H.2 of NPR 7123.1).
j. Appendices.

Each of these sections is describe in some detail in NPR 7123.1.

A Contract level SEMP shall be developed as a separate document:

Preliminary – Due 60 days after contract award
Final – Due 30 days after review and comment on the preliminary plan by the COR or their designee

Title: Waivers and Deviations	**DID No**: PM-10

Reference:
- GLPR 7120.5.30 Space Assurance Requirements (SAR).
- GLPR 7120.5.20, GRC Project Deviation/Waiver Process
- NPR 7123.1, NASA Systems Engineering Processes and Requirements

Purpose:
To seek relief from a contractual or technical requirement.

Deviations apply before a requirement is put under configuration control, at the level the requirement will be implemented, and waivers apply after a requirement is put under configuration control.

Related Documents:
- PA-01: Safety and Mission Assurance Plan
- PM-01: SpaceDOC III Management Plan

Preparation Information:
Waivers and deviations shall be developed in accordance with the standard contractor format or the contractor may request the NASA standard format. Waivers and deviations will be handled using GLPR 7120.5.20 as a guide. Deviations and Waivers are provided to NASA for approval.

Each waiver and deviations shall be delivered for review and approval to minimize the impact of delays.

Title: ORGANIZATIONAL CONFLICTS OF INTEREST (OCI) PLAN	**DID No.:** PM-11

Reference:

- NASA Federal Acquisition Regulation (FAR) Supplement (NFS) 1852.209-71, Limitation of Future Contracting
- NFS 1852.237-72, Access to Sensitive Information
- NFS 1852.237-73, Release of Sensitive Information
- FAR Subpart 9.5, Organizational and Consultant Conflicts of Interest
- NFS 1809.500, NASA Guide on Organizational Conflicts of Interest

Purpose:

The Plan will communicate the contractor's approach to identify and resolve OCIs. The contractor will be held accountable for identifying, dispositioning, and reporting OCIs during contract performance.

Related Documents:

Non applicable

Preparation Information:

The OCI Plan describes the contractor's comprehensive approach to identify, avoid, mitigate, neutralize, and report potential OCI issues, including conflicts described in the solicitation and those discovered during contract performance. The OCI Plan shall meet the requirements of FAR 9.5 and include the following:

1. Point of contact for OCI issues and reports.

2. Demonstrate an understanding of (1) OCI principles and (2) the full breadth of OCI issues and the types of harm that can result. The Plan at a minimum addresses the three primary types of OCIs (i.e., biased ground rules, unequal access to information, and impaired objectivity).

3. Define company roles, responsibilities, and procedures for (1) screening (i.e., identifying/recognizing, analyzing/evaluating, resolving, and reporting) existing and new business opportunities for actual/potential OCIs and (2) monitoring and reporting all potential/actual OCIs that arise, resolving conflicts, and reporting previously unidentified OCIs or potential OCIs to the Government.

4. Describe how employees are notified of the Plan's requirements and how this notification will be documented. Establish and require entrance training for new employees, refresher training for existing employees, and exit training for departing employees. Describe how completion of this training will be documented, including a copy of any training certification template that the contractor will use to document that its employees have completed training.

5. Describe how the contractor will report breaches of the protective measures in the Plan to the contracting officer. Describe what processes the contractor will implement following any breach and indicate that final resolution of the corrective action must be approved by the contracting officer.

6. Identify any affiliated companies/entities (e.g., a parent company or a wholly owned subsidiary) and procedures for coordinating OCIs with such affiliated companies/entities.

7. Address the process for reporting all potential/actual OCIs that arise during performance of the contract. An OCI report shall include (1) a description of the conflict, (2) the plan for resolving the conflict, and (3) the benefits/risks to contract performance associated with plan approval/acceptance. Specific resolution strategies shall be appended to the Plan upon approval

by the Government.

8. Explain how the contractor will flow down the provisions of this Plan to any subcontractor that may have a conflict with regard to performing the requirements of this contract. Discuss affected subcontractors' OCI program as it relates to this contract and specifically explain how affected subcontractors will identify, resolve, and report actual/potential OCIs associated with this contract.

9. Define organizational and employee sanctions for violations of established OCI procedures/requirements/guidelines.

10. Include an assertion from the Contractor that to the best of their knowledge no OCIs exist currently, if applicable. Provide a list of all the prime's and subcontractor's NASA contracts and subcontracts, which would provide the CO a better understanding of other NASA work performed by the Offeror that may give rise to an actual or potential conflict.

11. Include a requirement to update this plan as necessary to address specific OCIs. All updates to the plan must be approved by the contracting officer and the updates/changes must be incorporated in the contract to be effective.

12. Require periodic self-audits to ensure compliance with established OCI procedures/requirements/guidelines.

13. Define records related to the OCI plan (e.g., training and audit records) that will be made available to the Government upon request. Note: The OCI Plan as outlined in paragraphs 1 through 12 above is not for the purpose of addressing other very important contractual obligations such as (1) the contractor's obligation to protect sensitive information in accordance with NFS 1852.237-72, Access to Sensitive Information, (2) the contractor's obligation to conduct business in an ethical manner in accordance with FAR 52.203-13, contractor's Code of Business Ethics and Conduct, and (3) the contractor's obligation to prevent personal conflicts of interest in accordance with FAR 52.203-16, Preventing Personal Conflicts of Interest.

14. In an appendix to the OCI Plan identify the strategy (e.g., mitigation, limitation on future contracting, etc.) for resolving each OCI that is either identified in the solicitation or created by the requirements of the solicitation/contract and explain the effect of such strategy on performance of the contract. If using a firewall, explain how these actions will operate to successfully address the conflict without adversely affecting performance of the contract. (Note: Specific plans to limit future competition are reflected in the clause at NFS 1852.209-71, Limitation of Future Contracting.)

Due: Plan shall be submitted with the proposal.

Update: The contractor shall review the OCI Plan on an annual basis or as directed by the contracting officer to revise the OCI Plan if necessary. Revisions are subject to Contracting Officer approval and shall be incorporated by change page or complete reissue.

Title: SAFETY AND MISSION ASSURANCE PLAN	**DID No.**: PA-01

Reference:

- GLPR 7120.5.30 GRC Space Assurance Requirements (SAR)

Purpose:

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.

Related Documents:

- PA-02: System Safety Plan
- PA-04: Fracture Control Plan
- PA-07: Problem Report and Corrective Action (PRACA) Plan
- PA-09 Contamination/Cleanliness Control Plan
- PA-10: Software Assurance Plan and Metrics

Preparation Information:

This document will define the contractor's plan to apply relevant assurance principles and techniques to ensure the contract deliverables will be successfully accomplished and the applicable SAR requirements will be satisfied. The contact-wide overarching plan shall include and address all requirements and sections within the SAR, including Software Assurance (PA-10).

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 (example, PA-02 and PA-07). Existing company plans can be offered, with the extend of compliance discussed in the overarching PA Plan.

After approval of the overarching product assurance plan, each base or delivery order the contractor shall prepare an applicability document (SAR compliance matrix) detailing:

a) Any SAR requirement not being fully met by the project, along with rationale
b) Location of objective evidence for all requirements fully or partially met (project or contract plans, reports, procedures, etc.)

DUE: Contract-level Safety & Mission Assurance Plan Preliminary – Due 60 days after contract award
Final – Due 30 days after review and comment of the preliminary Plan by the COR or their designee

Base or Delivery Order as required by the BO/DO (SAR compliance matrix)
Document Draft – Due 60 days prior to SRR
Preliminary – Due midway between SRR and PDR
Final – Due at PDR, update as required 30 days after PDR

Title: System Safety Plan	**DID No :** PA-02

Reference:

- NPD 8700.1 NASA Policy for Safety and Mission Success
- NPR 7120.5 Program and Project Management Processes and Requirements
- NPR 8715.3 NASA General Safety Program Requirements
- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- GLWI-QER-8715.4 ISS Payload Safety Data Package Review
- SSP 30599, Safety Review Process, Appendix J

Purpose:

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.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PA-03: System Safety Hazard Analysis
- PA-05: Safety Data Package

Preparation Information:

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 SAR safety requirements will be satisfied. The plan shall include, but not be limited to, the following information:

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.

A detailed description addressing Appendix J, Section 8.1 of SSP 30599 (or other applicable processes as defined in the BO/DO) 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.

The System Safety Plan for an integrated, multi-payload cargo compliment (IMPCC) as defined by Appendix J, Section 8.1 of SSP 30599 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.

The plan may be a part of the contractor's Safety and Mission Assurance Plan (PA-01) or a separate, stand-alone document.

Preliminary – Due by SRR
Final - Due by PDR

Title: System Safety Hazard Analysis	**DID No :** PA-03

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- GLWI-QER-8715.3 Hazard Analysis Preparation
- GLWI-QER-8715.4 ISS Payload Safety Data Package Review

Purpose:

Conducted to identify applicable hazards and methods to eliminate or control those hazards.

Related Documents:

- PA-02: System Safety Plan
- PA-05: Safety Data Package

Preparation Information:

This document will identify the potential hazards associated with a space flight payload and define the approaches to be used to control and verify the hazards identified. The report format will be established by the carrier Safety Review Panel.

DUE: As specified in individual Base / Delivery Orders

Title: Fracture Control Plan	**DID No :** PA-04

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- SSP-30558 Fracture Control Requirements for Space Station
- NASA-STD-5019 Fracture Control Requirements for Spaceflight Hardware
- NASA-HDBK-5010 Fracture Control Implementation Handbook for Payloads, Experiments, and Similar Hardware

Purpose:

Documents the contractor's approach to fracture control and helps the Government understand how the contractor will comply with applicable fracture control safety requirements.

Related Documents:

- PA-02: System Safety Plan
- PA-05: Safety Data Package
- PA-06: Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)

Preparation Information:

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:

A) Structural Design
B) Material selection, procurement, and storage
C) Fabrication process control
D) Analysis and Testing
E) Quality assurance and nondestructive examination (NDE)
F) Payload operations and maintenance

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.

DUE: As specified in individual Base / Delivery Orders

Title: Safety Data Package	**DID No :** PA-05

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- GLWI-QER-8715.4 ISS Payload Safety Data Package Review
- SSP 30599, Safety Review Process, Appendix J
- SSP 51700, Payload Safety Policy and Requirements for the International Space Station

Purpose:

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.

Related Documents:

- PA-02: System Safety Plan
- PA-03: System Safety Hazard Analysis

Preparation Information:

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 Data Package will be required for each flight payload deliverable, and the contractor shall use the required reporting format required by the carrier.) Each completed Safety Data Package must be delivered to the proper POC at NASA GRC 30 days prior to delivery to the Safety Review Panel.

DUE: As specified in individual Base / Delivery Orders

Title: Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)	**DID No :** PA-06

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)

Purpose:

As described in the NASA-STD-6016, the MIUL documents the Materials and Processes required to ensure the hardware is safe and compliant to NASA-STD-6016, through the proper selection, application and processing, inspection, and testing of the chosen materials for the flight hardware application.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PA-04: Fracture Control Plan

Preparation Information:

The Materials and Processes Element may be a part of the Product Assurance Plan or a separate document.

The Materials and Processes Element shall address the following topics:

- Formulating, reviewing and maintaining materials documentation, including a Material Identification and Usage List (MIUL)
- Organization, review and approval of Material Usage Agreements (MUA)
- Organization, review and approval of Volatile Usage Agreements (VUA)
- Fracture Control
- Nondestructive Testing
- Contamination Control
- Coatings and Finishes
- Special Processes (Welding, Bonding, Heat Treatment)

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.

The MIUL, MUA and Materials Evaluation letter must be delivered to NASA GRC at least 2 weeks prior to the scheduled Pre-Ship Review.

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.

DUE: As specified in individual Base / Delivery Orders

Title: Problem Report and Corrective Action (PRACA) Plan	**DID No :** PA-07

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- NASA-HDBK-8739.18 Procedural Handbook for NASA Program and Project Management of Problems, Nonconformances, and Anomalies

Purpose:

Define a system to identify, control, and disposition nonconforming hardware/software and the remedial/corrective actions taken to resolve those problems.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PA-12: Nonconformance Report
- V-05: Acceptance Data Package (ADP)

Preparation Information:

The PRACA Plan shall include and address all nonconformance and problem reporting and control related requirements within the SAR.

The PRACA Plan shall describe the implementation of a closed-loop system for identifying, documenting, controlling, and correcting failures and non-conformances for flight hardware/software development and GSE that interfaces with flight hardware/software, to ensure corrective action is taken to prevent recurrence. 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 for classification (see below), disposition, and the problem report tracking and distribution process.

Nonconformance: A condition of any article, material, process, or service in which one or more characteristics do not conform to requirements specified in the contract, drawings, specifications, or other approved documents. Includes failures, defects, anomalies, and malfunctions. Used interchangeably with “discrepancy” and “noncompliance.”

- (Critical Nonconformance) - A nonconformance that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services, or is likely to prevent performance of a vital Agency mission
- (Major Nonconformance) - A nonconformance, other than critical, that is likely to result in failure or to materially reduce the usability of the supplies or services for their intended purpose
- (Minor Nonconformance) - A nonconformance that is not likely to materially reduce the usability of the supplies or services for their intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the supplies or services

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).

Note: Information required as part of the Product Assurance Plan but can be submitted as a separate document.

DUE: 30 days after contract award.

Title: Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	**DID No :** PA-08

Reference:

- GLWI-QER-8720.2 Failure Modes and Effects Analysis (FMEA), Critical Items List (CIL), and Fault Tree Analysis (FTA)
- 7120.5.30 Space Assurance Requirements (SAR)
- SSP 50431, Space Station Program Requirements for Payloads
- SSP 30234, Failure Modes and Effects Analysis and Critical Items List Requirements for Space Station

Purpose:

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.

Related Documents:

- PM-02: Risk Management Plan
- PA-01: Safety and Mission Assurance Plan
- PA-02: System Safety Plan

Preparation Information:

This document will report the results of FMEAs conducted to determine possible failure modes and effects on the local, system, and crew level to include the detailed detection methodology and mitigation strategy for each failure mode. 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
Or as specified in the individual Base / Delivery Orders

Title: Contamination/Cleanliness Control Plan	**DID No :** PA-09

Reference:

- NASA-STD-6016 Standard Materials and Process Requirements for Spacecraft
- MIL-STD-1246 Product Cleanliness Contamination Control Program
- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- ASTM E1548 (2009), Standard Practice for Preparation of Aerospace Contamination Control Plan

Purpose:

Describes the methods and procedures for controlling and assuring limited impact of contamination during hardware development, transportation, flight, and storage phases.

Related Documents:

- PA-01 Safety and Mission Assurance Plan

Preparation Information:

The Contamination Control Plan (CCP) shall be generated in accordance with the guidelines of ASTM E1548, Standard Practice for Preparation of Aerospace Contamination Control Plans and shall address the content of ASTM E1548, such as:

A) Hardware Control Requirements and design considerations that include contamination-sensitive manufacturing processes, surfaces, electrical, optical, fluids, packaging, shipment, and storage.

B) Facility Requirements and controls

C) Personnel requirements and work area controls

D) Description of what cleanliness control measures will be used.

E) Sections to address and assure understanding of requirements from NASA-STD-6016 such as:
   - Foreign Object Debris Control (FOD). No separate FOD plan is required if sufficient detail to describe the extent of compliance can be captured in this CCP.
   - Cleanliness level acceptance limits and verification methods for fluid systems, and for general spaceflight hardware internal and external surfaces.
   - Cleanliness levels for assembly- and subassembly-level hardware are identified on relevant documents, such as the engineering drawings and process documents.

Preliminary – Due for PDR
Final – Due prior to flight hardware development/assembly

Or as specified in the individual Base / Delivery Orders

Title: Software Assurance Plan and Metrics	**DID No.**: PA-10

Reference:

- GLPR 8739.1 GRC Software Assurance and Software Safety
- NPR 7150.2 NASA Software Engineering Requirements
- NASA-HDBK-2203 NASA Software Engineering Handbook
- GRC-SW-TPLT-SAP Software Assurance Plan Template
- NASA STD 8719.13 Software Safety NASA Technical Standard
- GLPR 7120.5.30 Space Assurance Requirements (SAR)

Purpose:

The SAP (Software Assurance Plan) 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. Metrics help define the software quality and safety for each project.

Related Documents:

- PM-04: Configuration and Data Management Plan
- PA-01: Safety and Mission Assurance Plan
- PM-03: Software Management and Development Plan

Preparation Information:

The SAP will define the contractor's plan to apply software assurance principles and techniques to ensure the Base / Delivery Order will be successfully accomplished and the applicable SAR requirements will be satisfied. The contractor's overall approach to Software Assurance should be addressed as part of the Safety and Mission Assurance Plan (PA-01). It may also be written as a stand- alone document for each task as stated below. The Contractor shall use the above references as a guide

The contractor's overall approach to software assurance should be addressed in the SpaceDOC III Safety and Mission Assurance Plan. Additionally, a project unique Software Assurance Plan shall be required for each new payload developed. Changes for projects in the maintenance phase shall fall under the existing plan if it exists. Otherwise, a plan shall be written to cover the hardware/software change.

Draft – Due 60 days prior to SRR
Preliminary – Due midway between SRR and PDR
Final – Due 60 days before PDR, update as required 30 days after PDR

Or as specified in the individual Base / Delivery Orders.

The contractor's software assurance plan shall address what software metric will be reported on a monthly basis. The following types of metrics are considered as minimum reporting requirement on a monthly basis. The contractor may consider additional ones in their plan.

Metrics shall include:

Software NCRs (Non-Conformance Reports)

A. Software Inspection Major Findings
B. Software Requests for Action (RFA)
C. Software Review Item Discrepancies (RID)
D. Software Process Audit Findings

Each metric shall include the following content:

a. ID
b. Description
c. Project
d. Date Opened
e. Current Status (New, Open, Closed)

Software Quality Metrics for each project will be provide to the government by the contractor on a monthly basis and as requested.

Title: SAFETY AND HEALTH PLAN	**DID No** : PA-11

Reference:

- GLP-QS-8715.1 GRC Safety Manual
- NPR 8621.1 NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Record Keeping w/Change 6
- NPR 8715.3 NASA General Safety Program Requirements
- GLP-QS-1800.1 GRC Occupational Health Programs Manual
- 29 CFR 1910 Occupational Safety and Health Standards

Purpose:

To identify all hazards related to tasks to be performed at NASA Glenn Research Center, as well as at the contractor site where flight hardware is present, 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.

Related Documents:

Non applicable

Preparation Information:

Their document will identify the potential hazards to all employees, equipment, and property while tasks are performed at NASA Glenn Research Center and at the contractor's site, where flight hardware is under development. Mishaps and injuries at any location with flight hardware present can result in schedule and cost impacts. 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 a corporate level Safety and Health Plan as part of the submittal to the RFP. The Glenn Safety Manual provides guidance on the contents of a safety and health plan.

Final – Due with Proposal (corporate level)
Final – Due 30 days after contract award (site specific Safety and Health Plan)

Title: Nonconformance Report	**DID No :** PA-12

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- NASA-HDBK-8739.18 Procedural Handbook for NASA Program and Project Management of Problems, Nonconformances, and Anomalies

Purpose:

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.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PA-07: Problem Report and Corrective Action Plan
- PM-02: Risk Management Plan
- PM-05: Engineering Change Proposals (ECPs)
- PM-10: Waivers and Deviations

Preparation Information:

For the purposes of contract surveillance and trending data, the contractor shall provide NASA GRC a monthly report listing all nonconformances associated with the SpaceDOC III contract. This report shall be in a contractor supplied format readable by Microsoft Office tools, including at a minimum the information below.

For BO/DO projects, the contractor shall report critical and major nonconformances to the NASA GRC SpaceDOC III COR, CSO, Chief Engineer, and appropriate Project Manager within 48 hours of occurrence. These are any nonconformances which is, or is suspected of being, a failure, an unsatisfactory condition, an unexplained anomaly, or an overstress occurring during or subsequent to manufacturing, production acceptance testing, or qualification testing (i.e. after development). A nonconformance is a condition of any article, material, process, or service in which one or more characteristics do not conform to requirements specified in the contract, drawings, specifications, or other approved documents. Includes failures, defects, anomalies, and malfunctions.

Critical and major nonconformance dispositions shall be forwarded to NASA Material Review Board (MRB) for approval.

Contractor MRB dispositions shall include scrap (>$2000), return to supplier, repair by standard or non-standard procedures, rework, and use-as-is.

Nonconformances with a disposition of scrap or return to supplier shall be considered minor under $2000.00. Additionally, these minor nonconformances shall not be used as justification for increasing the total value of the contract.

The nonconformance report should include as a minimum:

1) Description of nonconformance including date and location observed.

2) Classification level (critical, major, or minor)

3) Disposition

4) Analysis of root cause of problem (if applicable)

5) Description of planned corrective action (if applicable)

6) Closure status (open or closed)

7) Results from corrective actions performed (if applicable)

Root cause analysis should incorporate a methodology similar to “5 Why’s”, or otherwise adequately address true causation. “Human Error” is generally not accepted as a root cause.

DUE: Contract level: Monthly nonconformance report including all nonconformances, open and closed.

BO/DO: Initial report within 48 hours of occurrence for critical and major nonconformances or as specified in the individual Base / Delivery Order

Title: Reliability Report(s)	**DID No.**: PA-13

Reference:

- GLWI-QER-8720.3 Reliability Prediction/Maintainability Assessment/Availability Analyses
- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- SSP 50431, Space Station Program Requirements for Payloads

Purpose:

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.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PM-02: Risk Management Plan

Preparation Information:

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. Preferred sources for reliability predictions are in the following order: flight history, experience data with similar equipment, life/accelerated life test data, commercial/military/NASA databases, reliability handbook data, and expert elicitation. 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 volume reports for each subsystem and a separate Reliability Summary Report for the system level prediction and the Reliability Allocations. Each volume of the prediction report shall contain a description of the system/subsystem under analysis.

Allocations: 90 days prior to PDR
Preliminary Analysis: Due for PDR
Revised Analysis: CDR
Final: Due for SAR

Or specified in the individual Base / Delivery Order

Title: Limited Life Items List	**DID No.**: PA-14

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- SSP 50431, Space Station Program Requirements for Payloads
- GLWI-QER-8720.5 Preparation of the Limited-Life Items Plan

Purpose:

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.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PA-08: Failure Modes and Effects Analysis and Critical Items List (CIL)

Preparation Information:

Developing the Limited Life Items List

Limited Life Items are defined in the SAR. 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 SAR
Or as specified in the individual Base / Delivery Order

Title: System Maintainability/Availability Analysis	**DID No :** PA-15

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- SSP 50431, Space Station Program Requirements for Payloads
- GLWI-QER-8720.3, Reliability Prediction/Maintainability Assessment/Availability Analyses

Purpose: 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-13), maintainability analysis, limited life analysis (e.g., PA-15), preventative maintenance analysis, and spares & logistics analysis.)

Related Documents:

- PA-13:Reliability Report(s)
- PA-14:Limited Life Items List

Preparation Information:

This Data Item Deliverable shall document maintainability and 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.

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 SAR or as specified in the individual Base / Delivery Order

Title: Fastener Control Plan	**DID No :** PA-16

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- NASA-STD-8739.14, NASA Fastener Procurement, Receiving Inspection, and Storage Practices for NASA Mission Hardware
- NASA-STD-5020 Requirements for Threaded Fastening Systems in Spaceflight Hardware

Purpose:

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.

Related Documents:

- PA-02: System Safety Plan
- PA-05: Safety Data Package
- PA-06: Materials Identification and Usage List (MIUL); Material Usage Agreement (MUA)

Preparation Information:

This document shall define the overall approach for meeting fastener control requirements, including analysis necessary to select the appropriate fastener size and material. The plan as a minimum shall address the following areas:

a. Fastener Specification and Quality Control Level Determinations
b. Acquisition/supplier control including Counterfeit Avoidance
c. Documentation Requirements
d. Traceability
e. Receiving inspection
f. Testing
g. Handling and Storage

Final - Due 30 days before the PDR.

Or as specified in the individual Base / Delivery Order

Title: Lessons Learned Report	**DID No :** PA-17

Reference:
- NPR 7120.6 Lessons Learned Process

Purpose:
A report that identifies a set of Lessons Learned on the project associated with the development and operation of the hardware or software. The Lessons Learned are brief summaries of mishaps or success stories that are likely to be of interest to other projects throughout the NASA community.

Related Documents:
- NPR 7120.5: NASA Space Flight Program and Project Management Requirements
- NPR 8621.1: NASA Procedural Requirements for Mishap Reporting, Investigating, and Recordkeeping

Preparation Information:

The Lessons Learned report shall document any lessons learned which occurred during the specific project phase. Unlike a “best practice,” the lesson learned shall describe a specific “driving event” that occurred; and provide recommendations for avoiding a repetition (or obtaining a repeat of a success). The lessons learned evolve from both positive and negative outcomes experienced by employees during the course of doing their NASA work. The report shall include documentation of the lessons learned that are technical, as well as project/programmatic in nature.

Each Lessons Learned should include the following that is consistent with the NASA Lessons Learned format:
1) Title/Subject
2) Abstract
3) Driving Event
4) Lesson Learned
5) Recommendation
6) Related Documents

Examples of lessons learned are located at Lessons Learned Information System (LLIS):

http://llis.nasa.gov/

DUE: As specified in the individual Base / Delivery Order

Title: Probabilistic Risk Assessment (PRA) Report(s)	**DID No :** PA-18

Reference:

- 7120.5.30, Space Assurance Requirements (SAR)
- GLWI-QER-8720.6, Probabilistic Risk Assessment (PRA)
- GLWI-QER-8720.7, High Level Probabilistic Risk Assessment (PRA)
- ISO 11231:2019, Space Systems - Probabilistic Risk Assessment (PRA)
- NASA/SP-2011-3421, Probabilistic Risk Assessment Procedures Guide for NASA Managers and Practitioners

Purpose:

PRA is one of many measures utilized by designers to determine the best design. PRA focuses on event scenarios. It traces the propagating effects of initiators such as faults, failures, or events external to a system. The risk estimates from PRA will depend upon severity and probability of occurrence for system end-states. The purpose of the analysis is to obtain a comparison of system design options with respect to risk and to identify sources of high and low risk within each design option. PRA is also used to obtain a risk estimate that can be compared with the maximum allowable risk imposed by Project design requirements.

Related Documents:

- PA-01: Safety and Mission Assurance Plan
- PM-02: Risk Management Plan

Preparation Information:

The developer shall perform a Probabilistic Risk Assessment (PRA). The probability of occurrence for catastrophic and mission critical failures at the elapsed time for defined mission phases shall be calculated. These results shall be compared to the maximum allowable probability of occurrence as specified in the Project Design Requirements. The PRA shall provide a risk model of the system in terms of event sequence diagrams and event trees, or a fault tree and shall include the probability of occurrence for initiating events. (In the case of a fault tree, for the basic events). Sources of data for probability of occurrence, or frequency of occurrence, shall be documented in the report. Hardware component failures, software command faults, and human faults or errors shall be identified in the PRA model and shall be classified according to their contribution to the risk of catastrophic or mission critical failure. Items recommended for risk reduction shall be identified and recommendations should be made for design improvement. The documents listed above in the reference section of this DID can be used as a reference to aid in deciding on the best approach for performing the PRA. The PRA report shall contain an explanation of the methodology adopted to perform the PRA, the design analyzed, the functions of subsystems, the mission timeline, a summary of qualitative observations made in the course of the analysis, the numerical results of the analysis, and recommendations. NASA will not accept or approve a PRA report that is merely a dump of the logic model details and numerical results, all required explanation as indicated is this DID shall be provided in the PRA report to NASA.

Interim Report: 120 days prior to PDR
Preliminary Analysis: Due for PDR
Revised Analysis: CDR
Final: Due for SAR

Or as specified in the individual Base / Delivery Order

Title: System Requirements Document	**DID No :** R-01

Reference:
- SSP-41171 International Space Station Program; preparation of program, unique specifications
- NASA SP-2016-6105 NASA Systems Engineering Handbook

Purpose:
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.

Related Documents:
- R-02: Interface Requirements Document (IRD)
- R-04: Software Requirements Document
- V-01: Master Requirements and Verification Compliance Plan, Master Requirements and Verification Compliance Matrix/Summary

Preparation Information:
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 applicable:

Project Requirements
a) Missions – Life cycle, operations, crew resources.
b) Science Requirements – as they pertain to capability of hardware provided.
c) Reliability, availability, supportability, maintainability
d) Mechanical Environment – Vibration, shock, acceleration, noise.
e) Thermal Environment – flight environment (on-orbit cabin temp, Ascent/Descent temp/press, surface temp), ground environment.
f) EMI/EMC Environment
g) Radiation Environment
h) Induced Environment – natural and experiment
i) Operations/Operational Requirements
j) Transportation/transportability
k) Contamination and Cleanliness
l) Configuration Control Safety – Safety compliance, verifications (flight & ground handling)
m) Quality Assurance (including Software Product Assurance)

Design and Construction Standards
a) Electrical Design
b) Structural and Mechanical
c) Material Controls – off-gassing, flammability, stress corrosion cracking, materials selection, process selection, fracture control
d) Product Marking
e) Workmanship
f) Human Engineering

External Interfaces
a) External- Thermal, electrical power, command/data handling, structural, Ground Support Equipment (GSE)
b) Internal

Physical Characteristics
a) Size, mass, volume

Lower-Level Requirements (e.g. subsystem) Verification Requirements
Preliminary – Due for SRR Final – Due 60 days after SRR Updates – as required

Or as specified in the individual Base / Delivery Order

Title: Interface Requirements Document (IRD)	**DID No.:** R-02

Reference:

- SP-2016-6105, NASA Systems Engineering Handbook
- SSP57000, Pressurized Payload Interface Requirements Document (ISS Only)
- SSP57001, Pressurized Payload Interface Control Document Blank Book (ISS Only)
- SSP57003, Attached Payload Interface Control Document (ISS Only)
- NPR 7123.1, NASA System Engineering Processes and Requirements
- NPR 7150.2, NASA Software Engineering Requirements

Purpose:

The purpose of an IRD is described in SP-2016-6105, “NASA Systems Engineering Handbook” section 6.3.2, “Interface Management Guidance.”

The IRD defines all physical, functional, and procedural interface requirements and constraints between two entities. IRDs are used when separate organizations are developing components of the system or when the system must levy requirements on other systems outside program/project control.

The IRD is used as the basis for developing an Interface Control Document (ICD). Note: When interfacing with an existing external project that has an existing Interface Definition Document (IDD), the IDD will generally be used as the basis for developing the ICD (i.e., IRD not required).

Related Documents:

R-01: System Requirements Document
R-04: Software Requirements Document
R-06: Interface Control Document & Interface Definition Document

Preparation Information:

The IRD should be developed utilizing guidance from SP-2016-6105, NASA Systems Engineering Handbook” section 6.3 Interface Management. The generic outline provided in SP-2016-6105 Appendix L, “Interface Requirements Document Outline” will be utilized as a template for IRD development.

Draft – Due at SRR
Preliminary – Due at SDR
Final – Due at PDR

Or as specified in the individual Base / Delivery Order

Title: Payload Interface Agreement (PIA) Main Volume, Addendums and Data Sets	**DID No :** R-03

Reference:

- SSP-52000-PDS Payload Data-Sets Blank Book
- SSP-52000-PIA-PRP Payload Integration Agreement Blank Book for Pressurized Payloads

Purpose:

To develop Payload Integration Agreement (PIA) Main Volume, addendums, and data sets for International Space Station (ISS) payloads. The PIA Addendum documents the tactical parameters, dynamic requirements, schedules, and commitments associated with specific transportation flights and on-orbit increment operations. The Data Sets define, on an increment and flight-specific basis, the engineering, integration, and operational details of the requirements in the PIA Addendum. 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.

Related Documents:

R-02: Interface Requirements Document (IRD)
R-05: Software Interface Design Document
R-06: Interface Control Document & Interface Definition Document

Preparation Information:

In accordance with the main volume of the existing PIA, 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.

Due Date – Per increment integration schedule
Or as specified in the individual Base / Delivery Order

Title: Software Requirements Document	**DID No :** R-04

Reference:

- GLPD 7150.2 GRC Software Engineering Requirements
- GRC-SW-TPLT-SRS GRC Software Requirements Specification Template
- NPR 7150.2 NASA Software Engineering Requirements
- NASA STD 8719.13A NASA Software Safety Standard
- SSP 52050, ISPR to ISS Software Interface Control Document, Part 1
- SSP 57002, Payload Software Interface Control Document Template
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

This document specifies in detail the requirements for each Computer Software Configuration Item (CSCI) within a system. It includes the function and performance, interfaces, and qualification requirements.

Related Documents:

- D-06: Software Design Description
- R-01: System Requirements Document
- V-01: Master Requirements and Verification Compliance Plan, Master Requirements and Verification Compliance Matrix/Summary

Preparation Information:

The Software Requirements Document defines the specific requirements to be satisfied throughout the implementation of the software requirements for each CSCI within a system. For a system with multiple CSCI's, each CSCI can be documented in a separate deliverable or combined by sections in a single deliverable. 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.

For NASA class A and B software, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, SRS – Software Requirements Specification. For Class C, D, and E software, the document should contain the items listed in NASA-HDBK-2203, Topic 7.18 - Document Guidance, SRS – Software Requirements Specification as applicable to the CSCI.

Preliminary – Due at PDR
Final – Due at CDR
Or as specified in the individual Base / Delivery Order

Title: Software Interface Design Document	**DID No :** R-05

Reference:

- GLPD 7150.2 GRC Software Engineering Requirements
- GRC-SW-TPLT-IDD Interface Design Description Template
- NASA STD 8719.13 (Software Safety NASA Technical Standard)
- NPR 7150.2 NASA Software Engineering Requirements
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

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

Related Documents:

- D-06 Software Design Description
- R-04 Software Requirements Document,
- R-01 System Requirements Document

Preparation Information:

For NASA Class A, B, and the safety-critical portion Class C, D, and E software, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, IDD – Interface Design Document. For non-safety-critical portion of Class C, D and E software, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, IDD – Interface Design Document. For non-safety- critical Class C software, the document must contain at least the following:

- Type of interface (e.g., real-time data transfer, storage-and-retrieval of data) to be implemented.
- Specification of individual data elements (e.g., format and data content, including bit-level descriptions of data interface) that the interfacing entity(ies) will provide, store, send, access, and receive
- Specification of individual data element assemblies (e.g., records, arrays, files, reports) that the interfacing entity(ies) will provide, store, send, access, and receive.
- Specification of communication methods that the interfacing entity(ies) will use for the interface
- Specification of protocols the interfacing entity(ies) will use for the interface

DUE: As specified in the individual Base / Delivery Order

Title: Interface Control Document & Interface Definition Document	**DID No :** R-06

Reference:

- SP-2016-6105, NASA Systems Engineering Handbook
- SSP57000, Pressurized Payload Interface Requirements Document (ISS Only)
- SSP57001, Pressurized Payload Interface Control Document Blank Book (ISS Only)
- SSP57003, Attached Payload Interface Control Document (ISS Only)
- NPR 7123.1, NASA System Engineering Processes and Requirements
- NPR 7150.2, NASA Software Engineering Requirements

Purpose:

The purpose of an ICD and IDD are described in SP-2016-6105, "NASA Systems Engineering Handbook," section 6.3.2, Interface Management Guidance." Depending on the phase and nature of the development one or both of these document types may be required.

An interface control document details the physical interface between two system elements, including the number and types of connectors, electrical parameters, mechanical properties, and environmental constraints. The ICD identifies the design solution to the interface requirement. ICDs are useful when separate organizations are developing design solutions to be adhered to at a particular interface.

An IDD is a unilateral document which provides the details of the interface for a design solution that is typically already established. This document is sometimes referred to as a "one-sided ICD." The user of the IDD is provided connectors, electrical parameters, mechanical properties, environmental constraints, etc., of the existing design. The user must then design the interface of the system to be compatible with the already existing design interface.

Typically, an ICD will be developed using either the project's IRD or an external provider's IDD as the basis. However, if the BO/DO is developing an interface for future external customers/projects, then the BO/DO will create an IDD for future projects to use in their development efforts.

Related Documents:

- R-01: System Requirements Document
- R-02: Interface Requirements Document (IRD)
- R-04: Software Requirements Document

Preparation Information:

The ICD/IDD should be developed utilizing guidance from SP-2016-6105, NASA Systems Engineering Handbook" section 6.3 Interface Management.

As a minimum the ICD/IDD shall include:

A. Physical Requirements - 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.
B. Electrical Power and Signals - 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.
C. Software - such as codes, processors, memory storage, application description, uses, data

transfer and command protocols

D. Payload Environmental - such as vibration, shock, acoustic, EMI/EMC, ESD, thermal, contamination, purges, air and water-cooling, pressure/vacuum.
E. Safety - such as pyrotechnics, energy storage, trip-over, hazardous materials or processes, fire detection and suppression, gas interface, ionizing radiation, air and water thermal control.
F. Ground Support Equipment - such as mechanical, electrical, test specific, targets, simulators.
G. Ground System Interface - Data formats, communications protocols, data rates; compression algorithms, error detection and correction schemes; antenna patterns, Equivalent Isotropic Radiated Power (EIRP), Antenna gain-to-noise-temperature (G/T), beam width, frequency, polarization; command and telemetry formats; scenarios for data transmission, operations, maintenance; number and types of downlinks.
H. Operational Factors - such as ground contacts needed per day, data storage capacity and compression, general flight rules and limitations, real-time downlink, post-test downlink, ground support, personnel training during operation.
I. Training Simulators – crew training

For ICD's, 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 SDR
Final – Due at PDR

Or as specified in the individual Base / Delivery Order

Title: Review Presentation Package	**DID No :** D-01
Reference: ▪ NPR 7123.1 NASA System Engineering Processes and Requirements ▪ SP-2016-6105, NASA Systems Engineering Handbook	
Purpose: The Review Presentation Package is the presentation and any associated documentation needed to meet the requirements of the specific review (e.g., PDR, CDR, SAR, Safety Review, etc.)	
Related Documents: Non applicable	
Preparation Information: Each Review Presentation Package shall summarize (1) the information in the key document deliverables and (2) the requirements of the review as described in the Base / Delivery Order. The Review Presentation Package shall provide the review panel with the necessary information to make a determination whether the project met success criteria, e.g., with the hardware and/or software development. As an example, the Review Presentation Package for a Phase 1 Safety Review shall include the Hazard Reports and a description of the payload system and subsystems. DUE: The Review Presentation Package shall be prepared and distributed to the Government no later than 2 weeks prior to the review OR: As specified in the individual Base / Delivery Order	

Title: Engineering Trade and Analysis Data	**DID No :** D-02
Reference: ▪ SP-2016-6105, NASA Systems Engineering Handbook	
Purpose: This report documents the trade studies and engineering analyses performed during the design stages of the project. Alternative approaches will be captured for possible future use in this and/or other projects.	
Related Documents: Non applicable	
Preparation Information: The trade study report shall contain a description of the trade studies performed and the candidate concepts that were considered. This description shall address all trade off factors considered, where examples include cost, technology, operations, infrastructure, risk, and procurement strategy. For example, trade study results of risk assessment shall be included in this report if performed. The results of the systems analyses, and lifecycle cost analysis shall also be included in the trade study report. DUE: As specified in the individual Base / Delivery Order	

Title: Baseline System Description (Baseline Concept Description)	**DID No :** D-03

Reference:
NA

Purpose:
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 Baseline Concept Description (BCD), and then the Baseline System Description (BSD), is the single, authoritative summary document that describes the primary system functions and the technical solutions that defines the system and the interrelationships.

Related Documents:
- R-01: System Requirements Document
- R-02: Interface Requirements Document (IRD)
- D-05: Accommodations Handbook
- R-06: Interface Control Document & Interface Definition Document

Preparation Information:

The 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 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:

1. Introduction of System/Problem
2. Deployment Concept/Carrier Accommodations
3. System Technical Description
4. Operations Concept
5. Support Concept
6. Manufacturing Concept
7. Verification Concept
8. Design Safety Considerations

Each of the areas should determine the environment, constraints, boundary conditions, interfaces, critical risks, and unknowns.

Preliminary: Due for SDR
Final: Due for PDR, convert to BSD for CDR

Or specified in the individual Base / Delivery Order

Title: Product Drawings	**DID No :** D-04

Reference:
- ISO 10303 Standard for the Exchange of Product Model Data
- ASME Y14.100 Engineering Drawing Practices

Purpose:
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.

Related Documents:
- PM-04: Configuration and Data Management Plan
- V-13: As Built Configuration List

Preparation Information:

The product drawings shall be prepared and furnished in accordance with establish drawings standards of ISO-9001 or ASME Y14.100 or equivalent. Contractor code identification and documentation numbers will be used, unless otherwise specified in the Base/ Delivery Order. An electronic version of the drawings in PDF shall be made available to the Government unless otherwise stated in the Base/ 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, process and instrumentation 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

Or as specified in the individual Base / Delivery Order

Title: Accommodations Handbook	**DID No :** D-05

Reference:
Non applicable

Purpose:
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.

Related Documents:
- R-01: System Requirements Document
- R-02: Interface Requirements Document (IRD)
- D-03: Baseline System Description (Baseline Concept Description)
- R-06: Interface Control Document & Interface Definition Document

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.

DUE: As specified in the individual Base / Delivery Order

Title: Software Design Description	**DID No.:** D-06

Reference:

- GLPD 7150.2 GRC Software Engineering Requirements
- GRC-SW-TPLT-SDD Software Design Description Template
- NASA STD 8719.13 Software Safety NASA Technical Standard
- PM-03: Software Management and Development Plan
- PA-10: Software Assurance Plan and Metrics
- NPR 7150.2 NASA Software Engineering Requirements
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

This Software Design Document (SDD) is the top-level Computer Software Configuration Item (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.

Related Documents:

- R-02: Interface Requirements Document (IRD)
- R-04: Software Requirements Document

Preparation Information:

This document establishes the structure and organization of the systems 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.

For NASA Class A, B, and the safety-critical portion Class C, D, and E software, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, SwDD - Software Design Description. For non-safety-critical portion of Class C, D and E software the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, SwDD – Software Design Description. For non-safety- critical Class C and D software, the document must contain at least the following:

- Description of how the software item satisfies the software requirements, including algorithms, data structures, and functional decomposition
- Static/architectural relationship of the software units
- Concept of execution, including data flow, control flow, and timing

Preliminary version at PDR
Final (Code-To) version for CDR, update as required 60 days after CDR
Or as specified in the individual Base / Delivery Order

Title: Safety-Critical Structures Data Package	**DID No :** D-07

Reference:

- 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

Purpose:

This document presents the results of verification activities for Safety-Critical Structures to flight hardware safety requirements.

Related Documents:

- PA-05: Safety Data Package
- PA-06: Materials Identification and Usage List; Material Usage Agreement
- D-08: Fracture Control Summary Report
- D-09: Parts-Stress Analysis

Preparation Information:

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"

1. Introduction – 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.
2. Reference list – includes all references used in the report or identified in the body of the report.
3. Mass Properties – 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).
4. Materials List – List the materials used in this data package and their material properties – modulus of elasticity €, modulus of rigidity (G) or Poisson's Ratio (μ), ultimate tensile strength of a material (Ftu), yield tensile strength of a material (Fty), etc., include temperature effects if applicable. Also state the source of the property values listed.
5. Safety-Critical Structures Li–t - 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 and which are to be workmanship vibration tested to verify integrity.
6. Structural Modeling Description – 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. Other checks should include: element quality (ratio, skew, Jacobian ratios, etc.) Results of Rigid Body Mode checks shall also be presented along with finite element model checks for model integrity (i.e., unit displacement check, 1g load checks, and mesh quality checks). Additionally, the pedigree of the model shall be discussed (i.e., test validated, test correlated, if not tested then what uncertainty factor is to be applied).
7. Dynamic Analysis Results - This section shall contain the frequencies and modeshape 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 factorcalculation.
8. Load Analysis Results - 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). Also describe the type of analysis used to analyze the loads on the structural models (i.e., quasistatic analysis, base drive vibration analysis, couple loads analysis, etc).
9. Stress Analysis Results - 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:

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.”
ii. A free-body diagram of the structural element being analyzed.
iii. The source of the loads used.
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.

10. Fracture Control Analysis Results – List the reference for the Fracture Control Summary Report.

DUE: As specified in the individual Base/ Delivery Order

iii.

Title: Fracture Control Summary Report	**DID No**: D-08

Reference:

- SSP 52005B – ISS Payload Flight Equipment requirements and Guidelines for Safety Critical Structures.
- NASA-STD-5019 Fracture Control Requirements for Spaceflight Hardware
- NASA-HDBK-5010 Fracture Control Implementation Handbook for Payloads, Experiments, and Similar Hardware
- FCF-PLN-0030B - FCF Fracture Control Plan
- 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

Purpose:

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 **References** and **Related Documents** 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.

Related Documents:

- D-07: Safety-Critical Structures Data Package
- PA-02: System Safety Plan
- PA-04: Fracture Control Plan

Preparation Information:

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:

a) List of all fail-safe, fracture critical and low risk parts
b) Summary of structural stress analysis results of elastic stresses for which the maximum elastic stresses are used for crack growth analysis
c) List of available fracture mechanics material and newly developed fracture mechanics properties used for crack growth analysis.
d) Crack model selections and assumptions
e) Nondestructive examination (NDE) and initial flaw size selections
f) Identification of the cyclic loading conditions and assumptions
g) Summary of crack growth/damage tolerance or test results including as a minimum, the summary of fracture analysis data
h) Records of Non-Destructive Evaluation (NDE) inspection or proof test
i) Waiver/Deviation Records (affecting integration, safety)
j) Payload operations and maintenance on board the ISS or other carriers

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.

DUE: As specified in the individual Base / Delivery Order

Title: Parts-Stress Analysis	**DID No :** D-09

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- PA-02: System Safety Plan
- EEE-INST-002: Instructions for EEE Parts Selection, Screening, Qualification, and Derating

Purpose:

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, and (3) elimination of part failures and increases operational life with minimal drifting of performance outputs.

Related Documents:

- SSP 50431, Space Station Program Requirements for Payloads
- D-07: Safety-Critical Structures Data Package

Preparation Information:

Parts-Stress Analysis General Method

Parts-Stress Analysis typically considers the different stresses, under which, a part (electrical or mechanical) must be operated 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
Or as specified in the individual Base / Delivery Order

Title: Master Requirements and Verification Compliance Plan Master Requirements and Verification Compliance Matrix/Summary	**DID No.**: V-01

Reference:

- SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)
- SSP-57011 Payload Verification Program Plan (ISS Only)

Purpose:

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 & Validation Plan (V-04) unless the contractor chooses to incorporate them in this plan.

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, or 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. 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.

Related Documents:

- R-01: System Requirements Document
- V-04: Software Verification & Validation Plan
- R-02: Interface Requirements Document (IRD)
- R-03: Payload Interface Agreement (PIA) Main Volume, Addendums and Data Sets
- D-03: Baseline System Description (Baseline Concept Description) (if applicable)

Preparation Information:

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:

- 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.
- All verifications required for vehicle/carrier integration
- Flight Payload/hardware to Vehicle/Carrier Attach Fitting Integration
- Cleanliness, Control and Monitoring
- All safety requirements

For environmental testing portion of the Plan, the following should be included as a minimum:

- 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 SAR. Or as specified in the individual Base / Delivery Order

Title: Individual Item Verification Test/Demonstration Procedure	**DID No.**: V-02

Reference:

- SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)
- SSP-57011 Payload Verification Program Plan (ISS Only)

Purpose:

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.

Related Documents:

- V-01 - Master Requirements and Verification Compliance Plan
  Master Requirements and Verification Compliance Matrix/Summary
- V-03 - Individual Item Verification Report
- V-04 - Software Test Plan

Preparation Information:

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.

DUE: As specified in the individual Base / Delivery Order

Title: Individual Item Verification Report	**DID No.**: V-03

Reference:
- SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)
- SSP-57011 Payload Verification Program Plan (ISS Only)

Purpose:
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.

Related Documents:
- V-01: Master Requirements and Verification Compliance Plan/Matrix
- V-02: Individual Item Verification Test/Demonstration Procedure
- V-04: Software Test Plan
- PA-05: Safety Data Package
- D-07: Safety-Critical Structures Data Package
- D-08: Fracture Control Summary Report

Preparation Information:

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:

- Verification objective(s) (including Requirement Number)
- Description (as applicable) of: test setup; and/or analysis approach; and/or inspection technique/criteria
- Identification of item(s) verified (name, part number, and serial number) as well as any differences from the flight configuration.
- Copy of “as performed” procedure (e.g., could append "as performed" Individual Item Verification Test/Demonstration Procedure, V-02), if a test or demonstration.
- Summary of appropriate Product Assurance Procedures (including calibration procedures) used.
- Correlation of verification results with the requirements
- Summary of deviations from nominal results, failures, difficulties, corrective actions, failure reports, and nonconformance reports.
- Performance data, plots, pictures, and location of raw data and calibration curves as generated during the verification activity.
- Conclusions and recommendations.
- Signed approval by the Quality organization

Verification Reports are due 45 days after completion of the test/analysis/inspection.
Or as specified in the individual Base / Delivery Order

Title: Software Test Plan	**DID No :** V-04

Reference:

- IEEE-12207 Software Engineering Standards (where applicable)
- GLPR 7150.2 GRC Software Engineering Requirements
- NPR 7150.2 NASA Software Engineering Requirements
- GRC-SW-TPLT-STP Software Test Plan Template
- NASA STD 8719.13B (Software Safety NASA Technical Standard)
- SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)
- SSP-57011 Payload Verification Program Plan (ISS Only)
- NASA-STD-7009 Standard for Models and Simulations
- NASA-HDBK-2203 NASA Software Engineering Handbook

Purpose:

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 includes all software types governed under NPR 7150.2.

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.

Related Documents:

- PA-10: Software Assurance Plan and Metrics
- V-01: Master Requirements and Verification Compliance Plan, etc.
- V-02: Individual Item Verification Test/Demonstration Procedure
- V-03: Individual Item Verification Report

Preparation Information:

For NASA Class A, B, and the safety-critical portion Class C, D, and E, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, STP – Software Test Plan. For non-safety-critical portion of Class C, D and E software, the document must contain all of the items listed in NASA-HDBK-2203, Topic 7.18 – Document Guidance, STP – Software Test Plan. For non-safety-critical Class C and D software, the document must contain at least the following:

- General test conditions.
- Test progression.
- Data recording, reduction, and analysis.
- Test coverage (breadth and depth) or other methods for ensuring sufficiency of testing.
- Planned tests, including items and their identifiers.
- Test schedules.
- Requirement's traceability (or verification matrix).

In addition, models and simulations (M&S) software shall meet the requirements of NASA-STD-7009. The test plan shall specify the credibility assessment process used to verify that the M&S software meets the credibility and performance levels required by the users of the software (see NASA-STD-7009 for techniques). Each M&S software deliverable will have its own credibility assessment delivered with the software verification reports. If approved by the contracting officer, the process described by this plan may be used for all M&S software developed under this contract.

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 or Mission Readiness Review (MRR) or as specified in the individual Base / Delivery Order

Title: Acceptance Data Package (ADP)	**DID No.**: V-05

Reference:

- SSP 52054 - ISSP Payloads Certification of Flight Readiness Implementation Plan, Generic (ISS Only)
- GLPR 7120.5.30 Space Assurance Requirements (SAR)

Purpose:

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.

Related Documents:

- 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

Preparation Information:

The Acceptance Data Package should consist of the following pertaining to the hardware history:

a) Index Page: identifies deliverable item name, type of hardware, content of package, and appropriate deliverable data package approval signatures and date
b) DD250/1149 (or other recognized government shipping document)
c) Component/Equipment Historical Logs for Limited Operating/Age Sensitive Items
d) Identification of the As-Built Configuration
e) Waiver/Deviation Records (affecting integration, safety)
f) Failure Reports/Corrective Action Record/Unexplained Anomalies
g) Maintenance Instructions
h) Verification Test Reports identified as Acceptance Criteria activities in the Verification Plans
i) Unplanned/Deferred Work (exception basis only)
j) Cleanliness Certification
k) Developer Certification
l) Open Items from Phase III Ground Safety Review
m) MSDS – Material Safety Data Sheets
n) Pressure Vessel data
o) Program Listing (software)
p) Version Description Document (software)
q) User’s Guide or System Operating Manual (software)

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.

DUE: As specified in the individual Base / Delivery Order

Title: As Built Configured Item List	**DID No.**: V-06

Reference:

- GLPR 7120.5.30 Space Assurance Requirements (SAR)
- GRC Microgravity Science Division Operating Instruction, OP-6700-4
- SSP 41170 - ISSP Configuration Management Requirements
- PA-01: Safety and Mission Assurance Plan
- PM-04: Configuration and Data Management Plan

Purpose:

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.

Related Documents:

- D-03: Baseline System Description (Baseline Concept Description)
- D-04: Product Drawings

Preparation Information:

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 SAR 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:

- Name/Nomenclature
- Manufacturer
- Item number
- Serial number
- Quantity
- As built drawing number, including latest revision letter and change notice
- Software Identification and version
- Location in the system
- Note any approved deviations or waivers affecting the installed configuration item

Final: SAR
Or as specified in the individual Base / Delivery Order

Title: On Orbit Performance Acceptance Test Matrix/Plan Individual On Orbit Performance Acceptance Test Procedures	**DID No.**: V-07

Reference:

- PA-01: Safety and Mission Assurance Plan
- R-01: System Requirements Document
- SSP 41172 – ISSP Qualification and Acceptance Environmental Test Requirements

Purpose:

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.

Related Documents:

- V-01: Master Requirements and Verification Compliance Plan

Preparation Information:

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:

1. Operational testing with the initial (for series hardware) on-orbit component(s) to validate overall performance
    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)
    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
2. Testing to validate microgravity disturbance levels generated by the system and subsystems.
    a. Testing to verify overall microgravity level experienced at the science phenomenon
3. Testing to validate thermal performance (thermally map subsystems and demonstrate performance).
4. Testing for power quality and performance of subsystems
5. Any additional on orbit testing that is required for acceptance

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.)

On Orbit Performance Acceptance Test Matrix/Plan

Draft is required at PDR.
Preliminary is required at CDR.
Final is required at VRR/TRR.

Results of ground tests (refer to V-01) shall be presented at SAR, FRR, or MRR along with revisions to plan based on results of ground tests

Individual On Orbit Performance Acceptance Test Procedures
Preliminary procedures are required at VRR/TRR.
Final procedures are required at ORR.
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.

Or as specified in the individual Task / Delivery Order

Title: SIMULATION SOFTWARE VERIFICATION AND VALIDATION PLAN	**DID No.**: V-08

Reference:

- NPR-7150.2 NASA Software Engineering Requirements
- NASA-STD-7009 Standard for Models and Simulations

Purpose:

Describe processes that will be used to conduct Verification and Validation (V&V) of software used for modeling and simulation software. The processes shall comply with the two referenced NASA standards documents.

Related Documents:

- GLPD 7150.2 GRC Software Engineering Requirements
- PA-10: Software Assurance Plan and Metrics
- V-01: Master Requirements and Verification Compliance Plan

Preparation Information:

The credibility matrix described in NASA-STD-7009 shall be used to verify that all software developed in support of scientific computational models meets the credibility and performance levels required by the customers who will either use the software for simulations or provide the software as a component of other simulations. While each simulation shall have its own credibility matrix, the process described by this plan may, with the approval of the contracting officer, be used for all simulations developed under this contract.

Note that while 7009 provides guidance for the compliance matrices, NPR 7150.2 and GLPD-7150.2 contain the ultimate requirements and have precedence.

The plan is required after contract award; however, the individual credibility matrices shall be delivered along with the simulation software module.

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 COR or their designee

Title: Integrated Logistics Support Plan (ILSP)	**DID No**: OP-01

Reference:

- NPR 7120.5 NASA Space Flight Program and Project Management Requirements
- NPD 7500.1 Program and Project Life-Cycle Logistics Support Policy
- NPR 6000.1 Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components
- NPD 8720.1C NASA Reliability and Maintainability (R&M) Program Policy
- MIL-HDBK-502 Acquisition Logistics
- SSP 50277, International Space Station Program, P/Ls Integrated Logistics Support Guidelines
- SSP 50431 Space Station Program Requirements for Payloads

Purpose:

Document establishes the processes and specific plans for implementation of the ILS activities during development, testing, and operational phases. It defines the project's implementation of NPD 7500.1B, Program and Project Life-Cycle Logistics Support Policy, including a maintenance and support concept; participation in the design process to enhance supportability; supply support; maintenance and maintenance planning; packaging, handling, and transportation; technical data and documentation; support and test equipment; training; manpower and personnel for Integrated Logistics Support (ILS) functions; facilities required for ILS functions; and logistics information systems for the life of the program.

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Related Documents:

- OP-04: Launch Site Operations and Test Procedures
- PA-01: Safety and Mission Assurance Plan
- PA-08: Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)
- PA-13: Reliability Report(s)
- PA-14: Limited Life Items List
- PA-15: System Maintainability/Availability Analysis
- R-01: System Requirements Document

Preparation Information:

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:

A. Logistics Analysis - For preliminary document, develop summary of logistics needs. For final document, develop detailed implementation plan, describing the logistics actions needed operate and maintain the ground and flight systems, including the transport of spares (up and down) and temporary on-orbit storage per the maintenance requirements of a project.
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.
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.
D. Packaging, Handling, Storage & 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.
E. Logistic Support Facilities and Equipment - describe all of the processes required for the identification and acquisition of all Ground, Flight, and Support Equipment and facilities required to support on-orbit and ground functions.
F. Expected Roles and Responsibilities
G. Technical data and documentation
H. Contractor Logistics Support (CLS) – post launch responsibilities

DUE: As specified in the individual Base / Delivery Order

Title: Operations Handbook	**DID No :** OP-02

Reference:

- OP-03: Mission Operations Plan

Purpose:

The Operations handbook is an instruction and reference manual for the hardware and software user to initiate, operates, configure, maintain, calibrate, and monitor equipment.

Related Documents:

- OP-07: Training and Certification Plan

Preparation Information:

Operations Handbook contents:

A. Overview of the equipment in terms of its functions, initialization, maintenance, calibration, shutdown, and restart procedures that includes operation of all equipment subsystems.
B. Operation procedures and generic information such as, voice loop definition, phone numbers, email addresses, call signs and description of operations staff functions.
C. A detailed schematic of equipment interfaces to other equipment. This schematic includes all interfaces, starting from the data source to the data sink. The schematic should show the end-to-end system architecture. The level of detail is down to a single data line and should include such things as locations of hardware and important connection information, like line speeds, connection designators, and hardware descriptions to help understand the flow from one component to the next.
D. Description of overall function of the hardware and software along with relevant information, including all options, restrictions, and limitations.
E. Step-by-step procedures for performing set-up, initialization, maintenance, calibration, operation, shutdown, restart, tear down, and replacement of the software and hardware.
F. Description of any unique factors associated with the operation of the equipment.
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 affect the user's utilization of the equipment.
H. Description of subsystem outputs, including their destination information.
I. Unique system logistics, software, software maintenance, and sustaining engineering required for sustained equipment operations.
J. Contingency scenarios and procedures that include step-by-step shut-down procedures for both normal and abnormal shut-down of a function.
K. Error messages and corrective actions to be taken by the operator.
L. Redundancy management.
M. State of health monitoring, tracking, and tie to pertinent maintenance procedures.
N. Listing of operations limits, cautions, and constraints, and corrective actions to be taken by operator.

DUE: As specified in the individual Base / Delivery Order

Title: Mission Operations Plan	**DID No :** OP-03

Reference:

- NPR 7120.5, NASA Space Flight Program and Project Management Requirements

Purpose:

To describe the plan for supporting the flight operations of the payload or facility on the International Space Station or other space platform. Also included is the method to provide anomaly resolution support during the mission.

Related Documents:

- PM-06: Contractor Base/Delivery Order Work Plan

Preparation Information:

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 or other space platform resources required during the operations and timeline for usage.
H. Description of any Mission Operations specific software tools required and how they will be maintained.

DUE: As specified in the individual Base / Delivery Order

Title: Launch Site Operations and Test Procedures	**DID No :** OP-04

Reference:

- Launch Vehicle Payload Planning Guides as applicable

Purpose:

(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.

Related Documents:

- OP-01: Integrated Logistics Support Plan (ILSP)

Preparation Information:

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:

A. Description of proposed sequence of ground processing operations
B. Description of proposed facilities, ground support equipment, and personnel required
C. Equipment placement and personnel area requirements
D. Specific operations, procedures, and instructions to integrate, test, and checkout the payload
E. Summary of types of inspection and verification procedures
F. Explanation of schedule and personnel contingency methods
G. Description of roles and responsibilities
H. Summary of specific safety, security reliability, and quality assurance procedures for pre-launch processing including any special requirements for hazardous systems
I. Description of cleanliness methods, purge gasses and lines, and garments
J. Description of anyspecific 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.
K. Description of processing operations required for post-landing

DUE: As specified in the individual Base / Delivery Order

Title: Science and Engineering Data Management Plan	**DID No :** OP-05
Reference: Non applicable	
Purpose: To define the activities, methods, and schedule for obtaining, processing, evaluating the data integrity, archiving, and delivering the science and hardware performance data.	
Related Documents: ▪ OP-02: Operations Handbook	
Preparation Information: 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: A. Introduction B. Mission Description and Objectives C. Facility Overviews - Describe experiment hardware and data gathering equipment D. End-to-End Operational Data Flow - Describe the on-board and ground data flow that will be used during the mission. E. A description of all of the types of mission data. F. 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. G. Archives - Define the data archives that will be used, data to be archived, length of time the data will be stored. H. Experiment/Carrier Relationship I. Roles & Responsibility DUE: As specified in the individual Base / Delivery Order	

Title: Procedures	**DID No.**: OP-06
Reference: ▪ OP-02: Operations Handbook	
Purpose: To provide the user a detailed, step by step set of instructions for operation of the equipment. Operation may include maintenance, calibration, set-up, initialization, change-out, shut-down, restart, tear-down, nominal and off-nominal situations.	
Related Documents: Non applicable	
Preparation Information: Describe all aspects of the activities necessary to operate a particular piece of equipment. The procedure shall include as a minimum: A. Purpose of the procedure. B. Description of participants and their roles and responsibilities involved in the procedure. C. Description of proposed facilities, tools, and other support equipment, as well as material and parts with identification specifications, required to complete the procedure. D. Referenced documentation. E. List of Pre-requisite procedures to have been completed, prior to the start of the procedure. F. Equipment configuration information, (both subject equipment and any interface equipment necessary) including the pre-requisite initial state of equipment. G. Step–by-step instructions to complete the procedure, including interim and final configuration drawings, when appropriate. H. Expected feedback or response of the equipment after each step of the procedure. I. Summary of specific safety, security, reliability and quality assurance requirements, as related to the subject procedure. J. Description of end-state of equipment at the conclusion of the procedure. DUE: As specified in the individual Base / Delivery Order	

Title: Training and Certification Plan	**DID No :** OP-07
Reference: ▪ SSP 41184-01 Multilateral Training Management Plan, Volume 1 ▪ SSP 41184-02 Multilateral Training Management Plan, Volume 2	
Purpose: 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.	
Related Documents: N/A	
Preparation Information: 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: A. Description of participants involved in the training, and their roles and responsibilities. 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. C. Description of proposed facilities, tools, and other support equipment, as well as materials and documentation required to implement the training. D. Description of the certification process (i.e., test administration, attendance, self-test, etc.). E. Description of training flow, including any hierarchical relationships. F. Listing of the detailed training curriculum. G. Detailed discussions of the processes and activities, which will be performed to plan, develop, implement, administer, and track the training and certification requirements. H. Describe the recertification process, if one exists. DUE: As specified in the individual Base / Delivery Order	

Title: Decommissioning/Disposal Plan	**DID No** : OP-08
Reference: ▪ 7120.5 NASA Space Flight Program and Project Management Requirements	
Purpose: Define the end-of-life decommissioning for the project, including hardware, software, and associated documentation. The plan should also define the archiving of the data and final reports required.	
Related Documents: N/A	
Preparation Information: Decommissioning includes final delivery of any remaining project deliverables, disposal of the spacecraft and/or payload and all its various supporting systems, closeout of contracts and financial obligations, and archiving of project/mission operational and scientific data and artifacts. DUE: As specified in the individual Base / Delivery Order	

Title: Operations Concept	**DID No :** OP-09
Reference: Non applicable	
Purpose: To define an operations concept for the project that describes the flight and ground operations.	
Related Documents: ▪ OP-03: Mission Operations Plan	
Preparation Information: 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 DUE: As specified in the individual Base / Delivery Order	