Contract Data Requirements List (CDRL)

November 1, 1999

NASA Glenn Research Center
CLEVELAND, OHIO

SECTION 1 - Contract Data Requirements

1.1   <u>Scope</u>

   a) The Contract Data Requirements List (CDRL) is the basic contractual document, which governs data required by and for the contract.

   b) The contractor shall furnish data described by the Data Item Descriptions (DIDs) included herein and listed on the Contract Data Requirements Lists (CDRLs) for each item of data requested as a deliverable in the Delivery Order.

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

1.2   <u>Contract Data Requirements List (CDRL)</u>

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

   a) The data item number, which corresponds to the data item description number.

   b) The data item title.

   c) The data item approval code defined as follows:

   1. Code A: The initial submission and all subsequent changes require approval of the NASA contracting officer or designee prior to implementation
   2. Code I: Deliverables are sent to NASA for information purposes only. NASA will request changes on deliverables where errors or omissions are noted.
   3. Code S: Document and/or data need not be delivered to NASA but should be made available for information upon request or during surveillance activities.

1.3   <u>Data Items Description</u>

   a) Each data requirement listed on the CDRL is defined by a DID.

   b) 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.

   c) In many DIDs, the contractor shall propose the standard to be used that meets the DID item requirement most cost effectively. Much of the information requested in the DIDs may already exist in your documentation and format processes. The government strongly encourage using your existing documents and formats whenever it will meet the requirements of the DID.

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

1.4   Distribution and Delivery

The contractor shall distribute and deliver data according to contract requirements and provisions. The data shall be delivered to the following address distribution codes as annotated on the DRL:

        A - NASA Glenn Research Center
            MRDOC Contracting Officer
            MS 500-306
            21000 Brookpark Rd.
            Cleveland, OH 44135
        B - Mission Specific Project Office Library
            (Addresses to be supplied with delivery order)

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

        NASA Glenn Research Center
        MRDOC Contracting Officer
        MS 500-306
        21000 Brookpark Rd.
        Cleveland, OH 44135

The following shall be provided for each data item submission:

a) Copy of Record - The Copy of Record is the official file copy submitted in the form in which it is intended to be distributed and marked "Copy of Record" and suitable for reproduction.

b) Copies - The number of printed media copies of each document, if applicable, shall be specified in the delivery order and shall be delivered in a condition suitable for immediate distribution.

c) Electronic Data Delivery - Formats for electronic media delivery are defined in paragraph 1.5 of this CDRL. Delivery of electronic media data items shall occur per the same delivery schedule as printed media.

1.5   Delivery Media

a) There are two media in which data will be documented and are defined as:

    1. Hard Copy - Data typed, drawn or printed on paper by common, conventional practices. By these means, either the original, a reproducible copy or the record copy shall be reproduced for distribution as printed copies.
    2. Electronic - Data that is recorded in word processors, computerized data processing systems, or electronic storage devices such as magnetic tapes, disks and CD-ROM.

b) The electronic data delivery shall be in the following formats:

1. MS Word - The preferred format for word processing documents is in Microsoft Word format that is version 6.0 or higher and is both MS Windows and Mac OS compatible.
2. MS PowerPoint -The preferred format for presentation documents is in Microsoft PowerPoint format that is in version 4.0 or higher.
3. Portable Data Format (PDF) - As an alternative, documents may be delivered via a PDF format that is readable by the latest Adobe Acrobat PDF reader (currently version 3.0).
4. Drawing formats are defined in the appropriate DID.

c) Documentation delivery (in hardcopy or electronic format) shall be as specified in the CDRL. Additionally, all CDRL data which has been generated electronically shall be delivered via electronic transfer or electronic transfer media such as disks

1.6 **Documentation Change Procedures**

a) The contractor shall issue documentation change notices (DCNs) whenever minor changes or updates occur in data items that have been delivered to NASA.

b) Change bars shall be used to indicate changes or updates.

c) When major changes to a document are made a complete revision of the document shall be issued and delivered to NASA in accordance with the original instructions for the data item.

No change bars are used when a document is updated by revision and the DCN numbers for that document shall be automatically recycled to 001.

1.7 **Approval of Documentation**

Any documentation with a requirement for NASA approval shall be in accordance to the following:

a) Within thirty (30) calendar days after receipt of the document and/or data, one (1) copy of each submittal will be returned to the Contractor by the Government marked "Approved", "Disapproved", or "Approved as Noted".

b) Documents returned to the Contractor not fully approved shall be corrected and returned to the Government within thirty (30) calendar days after receipt by the Contractor.

c) In the event that documents or data marked "Approved" or "Approved as Noted" reflect information which is not in full conformance with the contract requirements, the Contractor shall notify the Contracting Officer immediately, since any approval of documents or data is not to be construed as a change in contract requirements.

d) Approval by the Government shall no 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.

No change bars are used when a document is updated by revision and the DCN numbers for that document shall be automatically recycled to 001.

DID #	Title	Submission A/I/S	Media	Dist. Code A	Dist. Code B
CONTRACT DATA REQUIREMENTS LIST					
CONTRACTUAL DATA					
CD-01	Performance Measurement Plan	A	Electronic	✔	
CD-02	Performance Measurement Report	I	Electronic	✔	✔
CD-03	Contractor Financial Management Report	I	Electronic	✔	
CD-04	Automated Information Security Plan	A		✔	
PROGRAM MANAGEMENT					
PM-01	Contractor Project Plan	A	Electronic	✔	✔
PM-02	Risk Management Plan	A	Electronic		✔
PM-03	Software Management and Development Plan	A	Electronic		✔
PM-04	Configuration Management Plan	A	Electronic		✔
PM-05	Engineering Change Proposals (ECPs), Deviations and Waivers	A		✔	✔
PRODUCT ASSURANCE					
PA-01	Product Assurance Plan	A	Electronic	✔	✔
PA-02	System Safety Plan	A	Electronic		✔
PA-03	System Safety Hazard Analysis	S			
PA-04	Fracture Control Plan	I	Electronic		✔
PA-05	Safety Compliance Data Package	A	Electronic		✔
PA-06	Materials Identification and Usage List	A	Electronic		✔
PA-07	Problem Report and Corrective Action	A			✔
PA-08	Failure Mode and Effects Analysis (FMEA) and Critical Items List (CIL)	I			✔
PA-09	EEE Parts List	I			✔
PA-10	Contamination/Cleanliness Control Plan	S			
PA-11	Software Assurance Plan	A	Electronic		✔
PA-12	Safety and Health Plan	A	Electronic	✔	
REQUIREMENTS					
R-01	Systems Requirements Doc.	A	Electronic		✔
R-02	Interface Control Document	A	Electronic		✔
R-03	Payload Interface Agreement & Annexes	A	Electronic		✔
R-04	Software Requirements Document	A	Electronic		✔
R-05	Mission Evaluation Request	I	Electronic		✔
R-06	TSC Requirements Document	A	Electronic		✔

CONTRACT DATA REQUIREMENTS LIST					
DID #	**Title**	**Submission**	**Media**	**Dist. Code**	
		A/I/S		**A**	**B**
	DESIGN				
D-01	Review Presentation Package	I			✔
D-02	Engineering Trade and Analysis Data	S			
D-03	Baseline System Description	A	Electronic		✔
D-04	Product Drawings	I	Electronic		✔
D-05	Accommodations Handbook	A	Electronic		✔
D-06	Software Design Document	A	Electronic		✔
D-07	Requirements Compliance Matrix	A	Electronic		✔
D-08	System Design Document	A	Electronic		✔
	VERIFICATION				
V-01	Verification Plan	A	Electronic		✔
V-02	Individual Item Verification Plan	I	Electronic		✔
V-03	Verification Reports	I	Electronic		✔
V-04	Individual Item Verification Reports	I	Electronic		✔
V-05	Performance Verification Plan	A	Electronic		✔
V-06	Individual Item Perf. Verification Plan	I	Electronic		✔
V-07	Performance Verification Report	I	Electronic		✔
V-08	Ind. Item Performance Verification Report	I	Electronic		✔
V-09	Software Verification and Validation Plan	A	Electronic		✔
V-10	Software Verification and Validation Report	I	Electronic		✔
V-11	Integration Data Package (CoFR)	A	Electronic		✔
V-12	Assembly, Integration, and Test Plan	A	Electronic		✔
V-13	As Built Configured Item List	I	Electronic		✔
V-14	TSC Training & Certification Plan	A	Electronic		✔
V-15	Mission Suitability & Performance Acceptance Plan	A	Electronic		✔
V-16	Mission Suitability & Performance Acceptance Report	A	Electronic		✔

CONTRACT DATA REQUIREMENTS LIST					
DID #	Title	Submission	Media	Dist. Code	
		A/I/S		A	B
	OPERATIONS				
OP-01	Integrated Logistics Support Plan	A	Electronic		✔
OP-02	Operator's Manual	A	Electronic		✔
OP-03	Increment Operations Plan	A	Electronic		✔
OP-04	Launch Site Operations and Test Procedures	I	Electronic		✔
OP-05	Data Delivery Plan	A	Electronic		✔
OP-06	TSC Operations Concept Document	A	Electronic		✔
OP-07	TSC Implementation Plan	A	Electronic		✔
OP-08	TSC Training Manual	A	Electronic		✔
OP-09	TSC Increment Specific Integrated Payload Data Set	I	Electronic		✔
OP-10	TSC Security Plan	A	Electronic		✔

Title: Performance Measurement Plan	**DID No.:** CD-01

Reference:
NFS 1852.242-73 NASA Contractor Financial Management Reporting
Clause F.5 Financial Management Reports for Delivery Order Contracts
Clause F.4 Technical Reports for Delivery Order Contracts

Purpose:
The Performance Measurement Plan will describe the structure and contents that will be utilized to document the current status of contracted activities.

Related Documents:
MRDOC Surveillance Plan
CD-02 Performance Measurement Report
CD-03 Contractor Financial Management Report

Preparation Information
The Performance Measurement Plan shall address how the fixed price and cost portions of the contract will be reported. The plan shall reflect that the FCF and each Delivery Order will get a separate monthly report, and shall describe the date of report submittals, the number of copies, and the preparation process of the contractor.

For FFP, FPIF and CPIF efforts:
The minimum set of data required to be included in the monthly Performance Measurement Report shall consist of:
A) Schedules: i) Project Milestone Schedule, ii) System Level Schedule, iii) Major Concept Level Schedule
B) Technical Accomplishments organized by appropriate WBS level
C) Near Term Activities organized by appropriate WBS level
D) Problems/Issues/Risks/Mitigation Strategies organized by the appropriate WBS level
E) Metric Reports (metrics to be proposed by the contractor)

Performance Measurement:

Each proposed metric should include a definition, source of data, computation approach, desired outcome (what the Contractor hopes to achieve/communicate by the metric), frequency of reporting and period of measurement. These metrics should reflect those normally produced by the contractor for their daily management of their activities.

All financial information shall be submitted in accordance with NPG 9501.2C (ref. NASA Form 533 reports)

Title: Performance Measurement Report	**DID No.:** CD-02
Reference: CD-01: Performance Measurement Plan	
Purpose: To provide a monthly report that will be used to measure the Contractor's progress in completing the activities required by the contract and to also validate progress payments.	
Related Documents: PM-02 Risk Management Plan	
Preparation Information The reports shall contain as a minimum; schedule, technical accomplishments, problems/issues/risks and mitigation strategies, near term activities, and metric reports for measuring Contractor performance. The Monthly Performance Report will be provided in accordance with the Performance Measurement Plan.	

Title: Contractor Financial Management Report	DID No.: CD-03

Reference:
NPG 9501.2C NASA Contractor Financial Management Reporting
Clause F.5 Financial Management Reports for Delivery Order Contracts

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

Related Documents:
CD-01: Performance Measurement Plan
CD-02: Performance Measurement Report

Preparation Information
The report shall be in accordance with the NFS 1852.242-73 entitled "NASA Financial Management Reporting (NASA Form 533 reports)

NPG 9501.2C provides basic requirements and instructions to assist in the preparation of Contractor Financial Management Reports (NASA Form 533 reports). The document information can be found at: http://ifmp.nasa.gov/codeb/library/forms.htm

The NASA Form 533 (NF533) reports provide data necessary for the following:
1. Projecting costs and hours to ensure that dollar and labor resources realistically support project and program schedules.

2. Evaluating contractors' actual cost and fee data in relation to negotiated contract value, estimated costs, and budget forecast data.

3. Planning, monitoring, and controlling project and program resources.

4. Accruing cost in NASA's accounting system, providing program and functional management information, and resulting in liabilities reflected on the financial statements. Cost is a financial measurement of resources used in accomplishing a specified purpose, such as performing a service, carrying out an activity, acquiring an asset, or completing a unit of work or project. NASA is required by law to maintain accrual accounting, which requires cost to be reported in the period in which benefits are received, without regard to time of payment. To facilitate this process, NASA requires its contractors to report accrued costs on NF533 reports on cost type, price predetermination, and fixed-price incentive contracts.

Title: Automated Information Security Plan	**DID No.:** CD-04
Reference: NFS 18-4.470-4(b) Submission of Security Plan for Unclassified Automated Information Resources NPD 2810, NASA Information Technology Security Program. Public Law 100-235, Computer Security Act of 1987.	
Purpose: The purpose of the plan is to describe the management and technical controls required to implement and operate an effective Information Technology (IT) Security process for the MRDOC contract at the Glenn Research Center.	
Related Documents:	
Preparation Information A. This plan shall address the security measures and program safeguards which will ensure that all information systems and resources acquired and utilized in the performance of the contract by contractor and subcontractor personnel are in accordance with NFS 18-4.470-4(b). B. The plan includes procedures and responsibilities for implementing the Information Technology (IT) Security process for the MRDOC contract team. C. The plan complies with all NASA Information Technology (IT) Security and security management regulations applicable to the MRDOC Contract. D. An existing corporate security plan may suffice.	

Title: Contractor Project Plan	DID No.: PM-01
Reference: NPG 7120.5A, NASA Program and Project Management Processes and Requirements	
Purpose: This document provides an integrated overview of the Contractor approach to the Delivery Order or Project. The Contractor Project Plan defines the contractor's approach, technical plan to accomplish the deliverables, defines the management and reporting structure, and the associated schedule and resources requirements. The Contractor Project Plan provides details on the technical task, proposed resources, and applicable requirements necessary to accomplish the Delivery Order or project. It clearly identifies all deliverables and development schedule with associated resources.	
Related Documents: PM-02, Risk Management Plan; PM-03, Software Management and Development Plan; PM-04, Configuration Management Plan; PA-01, Product Assurance Plan	
Preparation Information The following provides the requirements on the content and organization of the Contractor Project Plan. Where detailed planning documents are to be prepared (as defined by the Delivery Order) on specific management functions, this document should refer to them with a summary provide in this document. Some items will be better defined as the project matures.	

1.0   Technical Approach
    1.1   <u>Development Approach</u> - Summary reflecting Contractor proposed, overall approach for implementing the task or project. Describe the overall development approach that includes: interpretation of task requirements; identifying all flight units and test articles, simulators, and support hardware; a flow diagram to clarify development and test approach to be used; key features and/or critical elements; and summary of and rationale for any proposed significant work elements (e.g., specialized test hardware development, engineering hardware development, alternative approach, etc.) believed essential by the Contractor for successful and cost effective implementation of the task but not explicitly called out in the Delivery Order.

        1.2   <u>Technology/Risks</u> - Indicate any feasibility issues or proof-of-concept issues exist that must be taken into account in the development requiring additional testing along with any requirements that offer significant technical challenge or risk of failure.

    1.2   <u>Logistics</u> - Identify where the major project functions, such as hardware build, integration, etc., will take place and describe the special services, vehicles, systems, and major equipment necessary to satisfy the identified logistic requirements. The spares philosophy with quantity anticipated should also be identified.

    1.4   <u>Mission Operations, Training and Data Management</u> - Describe the operations, training, and data management approaches to the extent they are understood at the time. This should also include a summary of the Contractor approach for managing documentation, technical data and data deliverables in the context of the Delivery

Order.

1.5   Safety - Define the ground and mission safety requirements of the project. Safety implications related to implementation of the task should be described with any apparent or implied key flight safety issues.

2.0   Management Approach

1. Organization - Description of organizational elements and specific individuals to be given responsibility for major work elements of the task on the contractor team. Provide an organizational chart of the project that identifies key positions on the project and key external interfaces.

2. Work Breakdown Structure - Description (charts and descriptive dictionary) reflecting the Contractor Work Breakdown Structure (CWBS) for organizing the technical elements and essential support for the Delivery Order; it should be based (primarily) on deliverable hardware/software elements and sub-elements; the level of detail shall be adequate to support the allocation of personnel and costs and to define a logical schedule through design, implementation, delivery and operation phases (as appropriate for the Delivery Order. The CWBS structure should relate to line items on the master schedule and to the resources section.

3. Documentation - Provide a project documentation tree that includes all governing, hardware development, mission integration, and safety documentation.

4. Schedule - Provide an overall project master schedule that is consistent with the CWBS, identifies key milestones for each chosen CWBS element, and is logically phased to address all aspects of the Delivery Order.

2.5   Resources - Specify the funding and personnel requirements needed for the project against the CWBS. Select appropriate CWBS level to be the cost reporting level. Identify any use to be made of other facilities for which another entity will be financially responsible.

Title: Risk Management Plan	**DID No.:** PM-02

Reference:
NPG 7120.5A, NASA Program and Project Management Processes and Requirements (Section 4.3)
NASA Continuous Risk Management Course (http://arioch.gsfc.nasa.gov/302/Risk/RMPage.htm)

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. This document describes the methodologies and processes used to identify, analyze, control and communicate the Delivery Order's risks. The identification, characterization, mitigation plan, and mitigation responsibilities associated with specific risks are described and specific risk abatement strategies or contingency planning processes, are discussed.

Related Documents:
PM-01 Contractor Project 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 Delivery Order and provide government insight to risk management. "Risk" refers to anything that can prevent a team from meeting the Delivery Order objectives. All forms of risk shall be managed. These include technical, programmatic, supportability, cost, and schedule risks.

The Risk Management Plan shall provide descriptions of the processes to provide management at all levels with 1) a disciplined system for early identification of technical uncertainties, 2) a disciplined assessment of current project status, and 3) key indicators of mission success. The plan shall describe the basis for taking action to control risk and for measuring the effectiveness of that action.

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 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 responsibilities, typical milestones/reviews, and describe the key risk control activities.
f.) Communications and documentation – Present in all the above processes, this is the means by which the output of the processes is documented and communicated to all team members.

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) Potential mitigation measure not already taken and the cost to implement them
   (7) Characterization of the risk as acceptable or unacceptable with rationale.

This Plan may be included as part of the Contractor Project Plan (PM-01) or a separate document.

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

Reference:
GRC Software Development Manual;
NASA-STD-2100-91   NASA Software Documentation Standard (NASA-DID-M00 through M700)

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.

Related Documents:
PM-01, Contractor Project Plan; PM-02, Risk Management Plan;
PA-12, Software Assurance Plan; PM-04, Configuration Management Plan

Preparation Information

The Software Management and Development plan shall include as a minimum, if information is provided in an existing plan, then can be included by reference:

The Contractor Software Management and Development Plan shall provide detailed information on relative schedules, activities, resources, and procedures necessary for successful planning and implementation of all software (flight, ground, support). The plan shall also include a description of the needed development environment (equipment and software) as well as the chosen standards, languages, procedures, guidelines, software development lifecycle, techniques, verification approach (including what simulations and/or test environments and resources are needed), and milestones for developing and delivering software, including the support software.

This plan shall include an indication of the control level and types of software to be developed and the corresponding level of development and management activities such as risk management, configuration management, internal and external reviews, problem reporting and corrective actions, training, metrics, software safety and assurance planning including audits, expected verification and validation levels, delivery/installation plans and procedures including the data acceptance package procedure, and internal and external communications and reporting mechanisms.

Title: Configuration Management Plan	**DID No.:**
	PM-04

Reference:
    MIL-STD-973 Configuration Management
    NASA-STD-2100-91 NASA Software Documentation Standard
    ISO 10007 Quality Management - Guidelines for Configuration Management

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

Related Documents:
PM-01 Contractor Project Plan;   PA-01 Product Assurance Plan; PM-03 Software Management and Development Plan, PM-05, Engineering Change Proposals (ECPs), Deviations and Waivers

Preparation Information

The CM plan shall describe the Contractor's configuration management system in terms of applicable requirements, planned implementation methods, configuration verification methods, schedules, and organizational structure (assigned responsibilities), as well as management tools to be used by the Contractor in the execution of this CM effort. 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 Interfaces with oversight and control of work and assurance of integrated configurations (Government and major subcontractors)
c. CM System Description (CM Standards, CM requirements stated or implied in particular, those driven by a flight carrier, Processes, Software CM processes, etc.)
d. 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)
e. Inventory Management (tracks flight equipment, GSE equipment, and other operational support hardware, etc.)

| Title: | DID No.: |
| Engineering Change Proposals (ECPs), Deviations and Waivers | PM-05 |

Reference:
   MIL-STD-973
   GRC Product Assurance Manual (PAI #314)
   Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 8.

Purpose:
 To document proposed changes to Government requirements or deliverables (Engineering Change Proposal) or to request specific authorization to deviate from a particular Government controlled requirement before the fact (Deviation) or accepting a departure from a particular Government controlled requirement after occurrence (Waiver).

Related Documents:
 PM-01 Contractor Project Plan; PM-04 Configuration Management Plan

Preparation Information

Classification of Change Proposals

The Contractor must designate each change proposal as either a Class I or Class II change.

Class I designation is assigned to changes that affect:
  • fit, form, function, external ICDs or physical characteristics (weight, balance, etc) of the end item;
  • NASA approved and controlled documents (as identified in the Delivery Order (e.g., science or engineering requirements) or applicable requirements documentation);
  • contractual cost, schedule or milestones;
  • safety, reliability, maintainability; interchangeability of the affected system or subsystems;
  • change that is associated with a previously accepted and/or delivered End Item;
  • software compatibility;
  • Government Furnished Equipment.

Class II designation is assigned to changes not in the above categories (editorial change is one example of a Class II change).

Documentation of Change Proposals

The Contractor shall document each Engineering Change Proposal (using MIL-STD-973, ECP forms DG 1692 and DD1692-1 as guidelines). This document should describe the applicable requirement, the nonconformance, the reason for and affect of the nonconformance, the proposed corrective action (if any), and the reason(s) for approving the request. In addition to a description of the proposed change, the ECP shall contain sufficient information (as attachments, drawings, test results, etc.) to enable evaluation by NASA (or other oversight auditors) of the total impact of the proposed change.

The Contractor shall log and track each ECP from initiation to final disposition and closure within the

Configuration Control system.

<u>Delivery of ECPs</u>

The Contractor shall deliver each Class I change proposal to NASA for review and disposition. Class II change proposals need not be delivered to NASA but the status and disposition of all ECPs shall be accessible for review by NASA upon request.

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

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

<u>Review and Disposition</u>

Waivers and deviations shall be handled using MIL-STD-973 as a guide. The Contractor shall establish a Change Control Board (Engineering Change Board) to process Class II ECPs and to provide recommendations on Class I ECPs.

| Title: | DID No.: PA-01 |
| Product Assurance Plan | |

Reference:
GRC Product Assurance Manual (PAP #100); Standard Assurance Requirements and Guidelines for Experiments (SARGE).

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-06 Materials Identification and Usage List,
PA-07 Problem Reporting and Corrective Action, PA-12 Software Assurance Plan

Preparation Information
This document will define the contractor's plan to apply relevant assurance principles and techniques to ensure the FCF or Delivery Order will be successfully accomplished and the applicable SARGE requirements will be satisfied. The plan shall include, but not be limited to, the following information:

a) Reliability - A detailed description of how each specified Reliability management, engineering, and EEE parts control task will be performed or complied with in performance of the hardware development.
b) Quality Assurance - Identify all elements of the quality assurance organization, and describe the objectives, implementation policies and procedures, and control systems utilized throughout design, development, fabrication, delivery, and usage to provide quality products and materials.
c) Maintainability - Identify all elements of the maintainability assurance organization, and describe objectives, implementing policies and procedures, and control systems to provide maintainability assurance.

Note that Safety, Materials and Processes, Problem Reporting and Corrective Action, and Software Assurance plans may be included in this plan or prepared as separate documents (see PA-02, PA-06, PA-07 and PA-13) with a Preliminary Plan by RDR and a final plan for NASA Approval at PDR.

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

Reference:
NHB 1700.1 (VI-B) NASA Safety Policy and Requirements Document
NPG 7120.5A - Section 4.6
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 4
GRC Product Assurance Manual (PAI #201)
SSP-30000 Section 9

Purpose:
To define activities for identifying and eliminating or controlling potential hazards. Defines the approach to be used to ensure safety and helps the Government understand how the contractor will comply with applicable safety requirements.

Related Documents:
PA-03: System Safety Hazard Analysis
PA-05: Safety Compliance Data Package
PA-04: Fracture Control Plan

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 SARGE 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.

The plan may be a part of the contractor's Product Assurance Plan (PA-01) or a separate, stand-alone document with the preliminary plan by RDR and a final plan for NASA approval by PDR.

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

Reference:
GRC Product Assurance Manual (PAI #220)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 4.

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

Related Documents:
PA-02 System Safety Plan
PA-05 Safety Compliance 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 (Phase 1) and verify (Phase 2) the hazards identified. The contractor's report format will be acceptable (although it should be compatible with the requirements of the Safety Compliance Data Package) unless specific forms are required by the Safety Review Panel.

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

Reference:
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Sections 3.4 and 4.
SSP-30558 Fracture Control Requirements for Space Station

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 Compliance Data Package

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.

Title: Safety Compliance Data Package	DID No.: PA-05

Reference:
GRC Product Assurance Manual (PAI # 210, #211)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 4.
NSTS/ISS 13830 Payload Safety Review and Data Submittal Requirements
NSTS 1700.7B plus Addendum Safety Policy & Requirements for Payloads Using STS and ISS

Purpose:
Used in conjunction with the Space Shuttle/ISS Phased Safety Review Process. Helps NASA understand how the contractor will comply with applicable safety requirements.   Used to document and defend the identification, control, and verification of all unique safety hazards associated with the installation and operation of the experiment in space.

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 Compliance Data Package will be required for each flight payload deliverable (Space Shuttle, ISS), and the contractor shall use the required reporting format required by the carrier.)

Delivered for NASA review and approval 30 days before required submittal date to NASA JSC or NASA KSC.

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

Reference:
GRC Product Assurance Manual (PAI #630, #632)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 6.

Purpose:
Documents the Materials and Processes required to ensure the safety of the project through the proper selection, application, processing, inspection and testing of the chosen materials for the flight hardware subsystems and equipment.

Related Documents:
PA-01: Product Assurance 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)
Fracture Control
Nondestructive Testing
Contamination Control
Coatings and Finishes
Special Processes (Welding , Bonding, Heat Treatment)

MIUL and MUA:
These documents will identify material usage (MIUL) and justify the use of non-A-rated materials (MUA) in space flight hardware. The contractor's report format will be acceptable, but must contain adequate material identification per PAI #630 and #632 to assist the government in conducting their assessment and issuance of the Material Certification Letter.
The MIUL and MUA's must be delivered to NASA GRC at PDR and subsequent major milestone reviews (30 days prior to PSR)

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.

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

Reference:
GRC Product Assurance Manual (PAI #440)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Sections 7 & 8.
Program Requirement for Payload Developers (SSP 50431)

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 Product Assurance Plan
V-11: Integration Data Package

Preparation Information

The PRACA system shall describe a documented closed-loop problem reporting system for failures and non-conformances. The system shall include documentation of problem, traceability of material or part, disposition of problem, root cause corrective action, segregation of discrepant material, verification of corrective action, and trending to help prevent similar discrepancies. Describe review process including any review boards and the problem report tracking and distribution process.

The problem report should include as a minimum: 1) description of problem; 2) analysis of root cause of problem; and 3) description of corrective action; 4) corrective Action follow-up.

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

(Product Assurance Plan-Preliminary Plan by RDR and a final plan for NASA Approval at PDR.)

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

Reference:
GRC Product Assurance Manual (PAI #412)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 7.

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:
Procedures for Performing an FMEA, GSFC Document S-302-89-01, February 1990.
CR 5320.9, Payload and Experiment Failure Mode Effects Analysis and Critical Items List Ground Rules, MSFC.
MIL-STD 1629A, Procedures for Performing an FMECA, DoD.

Preparation Information

This document will report the results of FMEAs conducted to determine possible modes of failure and their effects on mission objectives and system safety. The contractor shall use listed   references as guides for performing FMEAs.

The Critical Items List will include item identification, cross-reference to FMEA line items, and retention rationale. Appropriate retention rationale may include design failures, historical performance, acceptance testing, manufacturing product assurance, elimination of undesirable failure modes, and failure detection methods.

Title: Electronic, Electrical, and Electromechanical (EEE) Parts List	**DID No.:** PA-09
Reference: GRC Product Assurance Manual (PAI #420, #450) Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 7 & 8. GRC Microgravity Science Division Operating Instruction, OI-6700-4	
Purpose: Provides traceability to EEE parts used in flight hardware; helps assure the Government that the contractor has a system to track and control parts.	
Related Documents:	
Preparation Information This document addresses the usage of EEE parts in flight hardware and facilitates compliance with SARGE and OI 6700-4 "EEE Parts Policy" requirements.	

Title: Contamination/Cleanliness Control Plan	**DID No.:** PA-10

Reference:
JSC SN-C-0005 Contamination Control Requirements
SP-5076 NASA Contamination Control Handbook
MIL-STD-1246B Product Cleanliness Contamination Control Program
Standard Assurance Requirements & Guidelines for Experiments (SARGE) - Section 9
GRC Product Assurance Manual (PAI #612, #615)

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 Product Assurance Plan

Preparation Information

The following items shall be included in the plan:

A) Hardware Control Requirements and design considerations that include surfaces, electrical, optical, and fluids.

B) Facility Requirements and controls

C) Personnel requirements and work area controls

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

| Title: | DID No.: PA-11 |
| Software Assurance Plan | |

Reference:
GRC Software Development Manual
NASA-DID-M400
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 10
GRC Product Assurance Manual (PAI #501)

Purpose:
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.

Related Documents:
PA-01: Product Assurance Plan

Preparation Information

A) This document will define the contractor's plan to apply software assurance principles and techniques to ensure the Delivery Order will be successfully accomplished and the applicable SARGE requirements will be satisfied. The Software Assurance Plan may be part of the Product Assurance Plan (PA-01) or written as a stand-alone document for each task. The Contractor shall use the above references as a guide to preparing this document.

(Note that a Software Assurance Plan will be required for each space flight payload deliverable.)

Preliminary Plan by RDR with a Final Plan for NASA Approval by PDR.

Title: Safety and Health Plan	**DID No.:** PA-12
Reference: GRC Safety Manual GRC Environmental Manual	
Purpose: To identify all hazards related to tasks to be performed at NASA Glenn Research Center and the corrective action plan to prevent any mishaps. In addition, it should describe the process to ensure regulatory compliance with safety and health regulations.	
Related Documents: 29 CFR 1910	
Preparation Information This document will identify the potential hazards to all employees, equipment and property while tasks are performed at NASA Glenn Research Center. The document should provide the processes to be used to mitigate these hazards and to prevent any mishaps while the tasks are in progress. In addition, it should describe the process to ensure regulatory compliance with safety and health regulations. The Safety and Health Plan will cover the contractor's personnel and tasks and the personnel and tasks of its subcontractor's. The contractor will provide the Safety and Health Plan as part of the submittal to the RFP. Glenn Safety Manual, Chapter 17, Appendix A provides guidance on the contents of a safety and health plan.	

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

Reference:
SSP-41171 International Space Station Program; preparation of program, unique specifications

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 experiment that includes interface requirements between the payload and carrier by reference or inclusion.

Related Documents:
R-02 Interface Control Document; R-05 Software Requirements Document

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 a minimum:

a) Missions – Life cycle, operations, crew resources.
b) Science Requirements – as they pertain to capability of hardware provided.
c) Reliability – Failures Modes Effects Analysis (FMEA), Parts Stress Analysis (PSA), Worst Case Analysis, Reliability Models/Predictions, Limited-Life Items, Problem Report and Corrective Action (PRACA)'s.
d) Mechanical Environment – Vibration, shock, acceleration, noise.
e) Thermal Environment – flight environment (on-orbit cabin temp, Ascent/Descent temp/press, surface temp), atmospheric pressure.
f) EMI/EMC Environment
g) Radiation Environment
h) Operations
i) Mechanical Design Requirements
j) Interface Requirements – Thermal, electrical power, command/data handling, Ground Support Equipment (GSE)
k) Induced Environment – natural and experiment
l) Operational Requirements
m) Material Controls – off-gassing, flammability, stress corrosion cracking, materials selection, process selection, fracture control
n) Contamination and Cleanliness
o) Configuration Control Safety – Safety compliance, verifications (flight & ground handling)
p) Quality Assurance (including Software Product Assurance)

Title: Interface Control Document (ICD)	DID No.: R-02

Reference:

SSP57000, Pressurized Payload Interface Requirements Document (ISS Only)

SSP57001, Pressurized Payload Interface Control Document Blank Book (ISS Only)

Purpose:

To coordinate and control all interfaces between the payload and the carrier and the ground data system to provide efficient electrical and mechanical integration. The physical, functional, and environmental design implementation associated with experiment safety and interface compatibility are also included. The interfaces defined in this document apply to transportation, ground integration, and on-orbit phases of the payload mission cycle.

Related Documents:

R-01 System Requirements Document

Preparation Information

The document shall provide detailed information regarding the payload interface to the carrier. The data provided by the payload/ instrument, in the form of written words, drawings, and schematics, will be incorporated into this combined payload and carrier ICD for applicable signatures.

The payload to carrier interface is defined per the following topics as a minimum:

A. <u>Physical Requirements</u> - such as mass properties, structural/mechanical, carrier interfaces during launch and landing, on-orbit carrier interfaces, footprint, clearance envelope, drill template, alignment, orientation, fields-of-view (optical, thermal, glint, RF), including tolerances; electrical connectors regarding sex (plug or receptacle), type, orientation, pin assignments, clocking and backshell type, cable locations/runs; thermal control coatings, blankets, heat flow and operating limits; microgravity quasi-steady state and transient sources.

B. <u>Electrical Power and Signals</u> - such as timing clock pulses, data busses, signal (name, type, function), voltage and current limits, frequencies, waveforms, rise and fall time, duration, periodicity, shielding, grounding, formats, line driver/receiver characteristics. Power fusing, voltage, currents, ripple, regulation, power quality, power handling capability, source impedance limits, remote power controller overload limits, electrical power consuming equipment.

C. <u>Software</u> - such as codes, processors, memory storage, application description, uses, data transfer and command protocols.

D. <u>Payload Environmental</u> - such as vibration, shock, acoustic, EMI/EMC, ESD, thermal, contamination, purges, air and water-cooling, pressure/vacuum.

E. <u>Safety</u> - such as pyrotechnics, energy storage, trip-over, hazardous materials or processes, fire detection and suppression, gas interface, ionizing radiation, air and water thermal control.

F. <u>Ground Support Equipment</u> - such as mechanical, electrical, test specific, targets, simulators.

G. <u>Ground System Interface</u> - Data formats, communications protocols, data rates; compression algorithms, error detection and correction schemes; antenna patterns, EIRP, G/T, beam width, frequency, polarization; command and telemetry formats; scenarios for data transmission, operations, maintenance; number and types of downlinks.

H. <u>Operational Factors</u> - 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. <u>Training Simulators</u> – crew training

Show sufficient detail on both sides of each interface to provide a clear picture of the resultant mated interface. For example, electrical interfaces should be presented to schematic detail (logic elements and piece parts) to the point where impedance and transfer characteristics no longer affect the interface.

Title: Payload Interface Agreement (PIA) and Annexes	DID No.: R-03

Reference:
SSP-52000-PDS Payload Data-Sets Blank Book [Page includes approved Rev A and Draft Rev B for internal review]
SSP-52000-PIA-PRP Rev A: Payload Integration Agreement Blank Book for Pressurized Payloads
PIA Blank Book for Fluids Combustion Facility

Purpose:
To develop a unique Payload Integration Agreement (PIA) for International Space Station (ISS) facility class and rack level pressurized payloads. The PIA is the Payload Developer (PD) and International Space Station Program (ISSP) agreement on the responsibilities, tasks and requirements that directly relate to the assignment and integration of the payload into the ISS. The PIA further defines the roles and responsibilities, technical requirements, and integration schedules to launch, operate, and return an ISS pressurized payload.

Related Documents:
R-02 Interface Control Document

Preparation Information

The PIA for ISS payloads shall be developed, in accordance with SSP-52000-PIA-PRP, with three separate parts as follows: main volume, the addendum, and the data sets. The main volume of the PIA describes the static requirements and the general roles and responsibilities of the parties involved in the integration and de-integration, prelaunch and post-landing processing, transportation and the on-orbit operation of the payload. More specifically, it contains information pertaining to specific reviews, schedules, hardware commitments and protocols required to manifest the payload. The addendum documents the tactical parameters, dynamic requirements, schedules, and commitments associated with specific transportation flights and on-orbit increment operations. Information in the addendum will be provided for each increment while the payload is on-orbit. Finally, the data sets contain the engineering, integration, and operational details required and agreed upon by the implementing organizations. Data sets define, on an increment and flight-specific basis, the engineering, integration and operational details of the requirements in the Addendum. Data sets will be updated, as agreed to by the implementing organizations, to meet increment and flight-specific needs. For details of the payload integration processes, see SSP 50200-01, Station Program Implementation Plan, Volume 1: Space Station Program Management Plan through SSP 50200-10, Station Program Implementation Plan, Volume 10: Sustaining Engineering.

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

Reference:
NASA STD 2100-91 (NASA Software Documentation Standard)
NASA STD 8719.13A (Software Safety NASA Technical Standard)
IEEE 12207 Software Development Standards
SSP 52050, ISPR to ISS Software Interface Control Document, Part 1
SSP 57002, Payload Software Interface Control Document Template

Purpose:
This document specifies in detail the requirements of the system Computer Software Configuration Item (CSCI). It includes the function and performance, interfaces, and qualification requirements.

Related Documents:
D-06 Software Design Document; R-01 System Requirements Document

Preparation Information
The Software Requirements Document defines the specific requirements to be satisfied throughout the implementation of the software requirements for the system CSCI. The information contained within the document provides the technical requirements to be implemented by the CSCI and enables the development team to assess whether or not the completed CSCI complies with the requirements of the system. The data included in this document provides the criteria for acceptance of the integrated software configuration. The document shall provide detailed information regarding the payload software per the following topics as a minimum; Flight Experiment Commanding Software, Diagnostics Software, Crew Interface Software, Ground Control Software, Experiment Monitoring Software, Safety and Reliability Software (e.g. fail safe, fault tolerance), Communication Interface Software, Software Simulation (check software without hardware), and Ground-based experimentation Software.

A general organization of the document is outlined below and should be used as a guideline only:
A. Introduction
B. Applicable Documents   [List of documents referenced in the document]
C. Requirements   [List all system functional and performance requirements]
D. Qualification Requirements   [Describes qualification requirements necessary to establish that the above requirements have been met]
E. Notes
F. Appendices
G. Glossary   [Acronym list and definition of terms]

Title: Mission Evaluation Request (MER)	DID No.: R-05
Reference:	
Purpose: For the Space Station Payloads Office (at JSC) to gather information on specific payloads for strategic planning purposes. A MER will be requested for submittal to the program. The MER will contain preliminary payload requirements that includes but is not limited to the following: (1) outfitting mass and volume, (2) steady state per run resources, accommodations and supporting services, and (3) scale of payload development with an operations concept.	
Related Documents: R-03 Payload Interface Agreement (PIA) and Annexes	
Preparation Information The intent of the Mission Evaluation Request is to gather payload information to characterize transportation, accommodations and operation information for strategic planning purposes. Access Form via: http://iss-www.jsc.nasa.gov/ss/issapt/payofc/OZ2/ppwg.html	

Title: TSC Requirements Document	**DID No.:** R-06
Reference: International Ground Segment Specification (IGSS) (SSP-54500)	
Purpose: To document the top-level TSC and user requirements.	
Related Documents: 	
Preparation Information Suggested contents: A. Introduction/Scope B. References C. Requirements for each system D. Audio E. Video F. Telecommunications G. Videoconferencing H. Data I. Networking J. Timing K. Ground track L. Facility M. Security N. Training and certification 	

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

Title: Engineering Trade and Analysis Data	**DID No.:** D-02

Reference:

Purpose:
This report documents the trades and engineering analysis performed during the design stages of the project. Alternative approaches will be captured for possible future use during the development of the project. The analysis data may also be required to provide the carrier and ground system teams with payload interface data, models, and analysis needed to assist them in their designs and preparations to support the payload for launch and mission operations.

Related Documents:
R-03 Payload Interface Agreement & Annexes

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 include the trade off factors considered such as, affordability, technology, operations, infrastructure, content, risk, and potential procurement strategies. The results of the systems analyses and lifecycle costing analysis shall be included in this trade study report. Trade study results of risk assessment shall be included in this report if performed.

The contractor shall provide to the carrier developer and ground system team the required external interface information (data, models, and analysis) for the development of the payload or ground system per the carriers interface requirements. This shall include as a minimum:

A. Reduced finite element models

B. Structural analysis

C. Thermal models analysis

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

Reference:
AFMC Pamphlet 800-62

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 BCD, and then the BSD, is the single, authoritative summary document that describes the primary system functions and the technical solutions that defines the system and the interrelationships.

Related Documents:
R-01 System Requirements Document; R-02 Interface Control Document;
D-05 Accommodations Handbook

Preparation Information
The Baseline Concept Description (BCD) is utilized in the formative (prior to PDR) development of the system that provides an overall description in an easily understood format used by the team and the Government as a communication tool, and as a point of departure for briefings, studies and cost estimates. The document begins as a brief record or overview of the system utilization environments, requirements, boundaries, constraints and general concepts, and evolves, in parallel with system development, into a more complete, formal structure.

The Baseline System Description (BSD) document evolves from the BCD, and documents the overall system design that meets the system requirements and grows in depth as details of the system matures. A general organization of the document is outlined below and should be used as a guideline only. In preparing a BCD/BSD for a specific system, the document must reflect the requirements of that project being documented:

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.

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

Reference:
Mil-Spec DOD-D-1000B
ISO 10303 Standard for the Exchange of Product model data

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:

Preparation Information

The product drawings shall be prepared and furnished in accordance with establish drawings standards of ISO-9001 or Military Specification DOD-D-1000B or equivalent. Contractor code identification and documentation numbers will be used, unless otherwise specified in the Delivery Order. An electronic version of the drawings shall be provided to the Government unless otherwise stated in the Delivery Order. The electronic drawing (model) shall be provided to the Government in native format. If the Government does not have appropriate software to access the native format an equivalent DXF or STEP interchange format will be required.

The product drawings and associated lists shall provide engineering definition sufficiently complete to enable a competent manufacturer to produce and maintain quality control of item(s) to the degree that physical and performance characteristics are interchangeable with those of the original design without recourse to additional design data.

The product drawing types shall include, as applicable, parts list, detail and assembly drawings, interface control data, diagrams, performance characteristics, critical manufacturing limits, and details of new materials and processes. The product drawings shall include detail processes, i.e., not published or generally available to industry, when essential to design and manufacture; performance ratings; dimensional and tolerance data; critical manufacturing assembly sequences; input and output characteristics; diagrams; mechanical and electrical connections; physical characteristics, including form and finish; details of material identification; inspection, test, and evaluation criteria; necessary calibration information; and quality control data.

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

Reference:

Purpose:
This document provides the user of a facility or module as 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 Control Document
D-03 Baseline System Description

Preparation Information

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

A general organization of the document is outlined below and should be used as a guideline only:
1. Introduction
2. Applicable Documents
3. General Description of the System
4. Accommodations/Resources/Capabilities
5. Interfaces (Mechanical, Electrical, Software, Fluids, Optical, etc.)
6. Support Equipment and Facilities
7. Operating Environments
8. Integration & Verification Requirements/Services
9. Training & Operations
10. Safety Requirements

Items that should be covered in this document within the outline include:
  - Auxiliary equipment provided to the user (when applicable; e.g., facility-provided diagnostic subsystems, standard containers, shipping containers, ground terminals, etc.)
  - General user design requirements and guidelines (e.g., materials constraints/controls, EMC

specifications, environmental test guidelines, etc.)
- Required activities related to user integration and operation of the system (e.g., ground test and prelaunch 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

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

Reference:
GRC Software Development Manual; NASA-STD-2100-91   NASA Software Documentation Standard (NASA-DID-M00 through M700) NASA STD 8719.13A (Software Safety NASA Technical Standard) IEEE 12207 Software Development Standards

Purpose:
This Software Design Document (SDD) is the top-level CSCI design document that describes the functional requirements, interface design, data requirements and architectural design of the system CSCI in sufficient detail to permit coding of the software.

Related Documents:
R-02 Interface Control Document; R-04 Software Requirements Document

Preparation Information
This document establishes the structure and organization of the systems Computer Software Configuration Item (CSCI); allocates the CSCI functions specified in the applicable Software Requirements Document and Interface Control Document to preliminary Computer Software Components (CSC) of the CSCI; and defines the internal and interface requirements of each CSC. A general organization of the document is outlined below and should be used as a guideline only: A. Introduction B. System Overview   [Purpose of the system and the software] C. Applicable Documents   [List of documents referenced in the document] D. Design Approach and Tradeoffs   [Describes rational for major decisions affecting the design] E. Design Model   [Interaction Diagrams & Coding notes related to compiler options & problems] F. Computer Software Components [Subsection on each Computer Software Component] G. Cross Reference to Software Requirements Document   [Table which traces each requirement into a specific CSC paragraph number in this document] H. Notes I.   Appendices J. Glossary   [Acronym list and definition of terms] K. Index Preliminary version at PDR; Code-To version at CDR.

Title: Requirements Compliance Matrix/Hardware Capabilities Document	**DID No.:** D-07
Reference:	

Purpose:
The system requirements matrices document shall show the derivation of requirements from their source, hardware and software compliance to the requirements, and the hardware capabilities to meet the requirements. The document also notes any deficiencies between hardware capabilities and the science requirements. The document also records any waivers that are granted in cases where the hardware cannot meet the science requirements and the rationale for granting the waivers.

Related Documents:
R-01 System Requirements Document; D-03 Baseline System Description

Preparation Information

The system Requirement Compliance Matrix or Hardware Capabilities Document shall contain the external (science, carrier, operations, safety and quality) requirements, derived requirements, system requirements, subsystem, and component requirements. The relationships of each requirement to its source requirement(s). The hardware and software compliance based on the current design shall be documented with compliance, noncompliance, and other appropriate indications based on the requirements. The document should also define any deficiencies between hardware capabilities and the requirements. The document also records any waivers that are granted in cases where the hardware cannot meet the science or carrier requirements and the rationale for granting the waivers.

Title: System Design Document	**DID No.:** D-08

Reference:

Purpose:
The System Design Document (SDD) is the top-level design document that describes the functional requirements, interface design, data requirements and architectural design of the system in sufficient detail to permit development or procurement of the subsystem elements.

Related Documents:
R-02 Interface Control Document; R-06 TSC System Requirements

Preparation Information
This document establishes the structure and organization of the systems and sub-systems; allocates the functional requirements specified in the applicable Requirements Document and Interface Control Document to sub-systems and or elements of the sub-system; and defines the internal and interface requirements of each subsystem.

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

A. Introduction
B. System Overview   [Purpose of the system and the software]
C. Applicable Documents   [List of documents referenced in the document]
D. Design Approach and Tradeoffs [Describes rational for major decisions affecting the design]
E. Sub-system design description [Subsection on each sub-system]
F. Cross Reference to System Requirements Document   [Table which traces each requirement into a specific sub-system paragraph number in this document]
G. Notes
H. Appendices
I. Glossary   [Acronym list and definition of terms]
J. Index

Title:	DID No.: V-01
Verification Plan	

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

Purpose:
The plan shall provide an overall approach to payload verification and summarize all applicable payload interface, carrier and safety requirements that are imposed to the payload developer and describe the methodology that will be used to verify successful implementation of them.   Sources would include, but not be limited to, the International Space Station (ISS), the Glenn Research Center (GRC), and the payload carrier (e.g., Shuttle, FCF, EXPRESS, sounding rocket).

Related Documents:
Individual Item Verification Plan (V-02); Verification Report (V-03)
Assembly, Integration, and Test Plan (V-12); System Requirements Document (R-01)
Interface Control Document (R-02); Payload Interface Agreement (R-03)

Preparation Information
Overall, the plan should reflect an integrated system for identifying, displaying, and tracking the verification activities. The Verification Plan shall cover ground and on-orbit verifications. Analysis, inspection, test, or a combination of those methods shall be used to verify successful implementation of each relevant requirement. It should be made consistent with higher-level (carrier) requirements for formatting and delivery. NASA Documents JA-061 and JA-081 describe verification documentation requirements, and may be used as a verification plan guide.

The Verification Plan shall provide a summary for each individual interface and safety requirement that includes a description of the following: applicability to the payload, the method(s) by which the requirement will be verified, a brief outline of how the method(s) will be implemented, when and where the requirement will be verified, unique oversight/approval needs (e.g., science investigator, Astronaut, and/or Government personnel), applicable references, applicable standards and any other information relevant to the verification.

The Verification Plan may include payload performance requirements (and other requirements derived by the payload developer) that are unique to the payload (e.g., scientific performance requirements, engineering performance requirements derived from science requirements) or be placed in a separated document, Performance Verification Plan (V-05).

Title: Individual Item Verification Plan	DID No.: V-02
Reference: SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)	
Purpose: For a given verification requirement found in the Verification Plan (V-01), provide a detailed, step-by-step plan to perform the verification.	
Related Documents: Verification Plan (V-01); Verification Report (V-03) Individual Item Verification Report (V-04); Assembly, Integration, and Test Plan (V-12)	
Preparation Information For each individual applicable interface and safety requirement identified in the Verification Plan (V-01) provide a detailed step-by-step plan (set up much like a checklist) to accomplish the verification. These step-by-step plans shall be entirely consistent with the information in the standardized forms and table found in the Verification Plan (V-01). They shall be of a common format with the other Individual Item Verification Plans (V-02). Each plan shall include drawings, graphics, tables and other information that is applicable to conducting the verification and interpreting the results. A given requirement may require two detailed plans -- one for pre-launch verification and one for on-orbit verification. The plan shall be written and structured to facilitate quality assurance surveillance activities during verification activities.	

Title: Verification Report	**DID No.:** V-03
Reference: Mandatory: SSP-57010 Pressurized Payloads Generic Payload Verification Plan (ISS Only)	
Purpose: For the applicable verification items identified in the Verification Plan (V-01), summarize the overall verification results for the payload hardware and software. The summary shall be entirely consistent with the results provided in the Individual Item Verification Reports (V-04).	
Related Documents: V-01 Verification Plan; V-02 Individual Item Verification Plan V-04 Individual Item Verification Report; V-12 Assembly, Integration, and Test Plan	
Preparation Information The Verification Report shall summarize the results of the verification activities, notes issues, and makes recommendations. The content and outline should be similar to the Verification Plan (V-01) and summarize the information from the Individual Item Verification Reports (V-04).	

Title: Individual Item Verification Report	**DID No.:** V-04

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

Purpose:
For a given verification requirement found in the Verification Plan (V-01) and per the related Individual Item Verification Plan (V-02), document in detail the results of verification activities. Such data will be used to demonstrate compliance with applicable requirements.

Related Documents:
Verification Plan (V-01)
Individual Item Verification Plan (V-02)
Verification Report (V-03)
Assembly, Integration, and Test Plan (V-12)

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)
- 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 Plan, V-02).
- 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.

Title: Performance Verification Plan	**DID No.:** V-05

Reference:

Purpose:
Identify applicable payload performance requirements (and other requirements derived by the payload developer) that are unique to the payload (e.g., scientific performance requirements, engineering performance requirements derived from science requirements) and describe the methodologies that will be used to verify and validate their successful implementation.

Related Documents:
Individual Item Performance Verification Plan (V-06); Performance Verification Report (V-07)
Individual Item Performance Verification Report (V-08); Assembly, Integration, and Test Plan (V-12)
System Requirements Document (R-01)

Preparation Information
Document similar in format to Verification Plan (V-01) and emphasizes verification and validation of functionality (i.e., does the hardware/software perform the functions it was intended to perform). Overall, the plan should reflect an integrated system for identifying, displaying, and tracking the verification activities. NASA Documents JA-061 and JA-081 describe similar verification documentation requirements and may be used as a verification plan guide.

Analysis, inspection, test, or a combination of those methods shall be used to verify successful implementation of each relevant requirement. All verifications shall be completed prior to launch of hardware or launch/upload of software. Some verifications may have to be repeated on-orbit.

The Performance Verification Plan shall provide a summary for each individual performance requirement (e.g., temperature measurement accuracy) provide a description of the following: applicability within the subject payload, the method(s) by which the requirement will be verified, a brief outline of how the method(s) will be implemented, when and where the requirement will be verified, unique oversight/approval needs (e.g., science investigator, Astronaut, and/or Government personnel), applicable references, applicable standards, and any other information relevant to the verification.
The Performance Verification Plan shall be an addition to the Verification Plan and not duplicate items already covered by the Verification Plan (V-01) or may be made part of the Verification Plan.

Title: Individual Item Performance Verification Plan	**DID No.:** V-06

Reference:

Purpose:
For a given verification requirement found in the Performance Verification Plan (V-05), provide a detailed, step-by-step plan to perform the verification.

Related Documents:
Performance Verification Plan (V-05); Individual Item Performance Verification Report (V-08)
Performance Verification Report (V-07); Assembly, Integration, and Test Plan (V-12)

Preparation Information
For each individual applicable performance requirement identified in the Performance Verification Plan (V-05) provide a detailed step-by-step plan (set up much like a checklist) to accomplish the verification. These step-by-step plans shall be entirely consistent with the information in the standardized forms and table found in the Performance Verification Plan (V-05). They shall be of a common format with the other Individual Item Performance Verification Plans. Each plan shall include drawings, graphics, tables and other information that is applicable to conducting the verification and interpreting the results. A given requirement may require two detailed plans -- one for pre-launch verification and one for on-orbit verification.

The plan shall be written and structured to facilitate quality assurance surveillance activities during verification activities.

Title: Performance Verification Report	**DID No.:** V-07
Reference:	

Purpose:
For the applicable verification items identified in the Performance Verification Plan (V-05), summarize the overall verification results for the payload hardware and software. The summary shall be entirely consistent with the results provided in the Individual Item Performance Verification Reports (V-07). The report shall be subject to government review and approval.

Related Documents:
Performance Verification Plan (V-05)
Individual Item Performance Verification Plan (V-06)
Individual Item Performance Verification Report (V-08)
Assembly, Integration, and Test Plan (V-12)

Preparation Information

The Verification Report shall summarize the results of the performance verification activities, notes issues, and makes recommendations. The content and outline should be similar to the Performance Verification Plan (V-05) and summarize the information from the Individual Item Performance Verification Reports (V-08).

Title: Individual Item Performance Verification Report	**DID No.:** V-08

Reference:

Purpose:
For a given verification requirement found in the Performance Verification Plan (V-05) and per the related Individual Item Performance Verification Plan (V-06), document in detail the results of verification activities. Such data will be used to demonstrate compliance with applicable requirements.

Related Documents:
Performance Verification Plan (V-05); Individual Item Performance Verification Plan (V-06)
Performance Verification Report (V-07); Assembly, Integration, and Test Plan (V-12)

Preparation Information
Each Individual Item Verification Report shall describe the performance 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)
- 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 Performance Verification Plan, V-06).
- 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.

Title: Software Verification and Validation Plans	**DID No.:** V-09

Reference:
IEEE-12207 Software Engineering Standards (where applicable)
Software Engineering Institute Capability Maturity Model

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.

These documents parallel V-01, V-02, V-05, and V-06 in scope, content, and level of detail. In general, the software verification and validation plans support and supplement documents V-01, V-02, V-05, and V-06.

Related Documents:
V-01, V-02, V-05, V-06
Software Verification and Validation Reports (V-10)
Assembly, Integration, and Test Plan (V-12)

Preparation Information

Analysis, inspection, test, or a combination of those (and other software unique) methods shall be used to verify successful implementation of each relevant software requirement. All verifications shall be completed prior to launch of hardware or launch/upload of software. Some verifications may have to be repeated on-orbit.

Preparation of Software Verification and Validation Plan (V-09) documents shall be in accordance with the applicable standards and in accordance with the software development process being used. To the extent possible, software verification and validation documents should maintain a similar appearance and format to DIDs V-01, V-02, V-05, V-06 as applicable.

These documents do NOT duplicate items in V-01, V-02, V-05, V-06 except when such duplication adds clarity. At the option of the contractor, software verification and validation plans may be folded into the V-01, V-02, V-05, V-06 documents because verification may often involve interaction of both hardware and software.

Title: Software Verification and Validation Report	DID No.: V-10
Reference: IEEE-12207 Software Engineering Standards (where applicable) Software Engineering Institute Capability Maturity Model	
Purpose: Provides a summary of verification results for the applicable software verification items identified in the Software Verification and Validation Plans (V-09).	
Related Documents: V-03, V-04, V-07, V-08 Software Verification and Validation Plans (V-09) Assembly, Integration, and Test Plan (V-12)	
Preparation Information The Software Verification and Validation Report shall summarize the results of the software verification and validation activities, notes issues, and makes recommendations. The content and outline should be similar to the Software Verification and Validation Plan (V-09). These software documents do not duplicate items in V-03, V-04, V-07, V-08 except when such duplication adds clarity. At the option of the contractor, software verification and validation reports may be folded into the V-03, V-04, V-07, V-08 documents because verification may often involve interaction of both hardware and software.	

Title: Integration Data Package (Certificate Of Flight Readiness)	**DID No.:** V-11

Reference:
GRC Product Assurance Manual (PAI #332)
SSP 52054 - ISSP Payloads Certification of Flight Readiness Implementation Plan, Generic (ISS Only)
Standard Assurance Requirements and Guidelines for Experiments (SARGE) - Section 8

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 to V-10 Applicable Verification Documentation; V-12 Assembly, Integration and Test Plan

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-Build Configuration
   e) Waiver/Deviation Records (affecting integration, safety)
   f) Failure Reports/Corrective Action Record
   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

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.

Title: Assembly, Integration, and Test Plan	**DID No.:** V-12
Reference:	

Purpose:
This plan documents the Contractor's approach for the flight system assembly, integration and test that leads to a fully integrated, documented, configuration controlled flight article. The plan also provides the overall approach to integration into the carrier, and associated testing.

Related Documents:
V-01 through V-11 Applicable Verification Documentation

Preparation Information
The contractor shall provide a definitive overall plan for the payload assembly, integration, in process testing, and final testing which identify the scope, purpose, configuration, sequence (test flow), and success criteria. The plan shall describe the process for coordinating the flow (fabrication and assembly), integration (from piece parts to sub-assemblies through full system), and test (as appropriate, subsystem tests, full system tests, functional tests, and environmental tests). The plan should be consistent with verification documentation and should reference the specific verification activities described in those documents, as appropriate. The plan shall also describe the COFR activities required by the carrier. The minimum integration and test activities the plan shall address for relevant subsystem, system and final assembly level activities are the following:
- Payload Assembly & Integration (mechanical &electrical integration, performance tests)
- EMI/EMC/ESD Test (conducted and radiated)
- Optical and Mechanical Alignments
- Flight Payload to Carrier Attach Fitting Integration
- Mass Properties Measurements
- Vibration Test
- Acoustics Test
- Shock Test
- Toxic Off-gassing
- Thermal Vacuum Test
- Thermal Balance Test
- Cleanliness, Control and Monitoring
- End-to-End Functional Tests
- Final Comprehensive Performance Tests and Acceptance Tests

Title: As Built Configured Item List	**DID No.:** V-13

Reference:

Purpose: To document the component items that make up the delivered payload. To be used to (1) determine if a latent problem is in the payload as discovered from elsewhere in the industry and (2) to help evaluate on-orbit performance problems issues should any arise.

Related Documents:

Preparation Information

The subject list should include all of the components contained in the payload and provide the following information for each item as a minimum:

- Name/Nomenclature

- Item number

- Serial number

- As built drawing number, including latest revision letter and change notice

- Location in the system

- Note any approved deviations or waivers affecting the installed configuration item

- Applicable supporting remarks

Title: TSC Training & Certification Plan	**DID No.:** V-14
Reference: Ground Support Personnel Training and Certification Plan (MSFC-PLAN-2848)	
Purpose: To define the ground support personnel training and certification process for both payload developers (users) and TSC facility operations staff to support the ISS CoFR process	
Related Documents:	

Preparation Information

This document should contain, as a minimum:

A. Training and Certification process
B. Training course work and required material
C. Progress reviews
D. Certification evaluations
E. Increment specific certification
F. Certificates
G. Requirements to maintain certification
H. Re-certification
I. De-certification
J. Appeal process

Title: Mission Suitability & Performance Acceptance Plan	DID No.: V-15

Reference:

Purpose:
Describes how the delivered system (including hardware, software, ground equipment, operational procedures, and other items comprising the system) is fully suitable for its intended mission and will meet its performance criteria and/or success criteria. Successful completion of the activities described in the plan should lead to formal, final Government acceptance of the system.

Related Documents:
V-01 to V-10
Mission Suitability & Performance Acceptance Report (V-16)
Assembly, Integration, and Test Plan (V-12)

Preparation Information

The *Mission Suitability & Performance Acceptance Plan* shall describe how the contractor will use "in-situ" operational tests, verification tests, other information, analyses to confirm that the deployed system is (or will be) fully suitable for its intended mission and will meet its performance criteria and/or success criteria. The plan's overall emphasis shall be on the technical purpose of the testing and the logic of how the combined results will prove mission suitability and performance. The details of the testing shall be contained in V-01, V-02, V-05, V-06, and V-09. The scheduling and integration of the testing and other acceptance activities into the overall assembly and physical integration process should be presented in the *Assembly, Integration, and Test Plan*.

Background regarding the scope of the work/tasks related to the plan follows below:

- Mission suitability criteria, performance criteria, mission success criteria, and/or operational scenarios shall be baselined (with Government approval) by a negotiated date nominally 60 to120 days after PDR or ATP. The system shall be produced to meet the suitability, performance, and success criteria and perform the scenarios; this implies that some system hardware/software features may be incorporated to facilitate cost effective acceptance testing.

- "In-situ" operational tests are central to achieving formal final Government acceptance of complex systems. Early in the system development, operational scenarios that, if successfully conducted, would confirm mission suitability and performance shall be developed. For example, per IEEE-12207, a software "Concept of Operations" document containing such scenarios would be developed during software requirements formulation. In a similar vein, scenarios encompassing the entire system hardware and software mission suitability and performance shall be developed for the system being produced. As the system is produced, the scenarios would be revised, made more detailed, and adjusted to the reality of the system being produced (changes to the baseline scenarios would be subject to formal configuration management practices). Moreover, the system would be designed to permit cost effective conduct of all acceptance activities.

- Ultimately, after the system has been installed (e.g., for on-orbit systems, in the ISS or in an ISS facility such as FCF), one or more of the scenarios would be conducted to demonstrate suitability and performance. In the case of PI hardware, the scenario could be the successful conduct of an experiment. In the case of FCF, the scenario could be the installation, successful operation, and de-installation of a real experiment and associated ground operations. Relevant data would be taken (along with the scientific data) to establish the system suitability and performance. The forgoing operational tests would each require its own detailed test plan that would be referenced in the *Mission Suitability & Performance Acceptance Plan*.

- For flight hardware, it is expected that prior to shipment to KSC, the scenario(s) planned for the in-situ on-orbit tests would be fully simulated (e.g., mission simulation) on the ground (to the extent feasible), and the resulting suitability and performance data would be fully evaluated. Successful completion of the ground test scenario(s) would be required prior to shipment to KSC (i.e., their outcome(s) would be presented at PSR). Each of these pre-launch operational tests would require its own detailed test plan, and that plan would be referenced in the *Mission Suitability & Performance Acceptance Plan*. These test plans for ground scenario testing would be similar in content and format to the proposed on-orbit testing with modifications, where needed, to allow for the relevant differences between the on-earth and on-orbit environment. For example, a combustion payload mission simulation scenario that tests the entire system may be combined with drop tower tests of the test section (e.g., to prove combustion will take place in low gravity using the subject test section).

- In addition to operational tests, the verification testing and result reporting described in V-01 to V-10 would comprise a significant portion of the acceptance process. How the V-01 to V-10 information will be used to confirm mission suitability and performance shall be described in the *Mission Suitability & Performance Acceptance Plan*.

Title: Mission Suitability & Performance Acceptance Report	**DID No.:** V-16
Reference:	
Purpose: Summarize the overall Mission Suitability & Performance Acceptance activity results for the payload or system, and use the results to make a clear and logical "case" establishing that the subject payload or system is fully suitable for its intended mission and will meet its performance criteria and/or success criteria. The summary shall be entirely consistent with the *Mission Suitability & Performance Acceptance Plan* (V-11) and the results provided in V-03, V-04, V-07, V-08, V-10, and scenario (see V-11) test reports.	
Related Documents: Individual Item Verification Report (V-04) Individual Item Performance Verification Reports (V-08) Software Verification and Validation Report (V-10) Mission Suitability & Performance Acceptance Plan (V-15)	
Preparation Information Report content and logic should be in accordance with the baselined *Mission Suitability & Performance Acceptance Plan* (V-11).	

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

Reference: NHB 6000.1D Requirements for Packaging, Handling, and Transportation for Space Systems NMI 5350.1A Maintainability and Maintenance Planning Policy SSP 50018 Space Station Packaging and Configuration Requirements MIL-STD-1388-1A Logistics Support Analysis

Purpose: Document establishes the processes for implementation of the ILS activities during development, testing, and operational phases. It is intended to be a blueprint for the logistics infrastructure needed to support operations.

Related Documents: Launch Site Operations and Test Procedures (OP-04) Product Assurance Plan (PA-01)

Preparation Information

The data provided in the plan should address the following activities as a minimum:

A. Logistics Analysis - define the strategy for conducting all of the analyses that define the support requirements.
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.
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 Orbital Support Equipment required to support on-orbit and ground functions.
F. Expected Roles and Responsibilities

| **Title:** | **DID No.:** OP-02 |
| Operator's Manual | |

| **Reference:** |

| **Purpose:** |
| The Operator's manual is an instruction and reference manual for the hardware and software user to initiate, operates, and monitors the payload configuration. |

| **Related Documents:** |

Preparation Information

Operator's Manual contents:

A. Overview of the payload or TSC facility in terms of its functions, initialization, shutdown, and restart procedures that includes operation of all payload or TSC facility subsystems.
B. TSC Console Operation procedures and generic information such as Cadre ID, voice loop definition, phone numbers, pages, call signs and description of TSC staff functions.
C. Description of overall function of the software along with relevant information, including all options, restrictions, and limitations.
D. Step-by-step procedures for performing initialization, shutdown, and restart of the software.
E. Description of unique factors associated with the operation of the payload.
F. Description of inputs, including user inputs and pertinent system inputs. User inputs shall be described in terms of commands, data, and options. System inputs include inputs that may effect the user's utilization of the payload/system.
G. Unique ground system logistics, software, software maintenance, and sustaining engineering required for sustained payload operations.
H. Contingency scenarios and procedures that includes step-by-step termination procedures for both normal and abnormal termination of a function.
I. Error messages and corrective actions to be taken by the operator.
J. Redundancy management.
K. State of health maintenance.
L. Listing of operations limits, cautions, and constraints.

Title: Increment Operations Plan	**DID No.:** OP-03

Reference:

Purpose:
To describe the plan for supporting the flight operations of the payload or facility during an increment of the International Space Station. (If not manifested on the ISS, this refers to the life cycle of the mission). Also included is the method to provide anomaly resolution support during the mission.

Related Documents:

Preparation Information

Increment Operations Plan contents:

A. Description of roles and responsibilities and plans to support the operations of the payload during on-orbit operations for the life or increment of the mission.

B. Description and designation of any unique ground systems and responsibilities needed for payload operations.

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 resources required during the increment (mission) and timeline for usage.

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

Reference:
Launch Vehicle Payload Planner's 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:

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 check out 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 any specific communication links needed between locations at the launch site to perform testing and to support the payload on the launch vehicle up to the point of launch.
K. Description of processing operations required for post-landing

Title: Data Delivery Plan	**DID No.:** OP-05

Reference:

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:

Preparation Information

This plan shall describe and define all aspects of the science mission evaluation and data management requirements that includes 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. 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.
F. Archives - Define the data archives that will be used, data to be archived, length of time the data will be stored.
G. Experiment/Carrier Relationship
H. Roles & Responsibility

Title: Telescience Support Center (TSC) Operations Concept Document	**DID No.:** OP-06

Reference:
POIC Capabilities Document (SSP-50304)
POIC to Generic User Interface Definition Document (SSP-50305)

Purpose:
To define an operations concept for telescience requirements for local and remote ground operations.

Related Documents:

Preparation Information

This document identifies the operational scenarios that apply to TSC increment support.

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 the next increment
G. Acronym list
H. Glossary of terms

| Title: | DID No.: OP-07 |
| TSC Implementation Plan | |

| Reference: |
| |

| Purpose: |
| To define an implementation for the telescience requirements for local and remote ground operations. |

| Related Documents: |
| |

Preparation Information

This document establishes the implementation guidelines for TSC increment support.

Suggested content includes:

A. Introduction
B. Reference documents
C. Document organization
D. Implementation approach broken out into three subsections: Requirements Definition Process, Integrated System Description, and System Requirements and Constraints
E. Implementation process broken out by each of the major TSC systems. Each section should define capacity and availability limits.
F. TSC facility implementation concepts defining the areas of operation and support
G. Test and check-out processing for subsystems and total system
H. Interface control process
I. Performance assessment process
J. Security assessment process
K. Certification process
L. Training process
M. Sustaining engineering and operations
N. Acronym list
O. Glossary of terms

Title: TSC Training Manual	**DID No.:** OP-08
Reference: Ground Support Personnel Training and Certification Plan (MSFC-PLAN-2848) GRC TSC Training and Certification Plan	
Purpose: The training manual is an instruction and class material manual for the TSC instructor to provide training to the TSC users and staff on TSC hardware and software usage and troubleshooting per the GRC TSC Training and Certification Plan.	
Related Documents:	
Preparation Information The TSC Training Manual should contain: A. Console operators and TSC facility operations staff curriculums needed to obtain certification in ground support personnel mission operations for the certification of flight readiness activities B. Instructor's material to conduct classes to support the above curriculums C. Workbooks and classroom material for students to support classes TSC console operators will be trained to operate and utilize the TSC hardware and software necessary to support their mission requirements. This training will include (but not limited to): A. Air to Ground communication B. Voice loop protocol C. Command system operation D. Ground system operations of data system, voice system, video system, etc. E. Facility policy and guidelines TSC facility operations staff will be trained to monitor, operate, troubleshoot and repair the TSC facility hardware and software to maintain a reliable facility for the users. This training will include (but not limited to): A. TSC subsystem operations B. TSC subsystem troubleshooting procedures C. TSC subsystem repair procedures D. TSC facility staff roles and responsibilities E. TSC ground system operations F. MSFC POIC/GRC TSC communications and protocol G. Security H. TSC policies and guidelines	

Title: TSC Increment Specific Integrated Payload Data Set	**DID No.:** OP-09
Reference:	
Purpose: To define TSC requirements for local and remote ground operations for a specific increment.	
Related Documents: GRC TSC Integrated Payload Data Set	

Preparation Information

This document identifies all of the TSC requirements for the Payload Developers and the TSC facility for a specific increment and is kept as an internal document to be referenced by TSC capability developers and increment specific planners

Suggested content includes (but not limited to):

A. Integrated Payload Data Set submitted to the MSFC PDL system
B. TSC facility specific requirements
C. Any other data necessary to prepare the TSC for increment specific operation

Title:	DID No.: OP-10
TSC Security Plan	

Reference:

NMI 1600.2a, NASA Security Program

Purpose:
To provide security management planning and processes for the TSC facility and infrastructure (computers, network, etc.)

Related Documents:

Preparation Information

Suggested contents (but not limited to):

A. Roles and responsibilities of key personnel
B. Information security controls
C. Incident response
D. Awareness training
E. Facility access control
F. Computer access control
G. Foreign national security
H. Personnel security controls
I. Intrusion detection
J. Visitor policy