

DATA PROCUREMENT DOC.
NO. **1125** ISSUE
RFP

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CONTRACT/RFP

EXHIBIT NUMBER

J-2

ATTACHMENT NUMBER

**Development and Testing of Roll Control Thruster and
Valve Package for NASA's Crew Launch Vehicle**

PROJECT/SYSTEM

DATA PROCUREMENT DOCUMENT

Contractor

CONTRACTOR

January 18, 2007

DATE

National Aeronautics and
Space Administration

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	INTRO	SGR	DRL	DRD			

National Aeronautics and Space Administration			DATA PROCUREMENT DOC.		
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NOTE: The current revision is denoted by a vertical line in the outer margin adjacent to the affected text.		AS OF: 01-18-07	SUPERSEDING:		PAGE:
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ITEM	PAGE	STATUS	ITEM	PAGE	STATUS

MSFC - Form 3461-2 (Rev August 1970)

1.0 INTRODUCTION

1.1 Scope: Subject to the Rights in Data clause, this Data Procurement Document (DPD) sets forth the data requirements in each Data Requirements Description (DRD) and shall govern that data required by the DPD for the contract. The contractor shall furnish data defined by the DRDs listed on the Data Requirements List (DRL) by category of data, attached hereto, and made a part of this DPD. Such data shall be prepared, maintained, and delivered to NASA in accordance with the requirements set forth within this DPD. In cases where data requirements are covered by a Federal Acquisition Regulation (FAR) or NASA FAR Supplement (NFS) clause, that clause shall take precedence over the DPD, consistent with clause FAR 52.215-8.

1.2 DPD Description: This DPD consists of a Document Change Log, a Page Revision Log, an Introduction, a Statement of General Requirements, DPD maintenance procedures, a DRL, and the DRDs.

1.2.1 General Requirements: The general requirements, as specified in paragraph 2.0 of this DPD, prescribe those requirements applicable to the preparation, maintenance, and delivery of data that are better defined in aggregate than in the individual DRDs.

1.2.2 Data Requirements List (DRL): Throughout the performance of the contract, the DRL provides a listing by data category of the data requirements of the DPD.

1.2.3 Data Requirements Descriptions (DRDs)

1.2.3.1 Each data requirement listed on the DRL is given complete definition by a DRD. The DRD prescribes content, format, maintenance instructions, and submittal requirements.

1.2.3.2 For the purpose of classification and control, DRDs of this DPD are grouped into the following broad functional data categories:

<u>CATEGORY SYMBOL</u>	<u>DESCRIPTION</u>
CD	Contractual Data
CM	Configuration Management
DE	Design and Development Engineering
LS	Logistics Support
MA	Management
MP	Materials and Processes
RM	Reliability and Maintainability
SA	Safety
SE	Systems Engineering

1.2.3.3 The symbols representing these data categories form part of the prefix of the DRD identification number. The first numerical characters reflect the DPD number.

1.2.3.4 To facilitate the usage and maintenance of the DPD, the DRDs have been sectionalized in accordance with the above data categories.

1.2.3.5 The DRDs are filed by data category and are in alpha-numeric sequence as listed on the DRL page (or pages) that precede the DRDs.

- 1.2.4 Document Change Log (DCL) and Page Revision Log (PRL): The Document Change Log chronologically records all revision actions that pertain to the DPD. The Page Revision Log describes the current revision status of each page of the DPD and thus, at all times, provides its exact configuration.
- 1.2.5 DPD Maintenance Procedures: Maintenance procedures define the detailed methods to be employed in maintaining the DPD. Detailed maintenance procedures are specified in paragraph 3.0 of this DPD.
- 1.3 Data Types for Contractual Efforts: The types of data and their contractually applicable requirements for approval and delivery are:

<u>TYPE</u>	<u>DESCRIPTION</u>
1*	All issues and interim changes to those issues require written approval from the requiring organization before formal release for use or implementation.
2*	NASA reserves a time-limited right to disapprove in writing any issues and interim changes to those issues. The contractor shall submit the required data to NASA for review not less than 15 calendar days** prior to its release for use. The contractor shall clearly identify the release target date in the "submitted for review" transmittal***. If the data is unacceptable, NASA will notify the contractor within 15 calendar days** from the date of submission, regardless of the intended release date***. The contractor shall resubmit the information for reevaluation if disapproved. The submittal is considered approved if the contractor does not receive disapproval or an extension request from NASA within 15 calendar days**.
3	These data shall be delivered by the contractor as required by the contract and do not require NASA approval. However, to be a satisfactory delivery, the data shall satisfy all applicable contractual requirements and be submitted on time.
4	These data are produced or used during performance of the contract and are retained by the contractor. They shall be delivered only when NASA requests in writing and shall be delivered in accordance with the instructions in the request. The contractor shall maintain a list of these data and shall furnish copies of the list to NASA when requested to do so.
5	These data are incidental to contract performance and are retained by the contractor in those cases where contracting parties have agreed that formal delivery is not required. However, the Contracting Officer or the Contracting Officer's Representative shall have access to and can inspect this data at its location in the contractor's or subcontractor's facilities, or in an electronic database accessible to the Government
*	Note: Type 1 and Type 2 data may be placed under NASA configuration management control when designated by NASA. CM control requires the contractor to submit Type 1 and Type 2 data updates through Engineering Change Proposals (ECPs).
**	Note: This time limit may be tailored for individual DPDs to meet the requirements of the procuring activity.
***	Note: If the contractor does not identify a release target date or if the intended release date is shorter than 45 calendar days from the date of submission, the 45 calendar days review cycle stands (or the tailored Type 2 time limitation for the specific procurement).

2.0 STATEMENT OF GENERAL REQUIREMENTS

2.1 Applicable/Reference Documents: Documents included as applicable documents in this DPD are the issue specified in the Statement of Work, and form a part of the DPD to the extent specified herein. Applicable documents listed in Item 15.2 of a DRD are applicable only to the preparation of the deliverable documentation described by that DRD.

References to documents other than applicable documents in the data requirements of this DPD may sometimes be utilized, and shall be indicated in 13. Remarks of the DRD. These do not constitute a contractual obligation on the contractor. They are to be used only as a possible example or to provide related information to assist the contractor in developing a response to that particular data requirement.

2.2 Subcontractor Data Requirements

2.2.1 The contractor shall specify to subcontractors and vendors, if any, the availability source of all data required for the satisfactory accomplishment of their contracts. The contractor shall validate these requirements for documents when appropriate; where the requirement concerns other contractor data, the contractor shall provide his subcontractor or vendor with the necessary documents. All such requests shall be accomplished under the auspices of the contractor.

2.2.2 Reference to subcontractor data in the contractor's responses is permissible, providing the references are adequate and include such identification elements as title, number, revision, etc., and a copy of the referenced data is supplied with the response document at time of delivery to NASA.

2.3 Data Distribution, Format, Data Restriction Marking, and Transmittal

2.3.1 Distribution: Distribution of required documentation shall be in quantities determined by the Contracting Officer. Recipient names and email addresses shall be noted on a separate distribution list to be furnished by the Contracting Officer. The Contracting Officer's letter may include other information pertinent to delivery of data, as required.

2.3.2 Format

2.3.2.1 Electronic Format: Electronic submission of data deliverables is required. Electronic deliverables shall be printable. Data deliverables shall be delivered to NASA in the format specified below unless a specific format is required by a DRD. Data submittals shall consist of a single Adobe Acrobat PDF file and the native format electronic file(s). The preferred native formats include Microsoft Word, Excel, PowerPoint or CAD drawing plot file, as appropriate. Where a single native format file is not possible, multiple files may be integrated into a single ZIP file for submission. The organization of the contents of the integrated ZIP file shall be made readily apparent to the reader, and each file within the integrated product shall be clearly identifiable and traceable within the organization of the integrated product. If files are fragmented, file names shall be labeled logically and contiguously, and the files shall be easily reassembled or merged (e.g. 1 filename, 2 filename, 2a filename, etc.). The software versions shall be confirmed prior to submittals.

2.3.2.2 Hardcopy Format: In addition to the electronic submittal, one hardcopy package of specific data deliverables shall be delivered to the NASA Contracting Officer for the Government contract file. This requirement is indicated in Item 15.4, Format of each DRD. The hardcopy package shall consist of the contractor's Transmittal Memo and one copy of the data deliverable.

2.3.3 Data Restriction Marking

2.3.3.1 Data Restriction Determination and Marking Requirements: The contractor shall determine the data restriction that applies to each data deliverable and mark the data restriction on the data coversheet, or indicate the data restriction in the data transmittal package if the data format precludes identification of data restriction directly in the data. The contractor shall make a determination for each individual data deliverable item, and shall not apply a default or blanket data restriction marking to all data deliverables (e.g., “data may be export restricted”). If NASA does not agree with the contractor applied data restriction, the NASA Contracting Officer shall return the data to the contractor, cancel the markings, or ignore the markings consistent with the procedures set forth in the “data rights” clause(s) contained in the contract.

2.3.3.2 Data Restriction Categories and Marking Statements: The contractor shall consider the following data restriction categories, as a minimum, and utilize specified marking statements.

If data delivered under this contract is subject to the International Traffic in Arms Regulations (ITAR), the data shall contain an “ITAR Notice” as follows:

International Traffic in Arms Regulations (ITAR) Notice

This document contains information which falls under the purview of the U.S. Munitions List (USML), as defined in the International Traffic in Arms Regulations (ITAR), 22 CFR 120-130, and is export controlled. It shall not be transferred to foreign nationals, in the U.S. or abroad, without specific approval of a knowledgeable NASA export control official, and/or unless an export license/license exemption is obtained/available from the United States Department of State. Violations of these regulations are punishable by fine, imprisonment, or both.

If data delivered under this contract is subject to the Export Administration Regulations (EAR), the data shall contain the “EAR Notice” as follows:

Export Administration Regulations (EAR) Notice

This document contains information within the purview of the Export Administration Regulations (EAR), 15 CFR 730-774, and is export controlled. It may not be transferred to foreign nationals in the U.S. or abroad without specific approval of a knowledgeable NASA export control official, and/or unless an export license/license exception is obtained/available from the Bureau of Industry and Security, United States Department of Commerce. Violations of these regulations are punishable by fine, imprisonment, or both.

If the contract contains FAR 52.227-14 *Alternate II*, the “Limited Rights Notice” may be applicable to data (other than computer software) delivered under this contract.

If the contract contains FAR 52.227-14 *Alternate III*, the “Restricted Rights Notice” may be applicable to computer software delivered under this contract.

If the contract contains FAR 52.227-20, the “SBIR Rights Notice” may be applicable to SBIR data delivered under this contract.

In accordance with the applicable data clause (e.g., FAR 52.227-14(c) or FAR 52.227-20(c)), the contractor may be able to assert a copyright claim in data delivered under this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government.

2.3.4 Transmittal

2.3.4.1 Data shall be transmitted to NASA by email, CD or DVD, hardcopy, or other mechanism agreed to by the Contracting Officer, COTR, and Project representatives who are responsible to receive, index, and store the data deliverables.

2.3.4.2 If email is used to transmit data deliverables, the email size shall be 10 Megabytes or less to ensure receipt by the NASA email servers. Encrypted email format shall be used to transmit data which has been judged sensitive by the contractor (e.g., export controlled, limited rights data, SBIR, restricted computer software, copyrighted, etc.).

2.3.4.3 Data Transmittal Package: Each data transmittal package shall include:

- a. Transmittal memorandum that specifies the meta-data below for each data transmittal:
 1. Contract number.
 2. Data Requirements Description (DRD) number.
 3. DRD data type (specified in Item 3 on the DRD).
 4. Submission date or milestone being satisfied.
 5. Document number and revision.
 6. Document title.
 7. File names of all files being delivered; file naming convention shall clearly identify the document being delivered.
 8. Distribution (as defined by the Contracting Officer's letter).
 9. Requested response date.
 10. Contractor assigned data restriction (export controlled, limited rights data, SBIR, restricted computer software, copyrighted, etc.) if not marked on data.
 11. NASA Records Retention Schedule (NRRS) number, if applicable. (See NPR 1441.1, NASA Records Retention Schedules)
- b. Printable electronic files or hardcopy data.

2.3.5 Use of the MSFC Documentation Repository: Marshall Policy Directive (MPD) 2210.1 specifies the requirements for utilizing the Documentation Repository. Electronic data deliverables should be transmitted directly to the Repository via a secure web page, available at <https://webpub.nis.nasa.gov/submittal/index.html>. Computer-Aided Design (CAD) drawings shall be submitted in the original native vector, Hewlett-Packard Graphic Language (HPGL) and raster image formats.

2.4 Printing: All printing, duplicating, or binding shall be in accordance with NFS 1852.208-81, Restrictions on Printing and Duplicating. Printing of formal reports and Type 1 and 2 data in book format shall be in accordance with the following general specifications:

- a. Method of reproduction - offset/xerography.
- b. Finished size - 8 1/2" X 11".
- c. Paper - 20-pound opaque bond.
- d. Cover - Litho cover stock.
- e. Pages shall be printed on both sides; blank pages shall be avoided when possible.
- f. Oversize pages shall be avoided when possible, but if necessary shall be folded to 8 1/2" X 11".
- g. Binding shall be the most economical method commensurate with the size of the report and its intended use.

2.5 Contractor's Internal Documents: The contractor's internal documents shall be used to meet the data requirements of this DPD unless a specific format is required by the applicable DRD.

- 2.6 Document Identification: Type 1 and 2 documents published by the contractor and submitted in response to the data requirements of this DPD shall be identified within an organized identification numbering system prescribed to NASA by the contractor and, if applicable, as approved by NASA. For all data types, the document number, change legend, date, and title constitute the minimum identification of the specific document and shall appear on the cover and title page. The contract number shall also appear on the cover and title page as separate markings. The originator and organization shall be included on the title page. The document number, change legend, and date shall appear on each page of the document. In the front matter of each document, identify the DPD number and applicable DRD number(s) required for document preparation. Successive issues or revisions of documents shall be identified in the same manner as the basic issue and shall have appropriate change identification. Drawings and ECPs are excluded from the marking provisions of this paragraph. All Type 1 documentation, excluding configuration management requirements, shall be marked "PRELIMINARY PENDING NASA APPROVAL," and once approved shall be reissued with "APPROVED BY NASA" and the date and approval authority annotated on the cover.
- 2.7 Reference to Other Documents and Data Deliverables in Data Submittals: All referenced documents shall be made readily available to the cognizant NASA organization upon request. The contractor should make sure that the references are available to NASA in a manner which does not incur delays in the use of the response document. Reference may be made, within one data submittal, to other data submittals delivered in response to this DPD in those cases where the data required by one DRD may have been delivered by the contractor in response to another DRD. The reference to previously-submitted data shall include the applicable DRD number, data submittal version date, and location within the referenced document.
- 2.8 Maintenance of Type 1 Document Submittals
- 2.8.1 Revisions of Type 1 documentation may be accomplished either by individual page revision or by a complete reissue of the document identified in accordance with requirements of 2.7 above, with the exception of drawings (which shall be revised in accordance with contract configuration management requirements).
- 2.8.2 Individual page revisions shall be made as deemed necessary by the contractor or as directed by the Contracting Officer.
- 2.8.3 A Type 1 document shall be completely reissued when, in the opinion of the contractor and/or NASA, the document has been revised to the extent that it is unusable in its present state, or when directed by the Contracting Officer. When complete reissues are made, the entire contents of the document shall be brought up to date and shall incorporate revised pages. All revisions shall be recorded. A revision log shall identify complete reissues except for periodic reports and documents which are complete within themselves as final.
- 2.8.4 Changes of a minor nature to correct obvious typing errors, misspelled words, etc., shall only be made when a technical change is made, unless the accuracy of the document is affected.
- 2.8.5 All revised pages shall be identified by a revision symbol and a new date. Each document shall contain a log of revised pages that identify the revision status of each page with the revision symbol. This list shall follow the table of contents in each document. The line or lines revised on a given page shall be designated by the use of vertical line in the margin of the page, and the change authority shall be indicated adjacent to the change.

2.8.6 Contractor Type 1 documents shall not be submitted containing pen and ink markups which correct, add to, or change the text, unless schedule problems exist and approval is obtained in writing from the Contracting Officer. Such markups, however, shall not exceed 20 percent of the page content and shall be acceptable provided that the reproduced copies are legible. In addition, hand-drawn schematics, block diagrams, data curves, and similar charts may be used in original reports in lieu of formally prepared art work, as long as legibility of copies is not impaired. Acceptability shall be determined by the Contracting Officer.

3.0 DPD MAINTENANCE PROCEDURES

3.1 NASA-Initiated Change: New and/or revised data requirements shall be incorporated by contract modification to which the new or revised portion of the DPD shall be appended. The contractor shall notify the Contracting Officer in the event a deliverable data requirement is imposed and is not covered by a DRD, or when a DRD is changed by a contract modification and for which no revision to DPD is appended. In such cases, the contractor shall submit the requested changes to NASA for approval. See paragraph 3.3.1 for change procedures.

3.2 Contractor-Initiated Change: Contractor-proposed data requirements, or proposed changes to existing requirements shall be submitted to NASA for approval.

3.3 DPD Change Procedures

3.3.1 Changes to a contractual issue of this DPD shall be identified by NASA on the Document Change Log and Page Revision Log. The actual revised material on the DPD page shall be identified by placing a heavy vertical line in the right-hand margin extending the entire length of the change. In addition, the numerical control number of the contractual direction authorizing the change shall be placed adjacent to the vertical revision line. These revision identifiers shall be used to reflect the current revision only; any previous symbols on a page shall be deleted by the current revision.

3.3.2 The date of the contractual direction paper, e.g., Change Order, Supplemental Agreement, or Contracting Officer's letter shall be entered under the "Status " column of the Page Revision Log adjacent to the affected page or DRD number, and in the "as of" block. The date that was in the "as of" block shall be entered in the "Superseding" block.

3.3.3 The Document Change Log entitled "Incorporated Revisions" shall be changed to indicate the number, portions affected, and associated Supplemental Agreement number, if applicable.

3.3.4 The Document Change Log entitled "Outstanding Revisions" is changed periodically to indicate outstanding Change Orders and Contracting Officer notification letters.

3.4 DPD Reissues

3.4.1 When conditions warrant, the DPD shall be reissued by NASA and shall supersede the existing DPD in its entirety. Reissues shall be issued by contractual direction.

3.4.2 All revision symbols (vertical lines and contractual direction control numbers) shall be removed from all pages; revision dates shall remain in the Date Revised block on DRDs that have been revised. The issue symbol, which shall commence with "A" and progress through "Z," shall be entered in the DPD identification block of each DRD page of the DPD.

Development and Testing of Roll Control Thruster and Valve Package for NASA's Crew Launch Vehicle

Data Requirements List

<u>DRD</u>	<u>DATA TYPE</u>	<u>TITLE</u>	<u>OPR</u>
CD - Contractual Data			
1125CD-001	2	Contract Information Technology Security Program Plan	IS10
1125CD-002	3	Technology Reports	ED03
CM - Configuration Management			
1125CM-001	1	Configuration Management Plan	ED03
1125CM-002	1	Acceptance Data Package	ED03
1125CM-003	1	Engineering Change Proposals and Associated Documentation	ED03
1125CM-004	3	Specification and Drawing Trees	ED03
1125CM-005	3	Engineering Drawings and Associated List	ED03
DE - Design and Development Engineering			
1125DE-001	2	Development Test Plan	ER32
1125DE-002	2	Fracture Control Plan	EM20
1125DE-003	2	Fracture Control Reports	EM20
1125DE-004	2	Structural Assessment Plan	ER41
1125DE-005	2	Development Test Reports	ER32
1125DE-006	2	Development Test Procedures	ER32
1125DE-007	3	Engine Thermal Data and Analysis	ER43
1125DE-008	3	Structural Strength and Fatigue Analysis Reports	ER41
1125DE-009	3	Structural Dynamics Analyses and Models Documentation	EV31
LS - Logistics Support			
1125LS-001	3	Special Handling and Storage Requirements Document(s)	AS42
MA - Management			
1125MA-001	1	Project Management Plan	CS40
1125MA-002	2	Program/Project Schedules	CS40
1125MA-003	2	Work Breakdown Structure (WBS) and WBS Dictionary	CS40
1125MA-004	2	Continuous Risk Management	QD40
1125MA-005	2/3	Major Review Documentation	ED03
1125MA-006	3	Monthly Status and Final Reports	ER32
1125MA-007	3	Financial Management Report (533M and 533Q)	CS40
1125MA-008	3	Final Scientific and Technical Reports	CS40

Development and Testing of Roll Control Thruster and Valve Package for NASA's Crew Launch Vehicle

MP - Materials and Processes

1125MP-001	2	Contamination Control and Implementation Plan (CCP)	EM03
1125MP-002	2	Materials and Processes Identification and Usage List (MIUL)	EM03
1125MP-003	2	Manufacturing and Assembly Plan	EM03
1125MP-004	2	Materials and Processes Selection, Implementation, and Control Plan	EM03
1125MP-005	2	Nondestructive Test (NDT) Plan	EM03
1125MP-006	2	Material Usage Agreements (MUAs)	EM03

RM - Reliability and Maintainability

1125RM-001	1/2/3	Problem Reporting and Corrective Action (PRACA) System and Trending	QD40
1125RM-002	2	Failure Modes and Effects Analysis (FMEA)	QD40

SA - Safety

1125SA-001	2	Safety, Health, and Environmental (SHE) Plan	AS10/QD50
1125SA-002	3	Mishap and Safety Statistics Reports	QD50

SE - Systems Engineering

1125SE-001	1	Specifications	ED03
1125SE-002	1	Interface Definition Document (IDD)	ER32
1125SE-003	3	Mass Properties Report	EV12

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CD-001**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Contract Information Technology Security Program Plan
7. **DESCRIPTION/USE:** To ensure that the contractor fully understands the Information Technology (IT) security requirements of NFS 1852.204-76 and NPR 2810.1. This plan will demonstrate that the contractor understands the Federal and NASA IT security requirements and details how they plan to implement IT security and remain compliant with changing IT security requirements.
8. **OPR:** IS10 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter. One copy shall go to the Organization Computer Security Official.
11. **INITIAL SUBMISSION:** Draft with proposal
12. **SUBMISSION FREQUENCY:** Final 45 days after contract award. Revise after any significant changes.
13. **REMARKS:** The Federal Information Security Management Act (FISMA) of 2002 applies to both information and information systems used by NASA, its contractors, and other organizations and sources, it has somewhat broader applicability than that of prior security law. That is, the NASA IT security program and its requirements apply to all organizations (sources) which possess or use Federal or NASA information - or which operate, use, or have access to Federal or NASA information systems - on behalf of NASA.
14. **INTERRELATIONSHIP:** SOW paragraph 6.0
15. **DATA PREPARATION INFORMATION:**
 - 15.1 **SCOPE:** The extent of the Contract IT Security Program Plan can vary and shall be appropriate to comply with the breadth of sensitivity level security requirements for protecting the collection, processing, maintenance, use, sharing, dissemination, or disposition NASA information.
 - 15.2 **APPLICABLE DOCUMENTS:**

NFS 1852.204-76	<i>Security Requirements for Unclassified Information Technology Resources</i>
NPR 2810.1	<i>Security of Information Technology</i>
ITS-SOP-00018	<i>Contract IT Security Program Plan Procedures</i>
 - 15.3 **CONTENTS:** The Contract IT Security Program Plan shall meet the requirements of ITS-SOP-00018.
 - 15.4 **FORMAT:** Contractor format is acceptable. The requirements of ITS-SOP-00018 shall be adequately covered and readily identifiable.
 - 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CD-002**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/3
6. **TITLE:** Technology Reports
7. **DESCRIPTION/USE:** Provides NASA with technical information concerning any invention, discovery, improvement, or innovation made by a contractor in the performance of work under this contract for the purpose of disseminating this information to obtain increased use.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:**
Technology Reporting Plan: Upon Contracting Officer's request.
Disclosure of Invention and New Technology (NASA Form 1679): Within 2 months of identification of reportable item.
Interim NASA New Technology Summary Report (NTSR) Form: 12 months from the date of the contract.
12. **SUBMISSION FREQUENCY:**
Technology Reporting Plan: Upon Contracting Officer's request.
Disclosure of Invention and New Technology (NASA Form 1679): For each reportable item.
Interim NASA New Technology Summary Report (NTSR) Form: Every 12 months.
Final NASA New Technology Summary Report (NTSR) Form: Three months after completion of contracted work.
13. **REMARKS:** Copies of NASA Form 1679 and the NTSR may be obtained and/or filled out at: <http://www.entre.nasa.gov/>. These forms may also be obtained from the New Technology Representative ([mailto:Carolyn E. McMillan@nasa.gov](mailto:Carolyn.E.McMillan@nasa.gov)).
14. **INTERRELATIONSHIP:** SOW paragraph 6.0
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Technology Reports include technical detail as is necessary to identify and fully describe a "Reportable Item". Per NFS 1852.227-70, "Reportable Item" means any invention, discovery, improvement, or innovation of the contractor, whether or not the same is or may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of any work under this contract or in the performance of any work that is reimbursable under any clause in this contract providing for reimbursement of costs incurred prior to the effective date of this contract.
- 15.2 **APPLICABLE DOCUMENTS:**
NFS 1852.227-70 New Technology Clause

DRD Continuation Sheet

TITLE: Technology Reports

DRD NO.: 1125CD-002

DATA TYPE: 3

PAGE: 2/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.3 **CONTENTS:** The Technology Reports consist of:

- a. Disclosure of Invention and New Technology (Including Software): In accordance with NFS 1852.227-70 (e)(2), the disclosure to the agency shall be in the form of a written report and shall identify the contract under which the reportable item was made and the inventor(s) or innovator(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and physical, chemical, biological, or electrical characteristics of the reportable item. The disclosure shall also identify any publication, on sale, or public use of any subject invention and whether a manuscript describing such invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the agency, the Contractor shall promptly notify the agency of the acceptance of any manuscript describing a subject invention for publication or of any on sale or public use planned by the Contractor for such invention. This reporting requirement may be met by completing NASA Form 1679 (latest revision) in hardcopy or online at: <http://www.webentre.nasa.gov/>. Use of this form or the online system is preferred; however, if the form is not used the following information should be provided in order to meet the reporting requirement:
 1. Descriptive title.
 2. Innovator(s) name(s), title(s), phone number(s), and home address(es).
 3. Employer when innovation made (name and division).
 4. Address (place of performance).
 5. Employer status (e.g., Government, college or university, non-profit organization, small business firm, large entity).
 6. Origin (e.g., NASA grant number, NASA prime contract number, subcontractor, joint effort, multiple contractor contribution, other).
 7. NASA Contracting Officer's Technical Representative (COTR).
 8. Contractor/grantee New Technology Representative.
 9. Brief abstract providing a general description of the innovation:
 - (a) Description of the problem or objective that motivated the innovation's development.
 - (b) Technically complete and easily understandable description of innovation developed to solve or meet the objective.
 - (c) Unique or novel features of the innovation and the results or benefits of its application.
 - (d) Speculation regarding potential commercial applications and points of contact (including names of companies producing or using similar products).
 10. Additional documentation.
 11. Degree of technological significance (e.g., modification of existing technology, substantial advancement in the art, major breakthrough).
 12. State of development (e.g., concept only, design, prototype, modification, production model, used in current work).
 13. Patent status.
 14. Dates or approximate time period during which this innovation was developed.
 15. Previous or contemplated publication or public disclosure including dates.
 16. Answers to the following questions (for software only):
 - (a) Using outsiders to beta-test code? If yes, done under beta-test agreement?
 - (b) Modifications to this software continue by civil servant and/or contractual agreement?

DRD Continuation Sheet

TITLE: Technology Reports

DRD NO.: 1125CD-002

DATA TYPE: 3

PAGE: 3/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- (c) Previously copyrighted (if so, by whom)?
- (d) Were prior versions distributed (if yes, supply NASA or Contractor contract)?
- (e) Contains or is based on code owned by a non-federal entity (if yes, has a license for use been obtained)?
- (f) Has the latest version been distributed without restrictions as to use or disclosure for more than one year (if yes, supply date of disclosure)?

17. Name(s) and signature(s) of innovator(s).

- b. Interim NASA New Technology Summary Report (NTSR): This report shall consist of a listing of reportable items for the reporting period or certification that there are none. This report shall also contain a list of subcontracts containing a patent rights clause or certification that there were no such subcontracts. Completion of the Interim NTSR shall satisfy this reporting requirement. Use of the form utilizing the online system at <http://www.webentre.nasa.gov/> is preferred; however an alternate format is acceptable provided all required information is provided.
- c. Final NASA New Technology Summary Report (NTSR): This report shall consist of a comprehensive list of all reportable items for the contract duration or certification that there are none. This report shall also contain a list of subcontracts containing a patent rights clause or certification that there were no such subcontracts. Completion of the Final NTSR shall satisfy this reporting requirement. Use of the form utilizing the online system at <http://www.webentre.nasa.gov/> is preferred; however an alternate format is acceptable provided all required information is provided.
- d. Subcontracts: The contractor shall provide copies of subcontracts containing a patent rights clause upon Contracting Officer's request.

15.4 **FORMAT:**

The Disclosure of Invention and New Technology (Including Software) report may use NASA Form 1679 (latest version) or the online system at: <http://www.webentre.nasa.gov/>, or provide sufficient information to meet the reporting requirement.

The interim and final NASA New Technology Summary Reports may use the NTSR Form (Interim or Final whichever is applicable) utilizing the online system at: <http://www.webentre.nasa.gov/> or provide sufficient information to meet the reporting requirement.

15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CM-001**
3. **DATA TYPE:** 1
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Configuration Management Plan
7. **DESCRIPTION/USE:** To describe the contractor's method for accomplishing the configuration management requirements of the contract.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** 45 days after Authority to Proceed (ATP)
12. **SUBMISSION FREQUENCY:** Revise as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.5
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Configuration Management Plan (CMP) provides the contractor's proposed management approach for implementation of configuration management.
- 15.2 **APPLICABLE DOCUMENTS:**
MSFC-STD-3394 *Standard for Contractor Configuration Management, MSFC Programs/Projects*
- 15.3 **CONTENTS:** The CMP shall provide the information defined in MSFC-STD-3394, Appendix A.
- 15.4 **FORMAT:** Contractor format is acceptable with MSFC approval.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by complete reissue. Update as required to maintain current with program changes.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CM-002**
3. **DATA TYPE:** 1
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Acceptance Data Package
7. **DESCRIPTION/USE:** To provide the documentation needed by MSFC to establish the acceptability of equipment/software for the intended use.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Preliminary two weeks prior to each Acceptance Review (AR)
12. **SUBMISSION FREQUENCY:** Final with delivery of each Configuration Item (CI)
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.5
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Acceptance Data Package (ADP) contains the elements of documentation required to establish the acceptability of equipment and software.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** An ADP for hardware contract configuration items shall contain the current log book that includes:
 - a. Running/operating time and cycle for each time and cycle critical items of the Configuration Item (CI). These logs shall identify the item(s) by nomenclature, part number, and serial number and shall state the total authorized life and the life expended.
 - b. Test history log, including post manufacturing checkout and final verification tests of the CI, with the following data:
 1. Actual measurements identified to specified tests. Reference to applicable test reports are satisfactory provided that copies of the reports are provided.
 2. Brief test summary.
 3. List of unaccomplished tasks and estimated man-hours to complete.
 4. List of actual and recommended retest.
 5. Special test instructions, investigations, warnings, and problems encountered during test.
 6. Failure and corrective actions data for all failures during all testing.
 - c. Inspection records for all inspections.
 - d. Transfer records providing a history of all CI and critical component movements.
 - e. Alignment data for all CIs and critical items.
 - f. Component log books, including Government furnished items.
 - g. Weight and balance logs covering total weight and horizontal, vertical, and lateral center(s) of gravity.

DRD Continuation Sheet

TITLE: Acceptance Data Package

DRD NO.: 1125CM-002

DATA TYPE: 1

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

h. Configuration Records:

1. Parts and drawing list identifying all parts and incorporated or pending changes to each.
2. Software configuration records defining the verified and validated software, version description documents, software certification, and the validated software program.
3. List of approved and pending deviations and waivers.
4. Complete list of hardware and software/firmware items shipped loose or separately.
5. Copy of proposed DD Form 250.

15.4 **FORMAT:** Contractor format is acceptable.

15.5 **MAINTENANCE:** The ADP shall be maintained current. Changes and/or updating shall be in accordance with the contractor's approved change control system.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CM-003**
3. **DATA TYPE:** 1
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Engineering Change Proposals and Associated Documentation
7. **DESCRIPTION/USE:** To propose changes to Government controlled configuration documentation, e.g., engineering changes to drawings, parts lists, specifications, software requirements documents, and interface control documents.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As required
12. **SUBMISSION FREQUENCY:** As required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** NFS 1852.243-70, *Engineering Change Proposals*, (February 1998). SOW paragraph 6.5
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** To describe proposed changes with supporting rationale to Government-controlled configuration documentation.
- 15.2 **APPLICABLE DOCUMENTS:**
MSFC-STD-3394 *Standard for Contractor Configuration Management, MSFC Programs/Projects*
- 15.3 **CONTENTS:**
The requirements of MSFC-STD-3394 shall be used in the preparation of proposed changes to Government-controlled configuration documentation.
 - a. The following MSFC forms or equivalent shall be prepared as required to define the specific requirements for a proposed change.
 1. Engineering Change Proposals (ECPs) - MSFC Form 2348, or equivalent.
Appropriate information shall be provided for each block on the ECP and yes/no questions will be answered with either a yes or no.
 2. Preliminary Interface Revision Notices (PIRNs) - MSFC Form 4229.
 - b. Changes to specifications, documents, drawings and parts lists shall be provided in From/To or Was/Is format so that the change is clearly defined and included with the submittal of the ECP.
 - c. Field Engineering Changes (FECs) shall be prepared and processed in accordance with the appropriate field site format and instructions. Format and processing instructions for specific sites may be obtained from MSFC CM Office Representative.

The program control number (PCN) (or its equivalent) assigned by MSFC and the proposal number assigned by the contractor shall be shown on all forms and messages.
- 15.4 **FORMAT:** The formats shall be as defined in paragraph 15.3.

DRD Continuation Sheet

TITLE: Engineering Change Proposals and
Associated Documentation

DRD NO.: **1125CM-003**

DATA TYPE: 1

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.5 **MAINTENANCE:**

- a. ECP maintenance shall be accomplished by complete revision.
- b. PIRNs shall be a complete reissue.

15.6 **MSFC APPROVALS**

- a. Receipt of contractual approval shall constitute the sole authority for the contractor to effect a Class I engineering change.
- b. Changes to documentation shall be approved as a part of the ECP.
- c. PIRNs shall be approved as part of the ECP.

The contractor shall prepare and submit ECPs when requested by MSFC to implement a Government-directed change.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CM-004**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Specification and Drawing Trees
7. **DESCRIPTION/USE:** A specification tree is a generation breakdown of the specifications with interrelationships, as applicable, to the configuration items. A drawing tree is a generation breakdown of the engineering drawings that depicts the allocation of requirements of the configuration item specification.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Specification trees - Three weeks prior to Prototype RCE Preliminary Design Review (PPDR). Drawing trees - Three weeks prior to Prototype RCE Critical Design Review (PCDR).
12. **SUBMISSION FREQUENCY:** Specification tree updated and submitted three weeks prior to PCDR
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.5
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** Specification and Drawing Trees depict the hardware and software configuration items in top down, or generation breakdown form.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The specification and drawing trees shall consist of an indentured or generation breakdown listing of all specifications or drawings applicable to a configuration item or items.
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by complete reissue or change page if hard copy is necessary.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125CM-005**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/3
6. **TITLE:** Engineering Drawings and Associated Lists
7. **DESCRIPTION/USE:** To provide engineering data defining the design to the extent required to support manufacturing, test, and logistics support of the vehicle and payload systems and required spare parts. Engineering drawings and associated lists shall be sufficient to depict the detailed configuration of all system, subsystem, and component levels and to include ground support equipment (GSE) and airborne support equipment (ASE). 2D and 3D CAD models shall be submitted as supplemental information.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Three weeks prior to Prototype Preliminary Design Review (PPDR)
12. **SUBMISSION FREQUENCY:** Three weeks prior to each major review, as part of an Acceptance Data Package (ADP), and as requested. In addition, 3D CAD Models shall be submitted between milestones as requested by the procuring activity.
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.5
15. **DATA PREPARATION INFORMATION:**
 - 15.1 **SCOPE:** Engineering drawings disclose (directly or by reference) the physical and functional requirements of an item by means of graphics or textual presentation or combinations of both, as supplemented by 3D models.
 - 15.2 **APPLICABLE DOCUMENTS:**

ASME Y14.100	<i>Engineering Drawing Practices</i>
ASME Y14.41	<i>Digital Product Definition Data Practices</i>
ASME Y14.5M	<i>Dimensioning and Tolerancing</i>
MIL-STD-961	<i>Department of Defense Standard Practices, Defense Specifications</i>
 - 15.3 **CONTENTS:** Requirements:
 - a. Part I - Engineering drawings and associated lists shall meet the requirements of ASME Y14.100. Geometric Dimensioning and Tolerancing shall be implemented in accordance with ASME Y14.5M. Supplemental 2D/3D CAD shall meet the requirements of ASME Y14.41. Engineering drawings and associated lists of end items, elements and/or all components and assemblies shall be provided to define the details necessary for the manufacture, test, inspection, operations and logistic support of the system. This definition shall:
 1. Reflect the end-product at its current level of design maturity.
 2. Provide the engineering data for logistics support products.
 3. Provide the necessary data to permit manufacture and/or acquisition of items identical to the original item(s).
 4. Document directly or by reference the following:
 - (a) Details of unique processes (i.e., not published or generally available to industry) when essential to design and manufacture.

DRD Continuation Sheet

TITLE: Engineering Drawings and Associated Lists

DRD NO.: 1125CM-005

DATA TYPE: 3

PAGE: 2/3

15. DATA PREPARATION INFORMATION (CONTINUED):

- (b) Performance ratings.
 - (c) Dimensional and tolerance data (Geometric Dimensioning and Tolerancing (GDT) shall be required between all external and major internal interfaces).
 - (d) Critical manufacturing processes and assembly sequences, and rigging procedures.
 - (e) Diagrams.
 - (f) Mechanical and electrical connections.
 - (g) Physical characteristics, including form and finish.
 - (h) Details of material identification, including heat treatment and protective coatings.
 - (i) Inspection, test, and evaluation criteria.
 - (j) Equipment calibration requirements.
 - (k) Quality assurance requirements.
 - (l) Hardware marking requirements.
 - (m) Requirements for reliability, maintainability, environmental conditions, shock, and vibration testing and other operational or functional tests.
5. Limited rights-in-data items - Engineering drawings for items which the Government does not have unlimited rights in data shall specify the form, fit, and function requirements of the item and conform to the requirements for a control drawing as defined in ASME Y14.100 or a specification prepared in accordance with the requirements of MIL-STD-961.
- b. Part II - Cable interconnect diagrams (CIDs), electrical system schematics, and wiring lists. Cable interconnect diagrams, electrical system schematics, wiring lists, and fluid system schematics shall be prepared in accordance with ASME Y14.100. Part I drawings shall be utilized to the maximum extent possible in providing the design definition. The drawings shall include the following:
- 1. Cable interconnect diagrams shall show graphically the arrangement of external electrical cabling which interconnects electrical assemblies and/or equipment. The CID shall show all cable runs and terminations; each cable shall be identified by reference designation number. The connector short sign shall be identified.
 - 2. Electrical system schematics shall illustrate and describe circuit items with symbols placed such that a circuit may be traced from item to item in the sequence of its function. The placement and arrangement of these circuits shall follow a logical sequence of presentation to provide a clear description of the distribution.
 - 3. Component Level Documentation - Schematics and/or wiring lists for components, including interconnecting cable harnesses, shall be provided.
 - 4. Overall Grounding Documentation - The grounding schematic shall show the details of all grounds and power returns from source to loads. All connections shall be shown. It shall also show details of all Electrical Ground Support Equipment interconnections to facility and safety grounds.
 - 5. The Fluid system schematic shall illustrate and describe all components with symbols and flow designators such that the fluid system may be traced from component to component (such as pumps, valves, meters, regulators, and filters). The schematics shall document the range requirements (flow, temperature, and pressure) for all component external interfaces and line sizes. The placement and arrangement of these components shall follow a logical sequence of presentation to provide a clear description of the flow of fluids in the system. The schematics shall reference engineering drawings and associated lists for configuration details.

DRD Continuation Sheet

TITLE: Engineering Drawings and Associated Lists

DRD NO.: 1125CM-005

DATA TYPE: 3

PAGE: 3/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- 15.4 **FORMAT:** Format of engineering drawings shall be in accordance with ASME Y14.100. Drawings shall be delivered in PDF format. 2D/3D CAD shall be in accordance with ASME Y14.41, in the current version of native developed CAD, fully parametric and associative. The contractor shall deliver ProEngineer compatible 3D models of the components. Alternate formats may be acceptable upon negotiation. All documentation/data shall include the contractor's CAGE code and document numbers. The Contractor may submit electronic files of drawings and CAD models via CD, DVD, or direct electronic transfer (Product Data Management (PDM) Tool, FTP, etc.) as specified by the Government.

For all binary deliveries, the contractor shall include a listing of the creating environment to include:

- a. CAD product name/version/patches.
 - b. Subordinate (plug-in) software/version/patches.
 - c. Description of hardware.
 - d. Operating system/version/patches.
- 15.5 **MAINTENANCE:** All documents produced under this DRD must be maintained current. Changes to and/or updating of engineering drawings and associated lists shall be in accordance with the contractor's approved drawing system and the provisions herein. Changes to engineering drawings under the Government's Class I change control shall be submitted by Engineering Change Proposal. The contractor shall maintain the capability to restore and modify any engineering data used in the design through the project lifecycle.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-001**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Development Test Plan
7. **DESCRIPTION/USE:** To establish and delineate a cohesive approach for development and acceptance testing of the system.
8. **OPR:** ER32 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Draft 30 days prior to Prototype RCE Preliminary Design Review (PPDR)
12. **SUBMISSION FREQUENCY:** Update 30 days prior to Prototype RCE Critical Design Review (PCDR) data package; update as required. Final 60 days prior to Engine Test Readiness Review (TRR).
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 5.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Development Test Plan covers all test approach trade studies, and test facility selection activities required in the development of the system.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Development Test Plan shall provide a detailed overview of the logic flow and overall test approach which the developer will use in the development and acceptance of the propulsion system. It provides a detailed summary of the rationale supporting component and system test approach decisions. It describes the trade studies which shall be completed to address the trade space (alternatives), success criteria, and decision dates. This plan shall present an overall test program schedule, indicating test facility modification, test article availability, and test operations. The Development Test Plan shall include as a minimum:
 - a. Test objectives and schedules relative to program milestones.
 - b. Description of unit under test and its configuration.
 - c. Constraints and limitations.
 - d. Instrumentation list.
 - e. Pretest analysis predictions.
 - f. Test cases/matrix.
 - g. Environments.
 - h. Safety and hazard analysis of test conduct and conditions.
 - i. Pass/fail criteria.
 - j. Organization responsible for the test(s).
 - k. Traceability back to the requirement.
 - j. Test Hazard Analyses.
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

- | | |
|-------------------------|--------------------------------------|
| 1. DPD NO.: 1125 | 2. DRD NO.: 1125DE-002 |
| 3. DATA TYPE: 2 | 4. DATE REVISED: |
| | 5. PAGE: 1/1 |
6. **TITLE:** Fracture Control Plan
7. **DESCRIPTION/USE:** To provide a plan for contractor compliance with requirements for fracture control.
- | | |
|---------------------|--------------------|
| 8. OPR: EM20 | 9. DM: ER32 |
|---------------------|--------------------|
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Three months after Authority to Proceed (ATP)
12. **SUBMISSION FREQUENCY:** As part of the Prototype RCE Preliminary Design Review (PPDR) and Prototype RCE Critical Design Review (PCDR) data packages; update as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 9.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Fracture Control Plan defines elements of the fracture control program.
- 15.2 **APPLICABLE DOCUMENTS:**
- | | |
|----------------|--|
| MSFC-HDBK-1453 | <i>Fracture Control Program Requirements</i> |
| MSFC-STD-1249 | <i>Nondestructive Evaluation Guidelines and Requirements for Fracture Control</i> |
| MWI 8071.1 | <i>Fracture Control Board</i> |
| NASA-STD-5007 | <i>General Fracture Control Requirements for Manned Spaceflight Systems</i> |
| NASA-STD-5003 | <i>Fracture Control Requirements for Payloads using the Space Shuttle</i> |
| NASA-HDBK-5010 | <i>Fracture Control Implementation Handbook for Payloads, Experiments and Similar Hardware</i> |
- 15.3 **CONTENTS:** The Fracture Control Plan shall define the elements of the fracture control program and responsibilities for managing them. The requirements for the Fracture Control Plan are defined in NASA-STD-5007, MWI 8071.1, and MSFC-HDBK-1453. Further information and examples are found in NAS-STD-5003, NASA-HDBK-5010, and MSFC-STD-1249.
- 15.4 **FORMAT:** Contractor format is acceptable. The plan shall be available in an electronic database.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-003**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Fracture Control Reports
7. **DESCRIPTION/USE:** To demonstrate that the hardware meets the fracture control requirements.
8. **OPR:** EM20 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of the Prototype RCE Preliminary Design Review (PPDR) data package
12. **SUBMISSION FREQUENCY:** Final at the Prototype RCE Critical Design Review (PCDR)
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 9.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Fracture Control Reports provide data to confirm that hardware meets fracture control requirements.
- 15.2 **APPLICABLE DOCUMENTS:**

MSFC-HDBK-1453	<i>Fracture Control Program Requirements</i>
MSFC-STD-1249	<i>Nondestructive Evaluation Guidelines and Requirements for Fracture Control</i>
MWI 8071.1	<i>Fracture Control Board</i>
NASA-STD-5007	<i>General Fracture Control Requirements for Manned Spaceflight Systems</i>
NASA-STD-5003	<i>Fracture Control Requirements for Payloads using the Space Shuttle</i>
NASA-HDBK-5010	<i>Fracture Control Implementation Handbook for Payloads, Experiments and Similar Hardware</i>
- 15.3 **CONTENTS:** The Fracture Control Reports shall be prepared in accordance with NASA-STD-5007, MWI 8071.1 and MSFC-HDBK-1453 and describe the fracture control analysis results that demonstrate that the fracture control requirements are met. Further information and examples are found in NASA-STD-5003, NASA-HDBK-5010, and MSFC-STD-1249. The reports shall include a list of parts and their disposition for fracture control and include the following for each fracture-sensitive part:
 - a. Diagrams and sketches that show where and how the part is used in subassemblies and assemblies and describe the part function.
 - b. Report of fracture control analytical and nondestructive evaluation (NDE) results for the assembly and subassembly. This report shall include:
 1. Part name.
 2. Part number.
 3. Idealized dimensions used in fracture analyses or tests.
 4. Material (generic name) and condition keyed to items listed in item 15.3.e.
 5. Assumed flaw dimensions and geometric model. For nonfracture critical parts, the classification of the part as low mass, contained/restrained, or fail-safe shall be given.
 6. Type of NDE performed.

DRD Continuation Sheet

TITLE: Fracture Control Reports

DRD NO.: 1125DE-003

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**
7. Lifetime corresponding to flaw size given in 15.3.b.5. For contained/restrained or fail-safe parts, lifetime is the life remaining in that respective condition.
 8. Maximum stress at the flaw location. For contained/restrained or fail-safe parts, this stress is the maximum stress in that respective condition.
 9. Ultimate calculated safety factor corresponding to item 15.3.b.8.
 10. Key references to a location on the part where the flaw is assumed to be located. Keys refer to location on diagrams described in item 15.3.c.
- c. Keyed diagrams and sketches that show flaw locations and part dimensions.
 - d. Representative fracture control analyses for fracture sensitive parts itemized in item 15.3.c. (All fracture control analyses shall be available upon request.)
 - e. Material properties used in the fracture control analyses.
 - f. Analyses load spectra for each fracture sensitive part.*
 - g. List of the accumulated loads for fracture critical parts.*
 - h. Results of flaw screening (NDE and proof testing).*
 - i. Results of damage tolerant testing of fracture critical parts.*
 - j. Rationale for acceptance of any detected flaws.*
- * May reference hardware related documents or other available documents serving as data requirements.
- 15.4 **FORMAT:** Contractor format is acceptable. Reports shall be available in an electronic database.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-004**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Structural Assessment Plan
7. **DESCRIPTION/USE:** To enable the Government to assure compliance with requirements for strength and fatigue analyses, tests, and structural assessments.
8. **OPR:** ER41 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of Prototype Preliminary Design Review (PPDR) data package
12. **SUBMISSION FREQUENCY:** Update at Prototype RCE Critical Design Review (PCDR); update as required
13. **REMARKS: NOTE: Reference Table 1 for applicability information.**
14. **INTERRELATIONSHIP:** SOW paragraph 4.1
15. **DATA PREPARATION INFORMATION:**
 - 15.1 **SCOPE:** The Structural Assessment Plan describes contractor compliance with requirements for strength and fatigue analyses, tests, and structural assessment.
 - 15.2 **APPLICABLE DOCUMENTS:**

NASA-STD-5001	<i>Structural Design and Test Factors for Safety for Space Flight Hardware</i>
NASA-STD-5005	<i>Ground Support Equipment</i>
NASA-STD-5012	<i>Strength and Life Assessment Requirements for Space Propulsion System Engines</i>
MSFC-HDBK-505B	<i>Structural Strength Program Requirements</i>
ANSI/AIAA S-80	<i>Space Systems – Metallic Pressure Vessels, Pressurized Structures, and Pressure Components</i>
ANSI/AIAA S-81	<i>Space Systems – Composite Overwrapped Pressure Vessels (COPVs)</i>
 - 15.3 **CONTENTS:** The Structural Assessment Plan shall be prepared in accordance with the applicable structural requirements documents (see Table 1) referenced in section 15.2 and describe how the contractor intends to comply with the structural strength program requirements. The plan shall identify the organization responsible for the structural analyses, tests, and assessment tasks; define satisfactory results; and include a schedule for completion. The plan shall identify components that require design verification tests and proof tests, specify appropriate test levels and environments, and state the means of correlating test data with analyses.
 - 15.4 **FORMAT:** Contractor format is acceptable. The plan shall be available in an electronic database.
 - 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

Table 1 - Applicability Information

Structural System	Applicable Requirement*	Comments
Space Propulsion System Engines	NASA-STD-5012	This document is only applicable to liquid fueled engines.
Ground Support Equipment	NASA-STD-5005	This document is only applicable to ground support equipment.
Metallic Pressure Vessels, Pressurized Structures and Components	ANSI/AIAA S-80	This document is only applicable to metallic pressure vessels.
Composite Overwrapped Pressure Vessels (COPVs)	ANSI/AIAA S-81	This document is only applicable to composite pressure vessels.
Vehicles, Payloads, and Other Hardware	MSFC-HDBK-505B or NASA-STD-5001	These documents are applicable to vehicles, payloads, and other hardware not listed above.

* Project specific structural assessment plans shall address additional requirements and special provisions.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-005**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Development Test Reports
7. **DESCRIPTION/USE:** To report the results of the development test activities.
8. **OPR:** ER32 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Electronic test data recorded during each day of testing will be posted to a secure server within 24 hours of completion of the last test of the day.
12. **SUBMISSION FREQUENCY:** Interim test series reports will be issued within 1 week of completion of a test series. The final test program report will be released to the government within 1 month of completion of the final test.
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125DE-001, *Development Test Plan* and 1125DE-006, *Development Test Procedures*. SOW paragraph 5.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Development Test Reports (i.e., procedure, memo, assessment, test reports, inspection reports) document the results of each development test activity.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Development Test Reports shall contain:
 - a. Electronic test data submissions shall include, but are not limited to:
 1. Header(s) indicating test number and date.
 2. Chamber pressure vs. time.
 3. Fuel and oxidizer (if applicable) inlet pressure and temperature vs. time.
 4. Fuel and oxidizer (if applicable) mass flow rates vs. time.
 5. Thrust vs. time.
 6. Accelerometer data vs. time.
 - b. Interim test series reports shall include, but are not limited to:
 1. Cover page including:
 - (a) Report title, number, and source.
 - (b) Report date.
 - (c) Name(s) of author(s).
 - (d) Contract number.
 - c. Brief abstract summarizing the contents of the report, including identification of the tests performed, the functional purpose of the tests (i.e., vibration, duty cycle demonstration, etc.), and the test objectives.

DRD Continuation Sheet

TITLE: Development Test Reports

DRD NO.: 1125DE-005

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- d. Body of the report shall include:
 - 1. Text describing details of the test series.
 - 2. Tables and figures presenting the data from each test in the series. Data to be reported shall include, as a minimum, conditions for each test parameter listed under item (a) for electronic test data.
 - 3. Discussions of whether test series objectives were met, any anomalies encountered, observations, etc.
 - 4. Description of deviations from nominal results, failures, approved corrective actions and procedures, and retest.
 - 5. Traceability back to the requirement.
 - 6. Copy of as-run control sequence (as appropriate), including duty cycles, pulse widths, etc.
 - 7. Identification of test configuration.
 - 8. Conclusions relative to success of the test series and recommendations for the next series, if applicable.
- e. The final test program report shall include all items listed in Section 15.3.b, but shall incorporate data from all tests conducted during the test program, address whether all test program goals were met, and provide overall conclusions and recommendations relevant to a follow-on flight program.

15.4 **FORMAT:** Contractor format is acceptable.

15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-006**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Development Test Procedures
7. **DESCRIPTION/USE:** To document and provide procedures for performing development test, inspection, or demonstration activities.
8. **OPR:** ER32 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Draft as part of the Prototype RCE Critical Design Review (PCDR) data package
12. **SUBMISSION FREQUENCY:** Baseline 60 days prior to TRR. There is no scheduled recurrence. However, changes to the delivered procedures document that could potentially affect test data shall be communicated to the government through an update submitted at least 2 days prior to the first test incorporating the changes.
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125DE-001, *Development Test Plan* and 1125DE-005, *Development Test Reports*. SOW paragraph 5.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Development Test Procedures define the detail instructions to be followed in conducting the identified development activities (test, inspection, or demonstration).
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** Each Development Test Procedure shall contain the following:
 - a. Identification of item/article being subjected to test, inspection, or demonstration.
 - b. Identification of objectives established for the particular test, inspection, or demonstration.
 - c. Description of steps and operations, in sequence, to be taken.
 - d. Identification of measuring and recording equipment to be used, specifying range, accuracy, and type and any special instructions for operating such equipment.
 - e. Layouts, schematics, or diagrams showing identification, location, and interconnection of item/article, support equipment, and measuring equipment.
 - f. Identification of hazardous situations or operations.
 - g. Precautions and safety instructions to ensure safety of personnel.
 - h. Environmental and/or other conditions to be maintained with tolerances.
 - i. Constraints on test, inspection, or demonstration.
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-007**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Engine Thermal Data and Analysis
7. **DESCRIPTION/USE:** To be used in future thermal analysis and to communicate the thermal analysis that was used during design.
8. **OPR:** ER43 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Thermal properties and environments will be submitted as soon as the data is available. Thermal models and geometry models as part of the Prototype RCE Preliminary Design Review (PPDR) data package.
12. **SUBMISSION FREQUENCY:** Final analyses presented as part of the Prototype RCE Critical Design Review (PCDR) data package
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 4.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Engine Thermal Data and Analysis provides information necessary to understand the thermal analysis that was performed during design and development.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Engine Thermal Data and Analysis shall contain the following:
 - a. Trade Studies and Design Analysis which shall include:
 1. Sensitivities to material properties.
 2. Coolant flow rates.
 3. Pressures.
 4. Temperatures.
 5. Hardware dimensional changes.
 6. Environmental variations.
 7. Thermal design margins for major components and engine interfaces.
 8. All thermal trade studies contained in the Thermal Design Data Book.
 - b. Special Studies for Engine Anomalies which shall include:
 1. Failure scenarios.
 2. Possible design changes.
 3. Report on the thermal aspects of the anomalies which shall include:
 - (a) References to other databases that were used.
 - (b) Delivery of any models that were used.
 - (c) A description of the anomaly.

DRD Continuation Sheet

TITLE: Engine Thermal Data and Analysis

DRD NO.: 1125DE-007

DATA TYPE: 3

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- (d) Failure scenarios that were studied.
- (e) Assumptions that were used.
- (f) Results of the studies.
- c. Thermal Properties Database which shall include for all material in the engine:
 - 1. Thermal conductivity, specific heat, and density.
 - 2. Fluid properties that are used.

NOTE: Thermophysical properties, density, thermal conductivity, specific heat, and viscosity shall be included for the temperature, pressure, and mixture ratio range that is expected in the engine. Programs used to calculate any fluid properties shall be referenced and provided to the Government.
- d. Thermal Environments Database which shall include:
 - 1. Temperatures, pressures, flowrates, and expected heat fluxes that are used as boundary conditions for the thermal design.
 - 2. Transient behavior of the flow environments and heat fluxes.
 - 3. Environments for all engine components.
- e. Geometric Math Model Database.

NOTE: The geometric math models that are used for thermal design and analysis shall be entered in a database as an aid to independent thermal analysis in the future. Geometry files entered into the database should have significant geometry information required to build a thermal model of the component.

15.4 **FORMAT:** The format shall be determined by the project.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-008**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Structural Strength and Fatigue Analysis Reports
7. **DESCRIPTION/USE:** To provide component strength and fatigue analysis and a structural analysis database used for development of the hardware.
8. **OPR:** ER41 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of the Prototype RCE Preliminary Design Review (PPDR) data package
12. **SUBMISSION FREQUENCY:** As part of the Prototype RCE Critical Design Review (PCDR) data package
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 4.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Structural Strength and Fatigue Analysis Reports provide strength and fatigue analysis and structural analysis databases. Strength and fatigue analyses are documented to demonstrate that strength and fatigue requirements have been met. Preliminary strength and fatigue analyses shall assure the structural integrity of major structural elements and the credibility of weight calculations. Analyses provided in support of the PCDR shall substantiate the structural integrity of detailed parts and provide the basis for approval of drawings. Analyses shall fully substantiate the structural integrity of each detailed part in its final design configuration.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The reports shall document strength and fatigue analyses for structural flight components, and provide a structural analysis database for the development hardware. These analyses shall verify the capability of the hardware to withstand worst case design loads. The strength and fatigue analysis reports shall identify such items as geometric description of each component, drawing or part number, identification of all applied loads, type of material and applicable strength and fatigue allowables, environments and effects, proper identification of reference inputs into the analyses, and a summary of calculated margins of safety and life predictions. An automated procedure shall be established to calculate margins for all structures and components. When loads from a new load cycle are provided, they shall be used to automatically determine new margins of safety. Effects of structural design changes shall be incorporated into this procedure so that margins of safety for the "as-built" configuration may be accurately calculated.

DRD Continuation Sheet

TITLE: Structural Strength and Fatigue Analysis Reports

DRD NO.: 1125DE-008

DATA TYPE: 3

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

When computer analyses, including finite element analyses, are used, deliverable information shall include a description of the analyses with applicable geometry, dimensions, loads, other boundary conditions, annotated input data file(s), plots of model geometry, and results. This information shall be sufficient to recreate the analysis if necessary. Computer programs, data inputs, and data outputs utilized in these analyses must be documented and available to the Government upon request.

15.4 **FORMAT:** Contractor format is acceptable. Reports shall be available in an electronic database.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125DE-009**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Structural Dynamics Analyses and Models Documentation
7. **DESCRIPTION/USE:** To define the structural dynamics analyses, loads, and models to be used for the design of the development hardware and its associated equipment.
8. **OPR:** EV31 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** 30 days prior to Prototype RCE Critical Design Review (PCDR)
12. **SUBMISSION FREQUENCY:** As part of Prototype RCE Critical Design Review (PCDR) and Acceptance Data Package
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 4.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Structural Dynamics Analyses and Models Documentation defines the structural dynamics analyses, loads, and models to be used for the design of the development hardware and its associated equipment.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Structural Dynamics Analyses and Models Documentation shall consist of:
 - Structural Dynamics Analysis Reports - These reports shall describe the structural dynamic response and loads analyses conducted on the development hardware, its systems, subsystems, and components to calculate stresses and/or to identify operational limits and restrictions. Assumptions, boundary conditions, applied environments for response analyses, rationale, appropriate results, Campbell or resonance diagrams for normal modes, characterized modal parameters for response analyses, plots of modes, and proper reference of models shall be provided. Environments used for response analyses shall include all vibration and mechanical induced environments including pressure fluctuations due to flow induced vibrations, cross-correlated pressure measurements that occur during the combustion process and vibroacoustics phenomena.
 - Models - The structural math models used for loads and dynamics response analyses shall be documented. Verification of models shall be included in the documentation. Model description shall indicate pertinent modeling parameters, model display, material properties used, and type of model. A list and scope of the structural math models shall be proposed by the contractor and approved by MSFC.
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125LS-001**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Special Handling and Storage Requirements Document(s)
7. **DESCRIPTION/USE:** To identify the requirements for special packaging, handling, storage and transportation for program critical hardware (PCH).
8. **OPR:** AS42 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Packaging, Handling, Storage and Transportation (PHS&T) Plan (part 15.3.a) as part of the Prototype RCE Preliminary Design Review (PPDR) data package. Parts 15.3.b, c, d, e, and f as part of Prototype RCE Critical Design Review (PCDR) data package. Detailed handling/moving procedures 30 days before each program critical hardware move.
12. **SUBMISSION FREQUENCY:** Updated PHS&T Plan as part of Prototype RCE Critical Design Review (PCDR) data package; updates as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 8.3.7
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Special Handling and Storage Requirements Document(s) addresses the specific requirements for responsibilities, surveillance, approvals, equipment and personnel certifications, and procedural aspects of the handling functions for program critical hardware.
- 15.2 **APPLICABLE DOCUMENTS:**
- 15.3 **CONTENTS:** The Special Handling and Storage Requirements Document(s) shall include:
 - a. PHS&T Plan, which includes:
 1. Organization and responsibilities.
 2. Requirements and process for training and certification of handling/moving personnel.
 3. Designated points of contacts for these functions.
 4. Process for developing the special moving/handling procedures, review, approval, and implantation for each PCH item.
 5. Method to ensure that all support and handling/moving equipment meets current safety and industry certification.
 - b. List of items designated as PCH, when it becomes PCH in the manufacturing process, and the locations where these items are to be moved/handled.
 - c. Detailed procedures required for each item designated as PCH for each handling and moving operation.
 - d. Designation of responsible organizations for handling each PCH item, its approximate weight, methods for handling, and any handling or moving constraints.
 - e. Safety and preventive maintenance instructions for each PCH item.
 - f. Details of periodic storage inspection processes required to insure that the stored articles meet the requirements for storage as outlined in the procedures.

DRD Continuation Sheet

TITLE: Special Handling and Storage Requirements Document(s) DRD NO.: **1125LS-001**

DATA TYPE: 1

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.4 **FORMAT:** Contractor format is acceptable.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

- | | |
|-------------------------|--------------------------------------|
| 1. DPD NO.: 1125 | 2. DRD NO.: 1125MA-001 |
| 3. DATA TYPE: 1 | 4. DATE REVISED: |
| | 5. PAGE: 1/2 |
6. **TITLE:** Project Management Plan
7. **DESCRIPTION/USE:** To provide an overall description of the process and methods planned for accomplishing the Statement of Work.
8. **OPR:** CS40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** With proposal
12. **SUBMISSION FREQUENCY:** 45 days after Authority to Proceed (ATP); update as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.0
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Project Management Plan provides the basic planning document which describes the contractor's overall plan for performing the contracted scope of work.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Project Management Plan shall provide a description of the contractor's management concepts, practices, approaches, plans, and schedules necessary for accomplishing (managing and controlling) the project tasks described in the Statement of Work. In addition, the plan shall present those management systems to be utilized to define and delegate task assignments and shall define the organizational relationships of the contractor, subcontractors, and the Government.
- Management Overview - A brief description of the project objectives, the system to be furnished, and the equipment (systems), and software that is to be provided. Include a concise summary of the contractor's management organization responsible for performance of the contract, including interrelationships with the Work Breakdown Structure (WBS), within the company and with other contractors, and proposed relationships with the NASA project management.
- Management Systems - This plan shall briefly describe how the various management systems are to be integrated and used for the overall project management and reporting of:
- a. Project management.
 - b. Contract management.
 - c. Financial management.
 - d. Data requirements management.
 - e. Schedules (planning and control).
 - f. Performance management (cost/schedule/technical).
 - g. Configuration management.
 - h. Engineering management.
 - i. Logistics management.
 - j. Test/verification management.

DRD Continuation Sheet

TITLE: Project Management Plan

DRD NO.: 1125MA-001

DATA TYPE: 1

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- k. Subcontractor/vendor management.
- l. Procurement management.
- m. Government furnished property (GFP) management.
- n. Systems engineering management.
- o. Safety, reliability, maintainability, quality assurance.
- p. Automated information management systems.
- q. Communications.
- r. Support equipment management.
- s. Spares philosophy and planning.
- t. Facilities utilization and management.
- u. Project reviews.
- v. Environmental impact management.

NOTE: It is not intended that this plan duplicate other plans called for in the Data Requirements List. This plan should summarize the overall project and reference or summarize other plans where appropriate and shall reference contractor internal procedures where applicable.

15.4 **FORMAT:** Contractor format is acceptable.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-002**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Program/Project Schedules
7. **DESCRIPTION/USE:** To provide the contractor's time-phased plan, current status, key milestones, task interdependencies, and major development phases necessary to accomplish the total scope of work. This schedule will be used to provide management insight into contractor status, potential problem areas, and critical path identification, which will serve as the basis for evaluating contractor performance.
8. **OPR:** CS40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Preliminary with proposal. Initial - first calendar month following the end of the first full month after Authority to Proceed (ATP).
12. **SUBMISSION FREQUENCY:** Monthly, no later than the 10th day of the calendar month following the end of the contractor's accounting month.
13. **REMARKS:** The schedule will be baselined at some point after ATP as agreed to by both parties and not to exceed 90 days after ATP. Reference is made to NPR 7120.5 (Current Revision), *NASA Program and Project Management Processes and Requirements*. This document shall be used as a guide in preparation of the schedules.
14. **INTERRELATIONSHIP:** DRDs 1125MA-001, *Project Management Plan* and 1125MA-003, *Work Breakdown Structure and Dictionary*. SOW paragraph 6.2
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Program/Project Schedule provides data for the assessment of contract schedule and logic network of the tasks to be performed.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Program/Project Schedule shall include tasks necessary to accomplish the total scope of work as defined in the work breakdown structure (WBS). The schedule shall also include all logical relationships (interdependencies) between tasks. Schedules shall contain the approved baseline schedule as well as current forecasted dates and shall be traceable to the approved Work Breakdown Structure (WBS). All key milestones shall be clearly identified and logically linked to related tasks. The program/project schedule shall be created and maintained in management software that supports automated time phasing of tasks, a logic driven critical path, schedule assessment, and trend analysis capabilities. Program/Project Schedules and the Logic Network shall be reported in four sections. The following deliverables shall be extractions from the automated logic network database. All data contained in the sections shall be consistent, statused monthly and based on the same cutoff date.
 - a. Summary Schedule - One page, top level, Gantt-type summary document arranged by WBS that reflects all contract and controlled milestones, major program/project phases (i.e., design, fabrication, integration, assembly, etc.) and all end item deliveries.

DRD Continuation Sheet

TITLE: Program/Project Schedules

DRD NO.: 1125MA-002

DATA TYPE: 2

PAGE: 2/2

15 **DATA PREPARATION INFORMATION (CONTINUED):**

- b. Logic Network Database - an automated logic network database consisting of schedule data for all WBS elements. The entire scope of work shall be broken into schedule tasks and milestones at a consistent level of detail to allow discrete progress measurement and visibility into the overall development, fabrication, integration, assembly, test, and delivery phase of each end item deliverable. Additionally, all schedule tasks/milestones shall be integrated with the appropriate sequence relationships to provide a total end-to-end logic network leading to each end-item delivery. This database shall contain all contract and controlled milestones, key subcontractor milestones, end item delivery dates, key data delivery dates, and key Government Furnished Property (GFP) need dates. The database shall contain the appropriate task coding attributes necessary to provide sort, select, and summarization capabilities for, but not limited to, WBS element, program/project phase, and level-of-effort tasks. The logic network database serves as the basis for identification of program/project critical paths as well as critical schedule analysis.
 - c. Critical Path Report - This report shall be an extract from the Logic Network Database and include all tasks and milestones with 10 workdays or less of total slack (float). The report shall be submitted in a waterfall format and organized in manner such that the path with the least amount of slack is delineated first and followed by each successive path according to total slack values.
 - d. Contractor Schedule Assessment Report - This report shall contain a count of the total number of tasks, milestones and non-detail (e.g., summary, hammock, rollup, etc.) activities contained in the schedule, a count of the number of completed tasks and milestones, a count of the number of tasks and milestones to be completed, a count of the number of tasks and milestones that have no predecessor and/or no successor relationships, a count of the total number of tasks and milestones that have a total float (slack) value greater than 25% of the remaining duration of the total program/project schedule, a count of the total number of non-detail (e.g., summary, hammock, rollup, etc.) activities that have any predecessor or successor logical relationships, a count of the total number of tasks and milestones that have forced or fixed dates. The report shall contain critical path narratives explaining changes and impacts to the critical paths listed in section c above. The report shall contain narrative explanations for contract milestones and significant project milestones that have moved more than 45 calendar days into the future from their baseline dates. Program/Project milestones shall be identified and negotiated with the project office. These narratives shall include a proposed work-around schedule detailing how the contractor plans to recover the lost schedule time.
- 15.4 **FORMAT:** Submission of the deliverables in 15.3 shall be by standard hardcopy and electronic media. Electronic media submittals shall be in native file format utilizing schedule management software approved by the MSFC project office. A legend identifying the contractor's schedule symbols used and their meaning shall be provided.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-003**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Work Breakdown Structure (WBS) and WBS Dictionary
7. **DESCRIPTION/USE:** To establish a product-oriented framework for reporting program cost, schedule, and technical performance. To provide a basis for uniform planning, reporting status, program visibility, and assignment of responsibilities.
8. **OPR:** CS40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Draft with proposal
12. **SUBMISSION FREQUENCY:** 30 days after Authority to Proceed (ATP), update as required. Revised pages shall be submitted 10 calendar days after contract WBS changes (following Government approval).
13. **REMARKS:** NPD 7120.4 (Current Revision), *Program/Project Management*, and NPR 7120.5 (Current Revision), *NASA Program and Project Management Processes and Requirements*, and MIL-HDBK-881, *Department of Defense Handbook Work Breakdown Structure*, shall be used as guides in the preparation of the WBS and the WBS dictionary.
14. **INTERRELATIONSHIP:** SOW paragraph 6.1
15. **DATA PREPARATION INFORMATION:**
 - 15.1 **SCOPE:** The Work Breakdown Structure (WBS) establishes a product-oriented logical subdivision of hardware, software, services, facilities, etc., that make up the total project scope of work. The WBS Dictionary provides a narrative description of the tasks and effort to be performed in each WBS element.
 - 15.2 **APPLICABLE DOCUMENTS:** None
 - 15.3 **CONTENTS:** The WBS and WBS Dictionary are two distinct project documents used for defining the approved project scope of work. The contents of each document are detailed in the following paragraphs:
 - a. WBS - A logical, hierarchical display of the subdivision of all project work to be completed. The WBS shall include the approved element title and element number.
 - b. WBS Dictionary - The WBS dictionary shall describe and document the work content of every WBS element and relevant efforts associated with each element (e.g., design, development, manufacturing). The WBS dictionary shall be arranged in the same order as the contract WBS. The WBS dictionary shall include the following for each WBS element:
 1. WBS element title.
 2. WBS element code.
 3. WBS element content description (including quantities, relevant associated work, and contract end items where applicable).
 4. WBS Index.

DRD Continuation Sheet

TITLE: Work Breakdown Structure (WBS) and WBS Dictionary **DRD NO.:** 1125MA-003

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

5. SOW paragraph number.
6. Specification (number and title) associated with the WBS element (if applicable).
7. Contract line item associated with the WBS element.
8. Date, revision number, revision authorization and approved changes.
9. Contract Identification Number.
10. Budget and reporting number (i.e., Charge Code).

15.4 **FORMAT:** The WBS shall be in a chart format showing element relationships, arranged in the same order as the WBS provided in the Request for Proposal. The WBS Dictionary shall be ordered in consonance with the WBS index and shall reference each WBS element by its identifier and name.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-004**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Continuous Risk Management
7. **DESCRIPTION/USE:** To provide a baseline document for planning, management, control, and implementation of the contractor's risk management program.
8. **OPR:** QD40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Risk Management Plan, Risk List, Analysis, and Tracking Report - 90 days after Authority to Proceed (ATP). Lessons Learned Search Reports and Lessons Learned Submittals - as part of the Prototype RCE Preliminary Design Review (PPDR) data package.
12. **SUBMISSION FREQUENCY:** Shall update and submit Risk List, Analysis, and Tracking Report in accordance with the NASA Project Risk Management Plan, every 30 days (monthly). Shall update Plan as required. Lessons Learned Search Reports and Lessons Learned Submittals shall be due at each subsequent major milestone [Prototype RCE Critical Design Review (PCDR) and Acceptance Reviews (AR)] and as appropriate throughout the project lifecycle.
13. **REMARKS:** Reference is made to the following documents:
 NPD 8700.1 NASA Policy for Safety and Mission Success
 Notice 97-58 NASA Procurement Notice for Risk-Based Acquisition Management (R-BAM)
 MWI 7120.6 Program and Project Continuous Risk Management
14. **INTERRELATIONSHIP:** SOW paragraph 7.0
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** Continuous Risk Management addresses how NASA risk management requirements are to be implemented throughout the program's life cycle.
- 15.2 **APPLICABLE DOCUMENTS:**
 NPR 7120.5 NASA Program and Project Management Processes and Requirements
 NPR 8000.4 Risk Management Procedural Requirements
- 15.3 **CONTENTS:** The Risk Management Plan shall specify how the contractor will satisfy the risk management requirements of NPR 7120.5 by using the risk management procedures and guidelines specified in NPR 8000.4 in a manner that is compatible with the Project Office's Risk Management Plan. The plan shall specify how the contractor will document risk management activities and how the contractor will communicate risk issues and concerns to the Government.

The Risk List shall identify program risks with regards to budget, cost, safety, schedule, and technical risks.

The Risk Analysis shall contain the following data: 1) References to source data for identified risk areas such as test data, lessons learned, Failure Modes and Effects Analysis (FMEA), hazard analysis and technical analysis; 2) Catalog of all program/project risks; 3) Risk evaluation data that identifies the impact, probability and time frame for each risk; 4) Risk classification and prioritization data.

DRD Continuation Sheet

TITLE: Continuous Risk Management

DRD NO.: 1125MA-004

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

The Risk Tracking Report shall contain the following data: 1) Status of all risks and risk metrics; 2) Risk mitigation plans and verification of completed mitigation plans; 3) Risk decision summaries that will document re-planning of unsuccessful mitigation plans and risk acceptance/closures.

Lessons Learned Search Reports shall specify how the contractor has satisfied the requirements of NPR 7120.5 by incorporating lessons learned. They shall contain the following data: 1.) Guidelines used to determine relevant searches; 2.) Details of searches that were performed, together with accompanying rationale; 3.) A list of relevant articles returned, source, and relevance to the project; and 4.) How the project plans to incorporate relevant lessons learned.

Lessons Learned Submittals shall include: 1.) Description of the driving event; 2.) Description of the lessons learned and any corrective action that may have resulted; 3.) Recommended changes to specifications or procedures.

15.4 **FORMAT:** Contractor format is acceptable unless specified by the Program Risk Management Plan.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

- | | |
|---|--------------------------------------|
| 1. DPD NO.: 1125 ISSUE: RFP | 2. DRD NO.: 1125MA-005 |
| 3. DATA TYPE: 2/3 | 4. DATE REVISED: |
| | 5. PAGE: 1/3 |
6. **TITLE:** Major Review Documentation
7. **DESCRIPTION/USE:** Used for conduct of formal technical reviews to evaluate design and status, document baselines, and monitor disposition of action items and Review Item Discrepancies (RIDs).
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** See Attachment 2
11. **INITIAL SUBMISSION:** See Attachment 2
12. **SUBMISSION FREQUENCY:** Per technical review
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraphs 4.1, 4.3 and 6.4
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** Major Review Documentation contains all of the required documentation necessary to support major technical reviews.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** Documentation required for the following technical reviews shall be provided as described in Attachment 1.
- Additional documentation to be provided are:
- a. Agenda - The agenda shall specify the time and place for the scheduled review, specific review items, supporting documentation, and key participants. Submit approved copies at the review. See Attachment 2.
 - b. Presentation Charts - Presentation charts shall be submitted at the review. They shall summarize the details contained in the data package and should identify compliance with the contract requirements. See Attachment 2 for distribution and availability of data.
 - c. Minutes - The minutes shall contain a description of the review with sufficient detail to enable the review to be made a matter of record. The minutes shall include the presentation charts, a listing of RIDs, action items with actionee and suspense (closure) data. See Attachment 2 for distribution and availability of data.
 - d. RIDs - RIDs showing action items, actionees, suspense dates and closure status shall be submitted. See Attachment 2 for distribution and availability of data.
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** As required to correct errors and to maintain RID closure status.

1. **Prototype RCE System Requirements Review (PSRR)**
 Allocated Baseline for Configuration Control (Engine Specification Document)
 Specifications (DRD 1125SE-001)
 Interface Definition Document (DRD 1125SE-002)
 Mass Properties Report (DRD 1125SE-003)

2. **Prototype RCE Preliminary Design Review (PPDR)**
 Development Test Plan (DE-001)
 Fracture Control Plan (DRD 1125DE-002)
 Fracture Control Reports (DRD 1125DE-003)
 Structural Assessment Plan (DRD 1125DE-004)
 Thermal models and geometry models (DRD 1125DE-007)
 Structural Strength and Fatigue Analysis Report (DRD 1125DE-008)
 Packaging, Handling, Storage and Transportation (PHS&T) Plan (Part 15.3.a) (DRD 1125LS-001)
 Lessons Learned Search Reports and Lessons Learned Submittals (DRD 1125MA-004)
 Contamination Control and Implementation Plan (DRD 1125MP-001)
 Failure Modes and Effects Analysis (FMEA) (DRD 1125RM-001)
 Interface Definition Document (DRD 1125SE-002)
 Update Mass Properties Report (DRD 1125SE-003)

2. **Prototype RCE Critical Design Review (PCDR)**
 Update Development Test Plan (DE-001)
 Fracture Control Plan (DRD 1125DE-002)
 Fracture Control Reports (DRD 1125DE-003)
 Structural Assessment Plan (DRD 1125DE-004)
 Development Test Procedures (DRD 1125DE-006)
 Engine Thermal Data and Analysis (DRD 1125DE-007)
 Structural Strength and Fatigue Analysis Report (DRD 1125DE-008)
 Structural Dynamics Analyses and Models Documentation (DRD 1125DE-009)
 Special Handling and Storage Requirements Documents (Parts 15.3.a,b,c,d,e and f) (DRD 1125LS-001)
 Lessons Learned Search Reports and Lessons Learned Submittals (DRD 1125MA-004)
 Failure Modes and Effects Analysis (FMEA) (DRD 1125RM-001)
 Update Interface Definition Document (DRD 1125SE-002)
 Update Mass Properties Report (DRD 1125SE-003)

4. **Acceptance Review (AR)**
 Acceptance Data Package (DRD 1125CM-002)
 Lessons Learned Search Reports and Lessons Learned Submittals (DRD 1125MA-004)

5. **Test Readiness Review (TRR)**
 Final Development Test Plan (DE-001)
 Development Test Procedures (DE-006)

ATTACHMENT 2

Technical Review Documentation
Distribution and Availability of Data

Document	Type	Design Reviews PSRR, PPDR, PCDR (Copies/Availability)	AR (Copies/Availability)
Agenda	2	One/15 days prior to review	One/15 days prior to review
		Approved copies at review	Approved copies at review
Data Package	3	20/Two weeks prior to review	20/Two weeks prior to review
Presentation Charts	3	One to each attendee at review	One to each attendee at review
Minutes	2	One to each attendee/Within two weeks after review	One to each attendee/ Within two weeks after review
RIDs (Generated at Review)	2	Five per RID/ Within seven days of closure date	Five per RID/ Within one day of closure date

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-006**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Monthly Status and Final Reports
7. **DESCRIPTION/USE:** To provide visibility to contractor and MSFC project management of actual and potential problems and progress toward meeting the cost, technical and schedule requirements.
8. **OPR:** JP30 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Monthly Status Report: First calendar month following the end of the first full month after Authority to Proceed (ATP), unless otherwise specified by the Contracting Officer
12. **SUBMISSION FREQUENCY:** Monthly Status Report: 10 days following the end of each month. Final Report: 30 days after each test.
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Monthly Status and Final Reports provide data for the assessment of monthly cost, technical and schedule progress of the contract work.
- 15.2 **APPLICABLE DOCUMENTS:**
- 15.3 **CONTENTS:**
 - a. The Monthly Status and Final Reports shall contain:
 1. Work accomplished for current reporting period, including a report of overall cost, technical and schedule performance.
 2. Work planned for next reporting period.
 3. Current problems which impede performance or impact program schedule or cost, and proposed corrective action.
 4. Other information that assist the Government in evaluating the contractor's cost, technical and schedule performance, e.g., innovative processes and cost reduction initiatives.
 - b. Final Report shall contain:
 1. Design details and test results of the valve.
 2. The design package and test results for the Roll Control Engine (RCE).
- 15.4 **FORMAT:** Contractor format is acceptable.
- 15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-007**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Financial Management Report (533M and 533Q)
7. **DESCRIPTION/USE:** To provide quarterly and monthly financial reports for monitoring program costs. The 533M and 533Q reports are the official cost documents used at NASA for cost type, price redetermination, and fixed price incentive contracts.
8. **OPR:** CS40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** An initial report in the 533Q format is required within 30 working days after Authority to Proceed. Initial 533M reporting shall begin no later than 30 days after the incurrence of cost.
12. **SUBMISSION FREQUENCY:** 533Q: Quarterly; no later than the 15th day of the month preceding the quarter being reported in columns 8a, 8b, and 8c. 533M: Monthly; no later than 10 working days following the close of the contractor's accounting month.
13. **REMARKS:** The data contained in the reports shall be auditable using Generally Accepted Accounting Principles.
14. **INTERRELATIONSHIP:** NFS 1852.242-73, *NASA Contractor Financial Management Reporting*, (November 2004). SOW paragraph 6.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Financial Management Report provides data on accumulated costs and funding projections for management of the contract.
- 15.2 **APPLICABLE DOCUMENTS:**
NPR 9501.2D *NASA Contractor Financial Management Reporting*
- 15.3 **CONTENTS:** The elements of cost for financial reporting shall be mutually agreed by the contractor and NASA project office. The Financial Management Reports (533M and 533Q) shall be prepared in accordance with the detailed instructions provided on the reverse side of the NASA Forms 533M and 533Q and the supplementary instructions set forth in NPR 9501.2D, Chapter 3.
 - a. 533Q Quarterly Report shall include actual cost and cost projections at the total contract level. The initial 533Q report shall reflect the original contract value detailed by negotiated reporting categories and serve as the original baseline plan.
 - b. 533M Monthly Report shall include actual cost and cost projections at the total contract level.

A summary level page reflecting cumulative total contract cost since inception shall be included. Reconciliation between the 533M/533Q and the Cost Performance Report (CPR) or Modified Cost Performance Report (M/CPR) shall be submitted as an attachment to the 533M/533Q Report.

DRD Continuation Sheet

TITLE: Financial Management Report (533M and 533Q)

DRD NO.: 1125MA-007

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.4 **FORMAT:** Contractor internal automated printout reports may be substituted for 533M/533Q forms (with NASA Contracting Officer's approval) provided that the contractor report contains all of the data elements required by NASA Forms 533M and 533Q. Electronic submission of contractor data is strongly encouraged (reference NPR 9501.2, paragraph 3.7).

15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MA-008**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Final Scientific and Technical Reports
7. **DESCRIPTION/USE:** To provide a summary of the results of the entire contract effort, including recommendations and conclusions based on the experience and results obtained.
8. **OPR:** CS40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter. In addition to the final report submitted to the Contracting Officer, the contractor shall concurrently provide to the Center STI/Publication Manager and the NASA Center for AeroSpace Information (CASI) a copy of the letter transmitting the final report to the Contracting Officer. The copy of the letter shall be submitted to CASI at the following address:
Center for AeroSpace Information (CASI)
Attn: Acquisitions Collections Development Specialist
7121 Standard Drive
Hanover, Maryland 21076-1320
11. **INITIAL SUBMISSION:** 30 days after completion of contract
12. **SUBMISSION FREQUENCY:**
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 6.3
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Final Scientific and Technical Reports shall summarize the results of the entire contract work.
- 15.2 **APPLICABLE DOCUMENTS:**
NFS 1852.235-73 *Final Scientific and Technical Reports*
- 15.3 **CONTENTS:** The Final Scientific and Technical Reports shall be prepared and submitted in accordance with NFS 1852.235-73. The Final Report shall contain the information required by NFS 1852.235-73. The Final Report shall summarize the results of the entire contract, including recommendations and conclusions based on the experience and results obtained. The Final Report shall include tables, graphs, diagrams, curves, sketches, photographs, and drawings in sufficient detail to explain comprehensively the results achieved under the contract. The Final Report shall include a completed report documentation page (Standard Form 298) as the final page, per NFS 1852.235-73(c).
- 15.4 **FORMAT:** Contractor format is acceptable for the text of the report. The last page of the report shall be in accordance with Standard Form 298. The report shall be provided in both hardcopy and electronic versions. Electronic format shall be in accordance with NFS 1852.235-73.
- 15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-001**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/3

6. **TITLE:** Contamination Control and Implementation Plan (CCIP)

7. **DESCRIPTION/USE:** The Contamination Control and Implementation Plan (CCIP) shall define implementation measures to assess and control contamination from design, through manufacturing, assembly, test and transportation, such that environments, materials, and processes do not adversely affect vehicle hardware system life or performance.

8. **OPR:** EM03 9. **DM:** ER32

10. **DISTRIBUTION:** Per Contracting Officer's letter

11. **INITIAL SUBMISSION:** As part of the Prototype RCE Preliminary Design Review (PPDR) data package

12. **SUBMISSION FREQUENCY:** One month prior to milestone reviews; update as required

13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125MP-002, *Materials and Processes Identification and Usage List (MIUL)*; 1125MP-003, *Manufacturing and Assembly Plan*, 1125MP-004, *Materials and Processes Selection, Implementation, and Control Plan*; 1125MP-005, *Nondestructive Test (NDT) Plan*, and 1125MP-006, *Materials Usage Agreement (MUA)*. SOW paragraph 8.3.10

15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Contamination Control and Implementation Plan (CCIP) is applicable to hardware developer(s), subcontractor(s), and vendor(s).

- 15.2 **APPLICABLE DOCUMENTS:**

MSFC-STD-506	<i>Standard, Materials and Processes Control</i>
MAPTIS-II database	http://maptis.nasa.gov/ Electronic Materials Selection List for MSFC Space Hardware Systems
SP-R-0022A	<i>General Specification, Vacuum Stability Requirements of Polymeric Materials for Spacecraft Applications</i>
MSFC-STD-246	<i>Standard Design and Operational Criteria of Controlled Environmental Areas</i>
MSFC-SPEC-1238	<i>Thermal Vacuum Bakeout Specification for Contamination Sensitive Hardware</i>
MSFC-SPEC-1443	<i>Outgassing Test for Non-Metallic Materials Associated with Sensitive Optical Surfaces in a Space Environment</i>
MPR 5340.1	<i>Controlled Work Area, Clean Room and Flow Bench Operations</i>
MIL-STD-1246	<i>Product Cleanliness Levels and Contamination Control Program</i>
ASTM E595	<i>Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment</i>

DRD Continuation Sheet

TITLE: Contamination Control and Implementation
Plan (CCIP)

DRD NO.: 1125MP-001

DATA TYPE: 2

PAGE: 2/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.3 **CONTENTS:** A CCIP shall be developed to define control and implementation measures for all stages of development and use. The plan shall define the molecular and particulate contamination control requirements and how those requirements will be implemented. This plan shall address specific procedures for controlling, monitoring, verifying and reporting cleanliness and other production environment standards at all project phases as required by MPR 5340.1 and MSFC-STD-246. The plan shall address as a minimum, the following:

- a. Conformance - If tailoring of the requirements is planned or necessary, this plan will allow for NASA approval of alternate requirements proposed by the hardware developer. The contamination control requirements of MSFC-STD-506, SP-R-0022A, MPR 5340.1, MSFC-STD-246, MAPTIS-II database and the following shall be addressed to describe the degree of conformance to the requirements and the method of implementation:
 1. Materials Selection - Materials shall be selected to preclude a source of contamination in both natural and induced environments. Contamination levels shall fall within acceptable critical surface design requirements established for critical surfaces. Friable, shatterable, or flaking materials shall not be used unless protected and approved by the assigned NASA contamination control engineer (CCE) via Materials Usage Agreement (DRD 1125MP-006). All materials exposed to the space environment and located near critical surfaces shall not contaminate those surfaces. All materials exposed to the space environment and located near critical surfaces shall not contaminate those surfaces. Total mass loss (TML) of 1.0% and a Collectable Volatile Condensable Materials (CVCM) content of 0.1% (both expressed as percentages of material weight) shall be used as screening levels for rejection of materials when exposed to conditions equivalent to the expected use environment. Testing shall be in accordance with ASTM E-595 or equivalent and MSFC-SPEC-1443. The use of materials deemed acceptable in accordance with this test shall be used as necessary, to ensure that the performance of the materials are satisfactory. All fluids shall be procured to specifications listed in the Contamination Control and Implementation Plan (CCIP). Acceptable fluid cleanliness levels shall be defined in the specifications.
 2. Cleaning and Surface Cleanliness - All materials shall be cleaned to meet the requirements for the end item use. The cleaning method shall not degrade the material properties, subsequent processing or quality of the part. Nonvolatile residue (NVR) for surfaces characterized as "A" per MIL-STD-1246 shall be determined. Cleaning methods and alternate solvents shall be approved by the NASA Contamination Control Engineer (CCE) and identified in the CCIP. All surface cleanliness requirements will be defined in the CCIP. All contamination sensitive systems shall be thermal vacuum baked to meet the requirements of MSFC-SPEC-1238. All oxygen, fuel and pneumatic systems shall meet the cleanliness requirements of MSFC-STD-164.
- b. Designation of the individual responsible for contamination control, defined as the Contamination Control Engineer (CCE), with corresponding duties and authority.
- c. Hardware design and fabrication, i.e., proper M&P selection such that the hardware is:
 1. Insensitive to contamination to the greatest extent possible.
 2. Not a contamination threat, i.e., payloads or critical surfaces and surfaces which come in contact with environments and fluids.
- d. Definition of hardware (from piece parts to vehicle assemblies) exposure environments from manufacture to on-orbit such that component sensitivity to both particulate and molecular contamination is eliminated or satisfactorily controlled.

DRD Continuation Sheet

TITLE: Contamination Control and Implementation
Plan (CCIP)

DRD NO.: 1125MP-001

DATA TYPE: 2

PAGE: 3/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- e. Cleanliness level acceptance limits and verification methods for fuels, fluids, bonding surfaces, internal surfaces, and external surfaces.
- f. Contamination violation reporting and effects assessment.
- g. Personnel contamination control training programs.
- h. Clean room garments, controls, and monitoring.
- i. Cleaning, inspection, and recertification methodology and frequency.
- j. Foreign object debris controls.
- k. Thermal vacuum bakeout criteria, conditions, and monitoring instrumentation.
- l. Protection methodology, e.g., bagging and packaging criteria and materials.
- m. Transportation controls and monitoring including component manufacture, as applicable, to assembly facilities and transportation to launch site.
- n. Retention of cleanliness verification measurement data for critical process operation.
- o. Methods and planning for contamination control for launch site integration activities.
- p. Contamination controls and methods of implementation for the transportation phase, and prelaunch through postflight storage activities, as applicable, at launch site.
- q. A list of all fluids to be procured to specifications and acceptable cleanliness levels defined in the specifications.

15.4 **FORMAT:** Contractor format is acceptable and shall be consistent with contents of paragraph 15.3 of this DRD.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-002**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2

6. **TITLE:** Materials and Processes Identification and Usage List (MIUL)

7. **DESCRIPTION/USE:** To identify all Material and Processes (M&P) usages contained in the end item, excluding piece part electronics, for evaluation of the acceptability of M&P selected and utilized.

8. **OPR:** EM03 9. **DM:** ER32

10. **DISTRIBUTION:** Per Contracting Officer's letter

11. **INITIAL SUBMISSION:** Two weeks prior to Prototype RCE Preliminary Design Review (PPDR)

12. **SUBMISSION FREQUENCY:** Two weeks prior to milestone reviews, update as required to reflect as-designed versus as-built configuration

13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125MP-001, *Contamination Control and Implementation Plan (CCIP)*; 1125MP-004, *Materials and Processes Selection, Implementation, and Control Plan*; 1125MP-005, *Nondestructive Test (NDT) Plan*, and 1125MP-006, *Materials Usage Agreement (MUA)*; 1125CM-006, *Engineering Drawings and Associated Lists*. SOW paragraph 8.3.10

15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Materials and Processes Identification and Usage List (MIUL) identifies all M&P usages contained in the end item.

- 15.2 **APPLICABLE DOCUMENTS:**

MSFC-STD-506	<i>Standard, Materials and Processes Control</i>
MSFC-SPEC-250	<i>Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for</i>
MAPTIS-II database	http://maptis.nasa.gov/ Electronic Materials Selection List for MSFC Space Hardware Systems.
MSFC-STD-3029	<i>Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments</i>
SP-R-0022A	<i>General Specification, Vacuum Stability Requirements of Polymeric Materials for Spacecraft Applications</i>
NASA-STD-6001	<i>Flammability, Odor, Offgassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion</i>
MSFC-PROC-1301	<i>Guidelines for Implementation of Required Materials Control Procedures</i>
MSFC-PROC-2095	<i>Desk Instructions for Processing Materials Usage Evaluation Sheets</i>

- 15.3 **CONTENTS:** As a minimum, the MIUL shall document and identify the following:
 - a. Detail drawing number, title (nomenclature), and dash number.
 - b. Next assembly number, title (nomenclature), and dash number.
 - c. Change letter designation.
 - d. Drawing source (contractor or vendor).

DRD Continuation Sheet

TITLE: Materials and Processes Identification and
Usage List (MIUL)

DRD NO.: **1125MP-002**

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- e. Material and process specification with title, revision, and author identified.
- f. Cure number from the Materials and Processes Technical Information System (MAPTIS) (shall define cure conditions for nonmetals only).
- g. Environmental data (complete environment history including all storage, assembly and service environments, media, pressure, temperature, etc.).
- h. Quantitative information shall include weight, thickness and surface area (for nonmetals only).
- i. MUA number/status (if applicable).
- j. NASA material code (from MAPTIS-II database shall identify material/alloy designation, form, strength or condition for metals; and material designation, trade name, use type, composition and manufacturer for nonmetals)
- k. Standard part number (NAS, MS, AN, etc.).
- l. Material rating/usage evaluation (shall evaluate usage based on applicable criteria of MSFC-STD-506, NASA-STD-6001, NASA-STD-3029, MSFC-SPEC-250, SP-R-0022A, utilizing MAPTIS-II database as a data source).
- m. Remarks (shall provide additional rationale to justify acceptance of M&P application using MSFC-PROC-1301 for guidance).

The hardware developer shall designate on the MIUL which process specifications are critical* to the fabrication, control and inspection of the contract end items on the MIUL. These processes shall be submitted for the review and approval of NASA.

* Critical Processes: A materials process (i.e., a process which changes the chemical/physical properties of a material). A critical process is an operation, treatment or procedure used as a step in manufacturing or inspection that, if improperly or inadequately performed, can have a significant performance effect on any of the following:

- a. Hardware designated for fracture control.
- b. Ordnance hardware.
- c. Hardware where design conformance is not assured by inspection or test.
- d. Hardware which has a high technical risk, i.e., stringent technical performance requirements in its intended application relative to state-of-the-art techniques for the item.

15.4 **FORMAT:** Contractor format is acceptable and shall be consistent with contents of 15.3 of this DRD. Contractor format for electronic submittal of MIUL data shall be compatible with MAPTIS. MSFC-PROC-2095 provides instructions and typical data formats for completing Materials Usage Evaluation Sheets (MUES).

15.5 **MAINTENANCE:** Changes shall be incorporated by change by change page or complete reissue, with changes denoted by a bar.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-003**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Manufacturing and Assembly Plan
7. **DESCRIPTION/USE:** To establish the requirements for the Manufacturing and Assembly Plan so that the program can scope the entire magnitude of the task to be accomplished and provide a technically sound, efficient, and cost effective plan of action to ensure projected schedules can be maintained. The plan shall define the make-or-buy process, including objectives, criteria, management, logic, and results.
8. **OPR:** EM03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Summary with contract proposal; two weeks prior to Prototype RCE Preliminary Design Review (PPDR)
12. **SUBMISSION FREQUENCY:** Two weeks prior to milestone reviews; update as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125MP-001, *Contamination Control and Implementation Plan (CCIP)*; 1125MP-004, *Materials and Processes Selection, Implementation, and Control Plan*; 1125MP-005, *Nondestructive Test (NDT) Plan*, 1125CM-006, *Engineering Drawings and Associated Lists*. SOW paragraph 8.3.10
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Manufacturing and Assembly Plan is applicable to hardware developer(s), subcontractor(s), and vendor(s).
- 15.2 **APPLICABLE DOCUMENTS:**
- 15.3 **CONTENTS:** The Manufacturing and Assembly Plan shall define the objective, methods and procedures to be used in the manufacture and assembly of the deliverable hardware. Specifically the plan shall contain:
 - a. Organization - A description of the manufacturing and assembly organizations and policies, as well as the organizational relationships between these and the other key organizations supporting the deliverable hardware manufacturing effort.
 - b. Systems and Controls - The systems and controls to be used by the fabrication and assembly organization for procurements, inspection and testing, nonconformance reporting, material control, configuration control, manufacturing and assembly documentation shall be defined.
 1. Procurements - Major components and assemblies to be procured rather than manufactured and/or assembled in-house, long lead time procurements, and risks associated with sole or proprietary sources shall be identified.
 2. Inspection and Test - Requirements for inspection and test stations, as well as procedures shall be provided for each control point in the manufacturing and assembly sequence.
 - c. Producibility Plan - The plan shall define the producibility analysis process to be used in the development of deliverable hardware. Flight hardware design documentation shall be reviewed to assure the ability to fabricate, inspect, and assemble hardware as depicted by the engineering design drawings.

DRD Continuation Sheet

TITLE: Manufacturing and Assembly Plan

DRD NO.: 1125MP-003

DATA TYPE: 2

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- d. Manufacturing and Assembly Flow - The methods, procedures, and operations of control points used to plan, manufacture, and monitor the fabrication and assembly of the deliverable hardware shall be defined.
 - 1. Critical Processes - All processes, methods, facilities, tooling, or skills critical to success shall be identified. The schedule shall fully reflect required availability milestone dates of all project critical items. New, unique, or unfamiliar processes shall be identified with rationale explaining why these processes are to be used.
 - 2. Tooling - A listing and planned usage of tooling and support equipment required to fabricate and assemble deliverable hardware shall be described.
 - 3. Assembly Sequence - A time correlated sequence of operations necessary to assemble the hardware, including assembly requirements, constraints, and operations to be performed shall be described.
 - e. Schedules - The detailed development and maintenance of manufacturing and assembly schedules showing milestones and completion dates necessary to ensure that deliverable end items shall be met.
 - f. Capabilities and Facilities - The facilities and capabilities required for fabrication, manufacturing, and assembly shall be described.
 - g. Major Subsystems - The major subsystems of deliverable hardware to be manufactured and assembled by the fabrication organization shall be identified.
- 15.4 **FORMAT:** Contractor format is acceptable and shall be consistent with contents of paragraph 15.3 of this DRD.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-004**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/3

6. **TITLE:** Materials and Processes Selection, Implementation, and Control Plan

7. **DESCRIPTION/USE:** To define the objectives, procedures, logic, and management controls of the hardware developer's, i.e., contractor's, Materials and Processes (M&P) selection, implementation, verification, and control program; and the hardware developer's interfaces with the procuring activity necessary in the operation of the plan.

8. **OPR:** EM03 9. **DM:** ER32

10. **DISTRIBUTION:** Per Contracting Officer's letter

11. **INITIAL SUBMISSION:** Two weeks prior to Prototype RCE Preliminary Design Review (PPDR)

12. **SUBMISSION FREQUENCY:** Two weeks prior to milestone reviews; update as required

13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125MP-001, *Contamination Control and Implementation Plan (CCIP)*; 1125MP-002, *Materials and Processes Identification and Usage List (MIUL)*; 1125MP-003, *Manufacturing and Assembly Plan* and 1125MP-006, *Material Usage Agreements*. SOW paragraph 8.3.10

15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Materials and Processes Selection, Implementation, and Control Plan defines the objectives, logic, required actions, responsibilities, and management controls the hardware developer shall use in establishing and maintaining a M&P control program. The hardware developer shall establish procedures in this plan to ensure that all M&P comply with the requirements of MSFC-STD-506, including vendor and off-the shelf items.
- 15.2 **APPLICABLE DOCUMENTS:**

MSFC-STD-506	<i>Standard, Materials and Processes Control</i>
MSFC-SPEC-250	<i>Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for</i>
MSFC-SPEC-445	<i>Adhesive Bonding, Process and Inspection, Requirements for</i>
- 15.3 **CONTENTS:** The plan shall describe the hardware developer activities involved in the identification, evaluation, documentation, and reporting of materials and processes usage in space flight hardware, support hardware and ground support equipment. The necessary interfaces with procuring activity in the operation of this plan shall be defined. The method for materials control and verification of subcontractors and vendors shall be included in the hardware developer's plan. As a minimum and as applicable, the plan shall address the following:
 - a. **Conformance** - Hardware developer shall address each applicable paragraph of MSFC-STD-506 and describe the method of implementation and degree of conformance for each applicable requirement. If tailoring of the requirements is planned or necessary, the hardware developer shall submit alternate approaches to MSFC-STD-506 in this plan, which meet or exceed the stated requirements. This tailoring approach shall allow for NASA approval of alternate requirements proposed by the hardware developer.

DRD Continuation Sheet

TITLE: Materials and Processes Selection, Implementation, and Control Plan DRD NO.: **1125MP-004**

DATA TYPE: 2 PAGE: 2/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- b. Hardware Developer's Organization - Authority shall be assigned to an individual or group who shall be responsible for review and approval of all M&P specified prior to release of engineering documentation.
- c. Materials and Processes Identification - Identification and documentation of the M&P used, both in the original design and in any changes.
- d. Usage Evaluation - Documentation of M&P used in accordance with the Material and Process Identification and Usage List (MIUL) requirements of MSFC-STD-506 and the comparison of test data to selection requirements.
- e. Testing - Logic, procedures and data documentation for any proposed test program to support materials screening and verification testing. Any material/process testing to be performed by the hardware developer shall require prior NASA approval.
- f. Material Usage Agreement (MUA) Procedures - Logic, procedures and documentation involved in documenting and approving materials/processes as indicated in MSFC-STD-506 shall be defined, including those that do not meet the established requirements, but are proposed for use due to lack of replacement materials/processes or other considerations.
- g. New Technology - Identify areas of new test technology or technique improvement for consideration.
- h. Approved Materials List (AML) - Hardware developer shall issue and maintain an Approved Materials List from which all materials, including fasteners, shall be selected. The selection of materials shall be based on consideration of cost, availability, reliability, and compatibility with the hardware environment.
- i. Approved Processes List (APL) - Hardware developer shall issue and maintain an Approved Processes List from which all processes shall be selected. In instances where cost, skill or equipment limitations make the selection of a subcontractors processes more economical, the processes shall be submitted to the hardware developer for approval prior to fabrication. Copies of all approved subcontractor and hardware developer process specifications shall be maintained by the hardware developer and shall be available for review by NASA.
- j. Corrosion Prevention , Control and Protective Finish Plan - Hardware developer shall issue and maintain a corrosion prevention, control and protective finish plan addressing the following as a minimum:
 - 1. Environmental corrosion prevention and control measures for all program components, including definition of all environments, test and verification requirements.
 - 2. Selection methodology with supporting data for the selection of M&P used in corrosion prevention and control.
 - 3. Finish specifications, delineating the protective finishes, including cleaning and surface treatment, shall be developed and available for review by NASA.
 - 4. Method of implementation and degree of conformance for each applicable paragraph of the guideline MSFC-SPEC-250.
- k. Forging Plan - A forging plan shall be developed showing locations and numbers of specimens to be excised from the first production equivalent size forging, including production forging verification and control measures. In the event of forging process changes, the plan shall include supporting rationale and/or tests to demonstrate the required design material properties and grain flow patterns at control areas. Hardware developer shall issue and maintain the forging plan as in accordance with the requirements of MSFC-STD-506.

DRD Continuation Sheet

TITLE: Materials and Processes Selection, Implementation, and Control Plan **DRD NO.:** 1125MP-004

DATA TYPE: 2 **PAGE:** 3/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- l. Casting Plan - Hardware developer shall issue and maintain a casting plan in accordance with MSFC-STD-506 showing locations and numbers of specimens to be excised from the first production equivalent size casting, including production casting verification and control measures. In the event of casting process changes, the plan shall include supporting rationale and/or tests to demonstrate the required design material properties and grain size at control areas. The use of castings shall receive NASA approval via the casting plan, prior to incorporation in the design.
 - m. Adhesive Control and Operator Certification Plan - Hardware developer shall issue an adhesive control plan and adhesive bonding operator certification plan as described in MSFC-SPEC-445.
 - n. Review Procedures - Assessment and status of materials and processes to permit evaluation of a given design or configuration at hardware milestone reviews.
- 15.4 **FORMAT:** Contractor format is acceptable and shall be consistent with contents of paragraph 15.3 of this DRD.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by page change or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-005**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/3
6. **TITLE:** Nondestructive Test (NDT) Plan
7. **DESCRIPTION/USE:** To identify all NDT and Nondestructive Evaluation (NDE) procedures and specifications employed in the inspection of materials.
8. **OPR:** EM03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Two weeks prior to Prototype RCE Preliminary Design Review (PPDR)
12. **SUBMISSION FREQUENCY:** Two weeks prior to milestone reviews; revise as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRD's 1125CM-006, *Engineering Drawings and Associated Lists*; 1125DE-002, *Fracture Control Plan*; 1125MP-001, *Contamination Control and Implementation Plan (CCIP)*; 1125MP-003, *Manufacturing and Assembly Plan*; 1125MP-004, *Materials and Processes Selection, Implementation, and Control Plan* and 1125MP-006, *Material Usage Agreements*. SOW paragraph 8.3.10
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The NDT Plan describes the NDT/NDE analysis, requirements and reporting system proposed for use.
- 15.2 **APPLICABLE DOCUMENTS:**

MSFC-STD-506	<i>Standard, Materials and Processes Control</i>
MIL-I-6870	<i>Inspection Program Requirements, Nondestructive for Aircraft and Missile Materials and Parts</i>
MIL-STD-410	<i>Nondestructive Testing Personnel Qualification and Certification</i>
MIL-STD-6866	<i>Inspection, Liquid Penetrant</i>
MIL-STD-1949	<i>Inspection, Magnetic Particle</i>
MIL-STD-0453	<i>Inspection, Radiographic</i>
MIL-STD-2154	<i>Inspection, Ultrasonic, Wrought Metals, Process for</i>
MSFC-STD-1249	<i>Standard, NDE Guidelines and Requirements for Fracture Control Programs</i>
ASTM E1001	<i>Standard Practice for Detection and Evaluation of Discontinuities by the Immersed Pulse-Echo Ultrasonic Method Using Longitudinal Waves</i>
ASTM E426	<i>Standard Practice for Electromagnetic (Eddy - Current) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys</i>
ASTM E164	<i>Standard Practice for Ultrasonic Contact Examination of Weldments</i>
- 15.3 **CONTENTS:** A Nondestructive Test (NDT) Plan shall be submitted in accordance with MIL-I-6870 describing the process for establishment, implementation, execution and control of NDT inspections. The NDT Plan shall implement the requirements of MSFC-STD-1249, MSFC-STD-506 and the applicable program Fracture Control Plan. The plan shall define NDT planning and requirements to include the following:
 - a. Design Requirements - The NDT plan shall include a well defined and disciplined system to assure all designs are reviewed to establish appropriate NDT inspection requirements and acceptance criteria.

DRD Continuation Sheet

TITLE: Nondestructive Test (NDT) Plan

DRD NO.: 1125MP-005

DATA TYPE: 2

PAGE: 2/3

15. DATA PREPARATION INFORMATION (CONTINUED):

1. The design and design review process shall be the responsibility of the Product Development Team (PDT) which has a multifunctional representation including Engineering, Manufacturing, Materials, Quality Assurance, and NDT as a minimum.
 2. Designs not utilizing PDT's, shall be coordinated with the Engineering Manufacturing, Materials, Quality Assurance and NDT representatives during design and at design completion.
 3. Final design approval by all reviewing organizations shall be accomplished to signify agreement with the specified engineering, manufacturing, materials, processing, NDT, and quality requirements and that the part is producible and inspectable or is subject to process controls.
 4. Establishment of NDT requirements shall consider NDT inspectability, capability and reliability; materials and processes; manufacturing and inspection history for similar processes; prior or similar service history; material, process or part criticality; design analysis and critical initial flaw size(s) (CIFS).
 5. NDT Inspection requirements to be considered shall include but not be limited to fluorescent penetrant, magnetic particle, and eddy current for surface oriented flaw detection. Other methods such as X-Ray for hidden surfaces or ultrasonic inspection, etc. may be appropriate for some design configurations. Where subsurface inspections are required, X-Ray or Ultrasonic inspections shall be utilized. Other methods may be used, if appropriate, and if demonstrated to reliably detect CIFS.
 6. NDT inspections shall be required to verify integrity of material and processes, as appropriate.
 7. NDT requirements shall assure products meet the design intent with special attention to Fracture Critical Parts and associated NDT reliability demonstration requirements and safety of flight considerations.
- b. NDT Requirements Implementation - Coordination with the appropriate manufacturing and quality assurance organization shall be done to assure the development and/or acquisition of needed inspection technology and resources to meet the specified design and quality assurance requirements.
1. NDT Inspection requirements and sequencing shall give consideration to the specific manufacturing processes with emphasis on optimizing inspection reliability and early flaw detection before unnecessary processing costs are incurred and/or performing processes which may significantly reduce flaw detection capability.
 2. Etch before Fluorescent Penetrant Inspection (FPI) shall be required when metal will be smeared by machining process and the smearing will adversely compromise the purpose of the inspection.
 3. Etch-FPI may be considered in either a semi-machined or finished machined configuration as appropriate for the specific materials and processes involved.
- c. NDT Certification - Flaw detection NDT Inspections for FPI, Magnetic Particle Inspection (MPI), Eddy Current Inspection (ECI), X-Ray and Ultrasonic (UT) (as a minimum) shall require formal training and certification using MIL-STD-410 as a guideline. Training and certification requirements for other methods shall be established.
- d. NDT Reliability Requirements for Fracture Critical Parts - NDT inspections for surface crack or crack like defects on parts designated as Fracture Critical shall reliably detect the design specified Critical Initial Flaw (CIF) size with 90% probability of detection (POD) and 95% lower confidence bound (LCB).

DRD Continuation Sheet

TITLE: Nondestructive Test (NDT) Plan

DRD NO.: 1125MP-005

DATA TYPE: 2

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15. DATA PREPARATION INFORMATION (CONTINUED):

1. NDT methods applied for CIF sizes equal or greater than those specified in MSFC-STD-1249 have been reliably demonstrated within industry. Demonstration of reliability shall be required when the inspection method adversely differs from standard industry and government practices described in the referenced specifications.
 2. Application of NDT methods for detection of cracks or crack like flaws smaller than those defined in MSFC-STD-1249 shall require a reliability demonstration. Such NDT methods are referred to as "Special NDT".
 3. NDT Reliability demonstration requirements shall be satisfied using prior NDT reliability demonstrations where the NDT methods, systems and applications are deemed similar.
 - e. NDT Inspection Specifications and Standards - NDT Inspection specifications and acceptance standards shall be prepared in accordance with NASA practices. NDT Inspection Specifications shall provide inspection capabilities and reliabilities comparable to the following referenced Military Standards, MSFC Standards, or Industry Specifications: MIL-I-6870, MIL-STD-410, MIL-STD-6866, MIL-STD-1949, MIL-STD-0453, MIL-STD-2154, MSFC-STD-1249, ASTM E1001, ASTM E426, and ASTM E164.
 - f. Reporting System Description- The plan shall describe the NDT/NDE requirements and reporting system used and shall provide a comprehensive description of all NDT/NDE activities, in accordance with the requirements of MIL-I-6870, MSFC-STD-1249 and MSFC-STD-506. The plan shall include, but not be limited to, the following:
 1. Means of coordinating design requirements such as critical crack size and NDT capabilities.
 2. Means of implementing NDT specifications and procedures, including personnel and facilities certification.
 3. Means of coordinating NDT procedures and specifications with NASA.
 4. Description of the implementation of automation of NDT.
 5. Reporting of and actions taken in regards to NDT results.
 6. Means of developing accept/reject criteria.
- 15.4 **FORMAT:** Contractor format is acceptable and shall be consistent with contents of 15.3 of this DRD.
- 15.5 **MAINTENANCE:** Shall be revised to maintain current. Changes shall be incorporated by change by change page or complete reissue, with changes denoted by a bar.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125MP-006**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/4
6. **TITLE:** Material Usage Agreements (MUAs)
7. **DESCRIPTION/USE:** For NASA review and approval of the following: materials and processes usage which do not comply with contractual specifications and requirements, and materials, processes, certifications and specifications that require NASA approval prior to qualification and/or incorporation into the design as specified in MSFC-STD-506.
8. **OPR:** EM03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** One month prior to Prototype RCE Preliminary Design Review (PPDR) (Class I)
12. **SUBMISSION FREQUENCY:** Class I, as identified in design and one month prior to milestone reviews; Class II upon request
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRDs 1125MP-001, *Contamination Control and Implementation Plan (CCIP)*; 1125MP-002, *Materials and Processes Identification and Usage List (MIUL)*; 1125MP-003, *Manufacturing and Assembly Plan*; 1125MP-004, *Materials and Processes Selection, Implementation, and Control Plan* and 1125MP-005, *Nondestructive Test (NDT) Plan*. SOW paragraph 8.3.10
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** Material Usage Agreements (MUAs) describe the material or processes application with sufficient technical rationale to justify usage in accordance with the guidelines of MSFC-PROC-1301.
- 15.2 **APPLICABLE DOCUMENTS**

MSFC-STD-506	<i>Standard, Materials and Processes Control</i>
MSFC-SPEC-250	<i>Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for</i>
MAPTIS-II database	http://maptis.nasa.gov/ Electronic Materials Selection List for MSFC Space Hardware Systems
MSFC-STD-3029	<i>Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments</i>
SP-R-00 22A	<i>General Specification, Vacuum Stability Requirements of Polymeric Materials for Spacecraft Applications</i>
NASA-STD-6001	<i>Flammability, Odor, Offgassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion</i>
MSFC-PROC-1301	<i>Guidelines for Implementation of Required Materials Control Procedures</i>

DRD Continuation Sheet

TITLE: Material Usage Agreements (MUAs)

DRD NO.: 1125MP-006

DATA TYPE: 2

PAGE: 2/4

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.3 **CONTENTS:** The MUA shall contain the information required per MSFC-STD-506, MSFC-SPEC-250, MSFC-STD-3029, JSC SP-R-0022, NASA-STD-6001 and MSFC Form 551 (latest revision) and shall be categorized as Class I, or Class II. MUAs shall be submitted as component level, i.e. valve, transducer, motor, where possible according to MSFC-PROC-1301 guidelines. Class I MUAs shall be required for materials, processes, certifications, and specifications, which require NASA approval prior to qualification and incorporation into design. Class I MUAs shall be submitted formally to the Materials Application Evaluation Board (MAEB) at Marshall Space Flight Center (MSFC), Mail Code EM03, Building 4612. Class II MUAs shall be retained by the hardware developer and subject to NASA review. Class I MUAs shall be submitted to NASA for review and approval for all M&P usages that do not comply with the contractual specification requirements. MUAs are classified as Class I if one or more of the following is in effect:

- a. Flammability - size greater than 1 square foot total (one or more materials and do not create propagation path).
- b. Toxicity - the total amount of material intended for use exceeds the maximum limit weight for the total Toxic Hazard Index (T) value of 0.5 or the total T value for the total number of assembled articles intended for use exceeds 0.5.
- c. Stress Corrosion - usage could effect safety of vehicle or major operational, cost or schedule problem; or complete environment history, including all storage, assembly and service environments are not defined.
- d. Fluid System - materials do not meet requirement of NASA-STD-6001 for liquid or gaseous oxygen.
- e. Corrosion - usage where corrosion can affect structural integrity, or complete environment history, including all storage, assembly and service environments are not defined.
- f. Thermal Vacuum Stability - line of sight, critical surfaces.
- g. Other - any other requirement, e.g., space environmental effects, propellant compatibility (hydrogen, hydrazine, etc.), age life capability, material design properties or temperature capability, processing, NDE, etc., that could affect the safety of vehicle or major operational, cost, or schedule problem.

Other materials that do not meet screening requirements, but are acceptable at the configuration/ part level, shall be designated as Class II. These MUAs shall be approved by the Chief of the hardware developer's Materials Organization, and retained at hardware developer's plant, subject to NASA's review upon request. A Rationale Evaluation Code shall be added in the MUA field of MIUL after the Class II MUA number specifying rationale for approval. Approved rationale codes are as follows:

Flammability Rationale:

- 03F Passed requirements when tested in configuration.
- 04F Sandwiched between non-flammable materials with only edge exposure and no ignition source or propagation path.
- 05F Unexposed/overcoated with approved material.
- 08F Minor usage (less than 0.1 lb. and 2 sq.-in. surface area); no propagation path or ignition source.
- 09F Material is used in hermetically sealed container.
- 10F Passes Test No. 8 of NASA-STD-6001, "Flammability Test for Materials in Vented or Sealed Containers".
- 11F Material acceptable in configuration; no ignition source or propagation path.
- 12F Material not exposed; totally immersed in fluid; evaluated for fluid compatibility only.

DRD Continuation Sheet

TITLE: Material Usage Agreements (MUAs)

DRD NO.: 1125MP-006

DATA TYPE: 2

PAGE: 3/4

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- 13F Material is acceptable when used on a metal substrate that provides a sufficient heat sink. Material considered noncombustible in this configuration by test or analysis.
- 14F "B" rated material inside a vented container with no propagation path to or ignition source from adjacent equipment.

Toxicity Codes:

- 02T Meets TOX requirements with vacuum bake
- 03T Meets TOX requirements in configuration test which is approved by JSC Toxicologist.

Fluid System Compatibility Codes:

- 02FS Passes requirements when tested in configuration.
- 03FS Material must be batch tested by subcontractor for each application.

Thermal Vacuum Stability Codes:

- 03VS "B" rated material; exposed area is not more than 2 sq.-in. and not near a critical surface.
- 04VS "X" rated material; exposed area is less than 1/4 sq.-in.
- 05VS Unexposed/overcoated with approved nonporous material.
- 06VS Weight loss due to dehydration.
- 07VS Material totally encapsulated by an acceptable material.
- 08VS "B" rated material cured to meet the requirements of an "A" rating.
- 09VS Vacuum bake to meet VCM requirements.
- 10VS Meets TVS requirements when tested in configuration.

Stress Corrosion Cracking Codes:

- 01SC Material in compression.
- 02SC No sustained tensile stresses.
- 03SC Effect of failure negligible (nonstructural application, will not effect performance if fails).
- 04SC Table II material per MSFC-STD-3029 and sheet form (<0.250").

Corrosion Codes:

- 01C Material used in inert environment (N₂, He).
- 02C Adequately finished for corrosion protection.
- 03C Acceptable in use environment.
- 04C Passivation adequate for environment.
- 05C Electrical grounding required, cladding plus conversion coating adequate.
- 06C Thermal conductance and electrical bonding requirements preclude painting and chemical conversion coating is adequate (for aluminum only).
- 07C Finished on a higher assembly.
- 08C Laminated shim - minimum exposure of corrosion resistant material.

15.4 **FORMAT:** MSFC Form 551 (latest revision) and MSFC-STD-3029, Section 5.4, "Assessment of the Potential for a Stress Corrosion Failure" are acceptable formats for MUA data. MUAs shall be submitted in an electronic or hardcopy format compatible with Materials and Processes Technical Information System (MAPTIS)/MAPTIS-II database.

15.5 **MAINTENANCE:** The hardware developer shall maintain such files as necessary for tracking, reporting status, and traceability of submittals and response to the MUA provided to MSFC. Update by new revision with changes denoted by bar.

DRD Continuation Sheet

TITLE: Material Usage Agreements (MUAs)

DRD NO.: **1125MP-006**

DATA TYPE: 2

PAGE: 4/4

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.6 **HARDWARE DEVELOPER SUBMIT LIST**: Hardware developer Submit List (available for review upon request) of Class II MUAs identifying issue, material, drawing number (including find or part number), next assembly, rationale code.

15.7 **ADDITIONAL RATIONALE**: Additional Rationale Codes for Type II MUAs must be submitted to NASA for approval.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125RM-001**
3. **DATA TYPE:** 1/2/3
4. **DATE REVISED:**
5. **PAGE:** 1/3

6. **TITLE:** Problem Reporting and Corrective Action (PRACA) System and Trending

7. **DESCRIPTION/USE:** To provide a closed loop system for reporting management visibility and accountability of reportable problems, significant anomalous conditions and recurrence control; provide processes and system to identify and track key critical issues using both qualitative and quantitative tools along with various trending processes for flight safety issues related to critical hardware/ software; and provide timely recommendations of effective recurrence control and its implementation plan/timeline.

8. **OPR:** QD40 9. **DM:** ER32

10. **DISTRIBUTION:** Per Contracting Officer's letter

11. **INITIAL SUBMISSION:** Lesser of 48-hours from isolation of reportable problem to line-replaceable unit or 10 days from occurrence of each reportable problem via fax or electronic transfer.

12. **SUBMISSION FREQUENCY:** For each occurrence, initial notification; then, interim/full resolution submittals as they are developed. Status reports/updates are required as they occur until satisfactory closeout or explanation is provided. For all reportable hardware problems, interim closure submittal shall be required prior to the mission. The interim closure submittal shall include the mission rationale and a plan of action schedule for developing full closure rationale.

13. **REMARKS:** Processes shall be maintained current with the latest release of referenced documents. Reference is made to the following documents:

NPD 8700.1	<i>NASA Policy for Safety and Mission Success</i>
NPD 8720.1	<i>NASA Reliability and Maintainability Program Policy</i>
NASA-STD-8729.1	<i>Planning, Developing and Managing Effective Reliability and Maintainability Programs</i>
MIL-HDBK-470	<i>Designing and Developing Maintainable Products and Systems</i>
NSTS 5300.4 (1D-2)	<i>Safety, Reliability, Maintainability and Quality Provisions for the Space Shuttle Program</i>
Maintainability Toolkit	<i>A Practical Guide for Designing and Developing Maintainable Products and Systems. (Reliability Analysis Center)</i>
Reliability Toolkit:	<i>Commercial Practices Edition – A Practical Guide for Commercial and Military Systems under Acquisition Reform. (Reliability Analysis Center)</i>
NPR 8715.3	<i>NASA Safety Manual</i>
NPR 8705.2	<i>Human-Rating Requirements and Guidelines for Space Flight Systems</i>
14. **INTERRELATIONSHIP:** DRDs 1125RM-002, *Failure Modes and Effects Analysis*. SOW paragraph 8.2

DRD Continuation Sheet

TITLE: Problem Reporting and Corrective Action (PRACA)
System and Trending

DRD NO.: **1125RM-001**

DATA TYPE: 1/2/3

PAGE: 2/3

15. **DATA PREPARATION INFORMATION:**

15.1 **SCOPE:** The Problem Reporting and Corrective Action system shall include the information to provide visibility and accountability of reportable problems and recurrence control. The scope shall include all the hardware health conditions captured per PRACA guidelines and key problems captured through contractor's Nonconformance System which can be helpful to assess the health of the hardware and its key contributory factors. This shall include close integration of the contractor's nonconformance database and the PRACA database (preferably electronically) to capture anomalous hardware conditions observed during refurbishment operations (such as aging of the hardware due to environment temperature, humidity, induced damages, radiation, etc.) that cannot be positively screened through subsequent inspection and testing (such as exposed wires, insulation degradation, corrosion fatigue, induced damage, etc.). Suitable trending mechanisms/systems shall be developed and implemented to proactively identify and isolate the impending failures/failure conditions and to make recommendations for suitable corrective actions to mitigate critical failures or reduce risk. PRACA activities shall include supporting various program reviews and flight certification review, as needed.

The reportable problems and anomalous conditions shall include the following conditions:

- a. Problems of criticality categories 1, 1R, 2, 2R, 2P, 2PR, and functional failures of category 3 occurring on flight and flight-like hardware/software beginning with qualification or acceptance testing.
- b. Unexplained hardware/software anomalies.
- c. Overstress or potential overstress of hardware/software detected during acceptance or certification testing and subsequent operations involving flight hardware/software, flight support equipment, or ground support equipment reportable problems (e.g., equipment directly involved in mission operations).

15.2 **APPLICABLE DOCUMENTS:** None

15.3 **CONTENTS:** The problem report shall include the following information:

- a. Initial notification:
 1. Unique identifiable report number.
 2. Date of occurrence.
 3. Complete description of problem including comparison of expected events with actual events (or results).
 4. Provide failure mode criticality.
 5. Test operation being performed at time of occurrence (certification, acceptance, final checkout, countdown), if applicable.
 6. Nonconforming article - part name, part number, serial number, manufacturer, and lot number.
 7. Next higher assembly - part name, part number, serial number, manufacturer (as applicable).
 8. Test article - part name, part number, serial number, and manufacturer.
 9. Indication of whether problem is a failure or unsatisfactory condition.
 10. Indication of whether problem is due to design deficiency or manufacturing inconsistency, if known.
 11. List test documents (if applicable).
 12. Preliminary cause of problem (if possible).
 13. Remedial action taken.

DRD Continuation Sheet

TITLE: Problem Reporting and Corrective Action (PRACA)
System and Trending

DRD NO.: 1125RM-001

DATA TYPE: 1/2/3

PAGE: 3/3

15. **DATA PREPARATION INFORMATION (CONTINUED):**

- b. Problem closure shall include updates to 1 thru 13 above as necessary and the following:
 - 1. Date of resolution.
 - 2. Actual cause of problem based on failure analysis.
 - 3. Corrective action implemented to prevent recurrence.
 - 4. Disposition of failed hardware.
 - 5. Copy of test reports, studies and presentations.
 - 6. Failure analysis reports.
 - 7. Implementation change paper.
- c. If no corrective action is taken or the cause of the problem cannot be determined, the problem shall have an "explained" disposition. The final report shall contain problem clarification, problem history, planned use of hardware or like units, analysis results and probable cause, last test able to detect the anomaly, methods of detecting in flight, the effect of recurrence, operational work-arounds, rationale for acceptability, and corrective action for subsequent hardware.
- d. All problems shall be dispositioned prior to flight. If a closure or explanation cannot be provided, the problem shall be "interim closed" for resolution at a later date if:
 - 1. Problem is not applicable to hardware scheduled for that flight.
 - 2. Condition does not exist on the flight hardware.
 - 3. Condition is screened by acceptance test procedures, preflight checkout, or special test.
 - 4. Problem is applicable to the flight, but sufficient evidence exists that the hardware/software in question can be flown safely as an accepted risk.
- e. In addition to the normal distribution, a copy of the reports shall be submitted to the MSFC Problem Assessment Center (PAC).
- f. Support shall be provided to the Problem Review Board (PRB) if requested by NASA.

15.4 **FORMAT:** Contractor format is acceptable.

15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP 2. **DRD NO:** **1125RM-002**
3. **DATA TYPE:** 2 4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Failure Modes and Effects Analysis (FMEA)
7. **DESCRIPTION/USE:** To identify and document the possible failures modes and causes of each hardware item of a subsystem/system, the worst case effect of such failures for each mission phase and assigns criticality per the applicable FMEA guidelines document. This information is vital for design improvements, reliability and maintainability analysis.
8. **OPR:** QD40 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of Prototype RCE Preliminary Design Review (PPDR) data package (10-30% complete)
12. **SUBMISSION FREQUENCY:** FMEA - as part of the Prototype RCE Critical Design Review (PCDR) data package (90% complete), baseline after PCDR
13. **REMARKS:** Reference is made to SAE ARP 4761, *Guidelines and Methods for Conducting the Safety Assessment on Civil Airborne Systems and Equipment*.
14. **INTERRELATIONSHIP:** DRD 1125RM-001, *Problem Reporting and Corrective Action (PRACA) System*. SOW paragraph 8.2
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** FMEA shall be performed for all Development hardware items to meet applicable program/project requirements. A detailed Reliability Block Diagram (RBD) is recommended to document all key line replaceable units and/or assemblies and their interrelationship in terms of redundant and series configuration and number of success paths to ensure mission success.

FMEA provides for each hardware item in a subsystem/system as identified on the RBD. The FMEA identifies potential failure modes of each item and its associated failure causes, analyzes and documents the effect of the failure mode during each critical phase of the mission and assigns a criticality number to substantiate the appropriate crew, vehicle and mission risk.

Common Cause Failures Analysis shall be performed as part of FMEA analysis to assess the crew, vehicle and mission risks.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** FMEA documentation shall include:
 1. Introduction: Concise statement on the objectives of the report.
 2. Subsystem description in term of its function (s) and list of hardware items.
 3. All assumptions and ground rules used in the analysis.

DRD Continuation Sheet

TITLE: Failure Modes and Effects Analysis (FMEA)

DRD NO.: 1125RM-002

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15. **DATA PREPARATION INFORMATION (CONTINUED):**

4. Reliability Block Diagram, Schematics and/or other simple models of the system.
5. List of all applicable and reference documents.
6. Completed Analysis worksheets for every identified failure mode for its worst case effects for each hardware item. Worksheet shall include all relevant information such as: identification of the item to be analyzed, identification of the analyst and responsible managers, revision dates, hardware part number and its functional description, FMEA number, failure mode identification and description, failure causes, mission phase in which the failure occurs, the worst case failure effect on the subsystem, interfacing subsystems, mission, Space Transportation System, Payloads and other applicable systems, failure detection and isolation methods, corrective action, functional criticality, redundancy screens, success paths after first failure, Remarks/Hazards, effectivity, disposition and rationale.

NOTE: FMEA results shall be documented by listing each identified failure mode for each component in the system being analyzed on a separate table or worksheet. The worksheet contains all the data elements to be addressed in the analysis. The failure effects, causes, criticalities etc., are individually assessed for each component depending upon the function of that component performs.

- 15.4 **FORMAT:** FEMA worksheets shall use a matrix format with headings in accordance with the applicable program specific guideline document. FMEA shall be prepared and submitted to NASA/MSFC electronically as well as hard copies per program specific directions. Contractor format is acceptable for FMEA after concurrence by MSFC S&MA.
- 15.5 **MAINTENANCE:** These document shall be maintained current based on various design changes, flight and test experiences. Changes shall be incorporated by change page or complete reissue with routine updates at least once a year depending on complexity of the program.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125SA-001**
3. **DATA TYPE:** 2
4. **DATE REVISED:**
5. **PAGE:** 1/4
6. **TITLE:** Safety, Health, and Environmental (SHE) Plan
7. **DESCRIPTION/USE:** To provide the contractor and the Government a baseline document to (1) prevent employee fatalities, (2) reduce the number of incidents, (3) reduce the severity of employee injuries and illnesses, and (4) protect the environment through the ongoing planning, implementation, integration and management control of the contractor's industrial safety, occupational health, and environmental program by compliance with the Marshall Space Flight Center (MSFC) SHE core program requirements in accordance with NFS 1852.223-73.
8. **OPR:** AS10/QD50 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Preliminary with proposal
12. **SUBMISSION FREQUENCY:** Ten days after Authority to Proceed (ATP); update as required
13. **REMARKS:**
14. **INTERRELATIONSHIP:** NFS 1852.223-70, *Safety and Health*; NFS 1852.223-73, *Safety and Health Plan*; FAR 52.223-3, *Hazardous Material Identification and Material Safety Data*; FAR 52.223-4, *Recovered Material Certification*; FAR 52.223-5, *Pollution Prevention and Right-to-Know Information*; FAR 52.223-7, *Notice of Radioactive Materials*; FAR 52.223-9, *Estimate of Percentage of Recovered Material Content for EPA-Designated Products*; FAR 52.223-10, *Waste Reduction Program*; FAR 52.223-11, *Ozone Depleting Substances*; FAR 52.223-12, *Refrigeration Equipment and Air Conditioners*; FAR 52.223-13, *Certification of Toxic Chemical Release Reporting*; and FAR 52.223-14, *Toxic Chemical Release Reporting*. DRD 1125SA-002, *Mishap and Safety Statistics Report*. SOW paragraph 8.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Safety, Health, and Environmental Plan shall describe the contractor's methods of planning, implementing and controlling their industrial safety, occupational health, and environmental requirements over the duration of the contract.
- 15.2 **APPLICABLE DOCUMENTS:** Compliance with the following Occupational Safety and Health Standards and applicable requirements shall be specified in the plan (if applicable to the scope of this contract).

29 CFR 1910	<i>Department of Labor; Occupational Safety and Health Administration Standards for General Industry</i>
29 CFR 1926	<i>Department of Labor; Occupational Safety and Health Administration Standards for Construction Industry</i>
40 CFR	<i>Protection of the Environment</i>
ANSI Standards applicable to the scope of this contract	
ASME Boiler and Pressure Vessel Code applicable to the scope of this contract	
NFPA Standards <i>National Fire Codes</i>	

DRD Continuation Sheet

TITLE: Safety, Health, and Environmental (SHE) Plan

DRD NO.: **1125SA-001**

DATA TYPE: 2

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15. **DATA PREPARATION INFORMATION (CONTINUED):**

NASA-STD-8719.11	<i>Safety Standard for Fire Protection</i>
NPR 8715.3	<i>NASA General Safety Program Requirements</i>
MPR 1040.3	<i>MSFC Emergency Plan</i>
MPD 1800.1	<i>MSFC Smoking Policy</i>
MPR 1800.1	<i>Bloodborne Pathogens</i>
MPR 1810.1	<i>MSFC Occupational Medicine</i>
MPD 1840.1	<i>MSFC Environmental Health Program</i>
MPR 1840.1	<i>MSFC Confined Space Entries</i>
MPD 1840.2	<i>MSFC Hearing Conservation Program</i>
MPR 1840.2	<i>MSFC Hazard Communication Program</i>
MPD 1840.3	<i>MSFC Respiratory Protection Program</i>
MPR 1840.3	<i>MSFC Hazardous Chemicals in Laboratories Protection Program</i>
MPD 1860.1	<i>Laser Safety</i>
MPD 1860.2	<i>MSFC Radiation Safety Program</i>
MPR 3410.1	<i>Training</i>
MWI 3410.1	<i>Personnel Certification Program</i>
MPD 8500.1	<i>MSFC Environmental Management Policy</i>
MPR 8500.1	<i>MSFC Environmental Management Program</i>
MPR 8500.2	<i>MSFC Environmental Management System Manual</i>
MWI 8540.2	<i>Affirmative Procurement Program for Environmentally Preferable Products</i>
MWI 8550.1	<i>Waste Management</i>
MWI 8550.2	<i>Storm Water Management</i>
MWI 8550.3	<i>Wastewater Compliance</i>
MWI 8550.4	<i>Air Emissions Compliance</i>
MWI 8550.5	<i>Chemical Management</i>
MWI 8621.1	<i>Close Call and Mishap Reporting and Investigation Program</i>
MPR 8715.1	<i>Marshall Safety, Health and Environmental (SHE) Program</i>
MWI 8715.1	<i>Electrical Safety</i>
MWI 8715.2	<i>Lockout/Tagout Program</i>
MWI 8715.3	<i>Hazard Identification & Warning System</i>
MWI 8715.4	<i>Personal Protective Equipment (PPE)</i>
MWI 8715.5	<i>Building Manager Program</i>
MWI 8715.9	<i>Occupational Safety Guidelines for Contractors</i>
MWI 8715.10	<i>Explosives, Propellants, & Pyrotechnics Program</i>
MWI 8715.11	<i>Fire Safety Program</i>
MWI 8715.12	<i>Safety, Health, and Environmental Finding Tracking System (SHEtrak)</i>
MWI 8715.13	<i>Safety Concerns Reporting System (SCRS)</i>
MWI 8715.15	<i>Ground Operations Safety Assessment & Risk Mitigation Program</i>
MPD 8900.1	<i>Medical Operations Responsibilities for Human Space Flight Programs (NOTE: This document only applies to Space Station contracts)</i>

DRD Continuation Sheet

TITLE: Safety, Health, and Environmental (SHE) Plan

DRD NO.: 1125SA-001

DATA TYPE: 2

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15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.3 **CONTENTS:** The Safety, Health, and Environmental (SHE) Plan shall clearly describe how the contractor shall comply with the MSFC SHE core program requirements listed below to accomplish the following: (1) the methods to ensure compliance with the MSFC SHE core program requirements listed below, (2) the methods to ensure potentially hazardous conditions are identified and corrected, (3) the methods to ensure employees are trained to perform their tasks in a safe and healthful manner, and (4) the methods to ensure compliance with the applicable documents that pertain to the specific work tasks .

a. Management leadership and employee involvement:

1. A statement of the management policy and their commitment to (1) provide a safe and healthful workplace for personnel (i.e., employees, customers, and public), (2) protect the property and the environment, and (3) ensure compliance with EPA, OSHA and NASA requirements applicable to the contracted effort.
2. A description of how management and employees are held accountable for implementing their tasks in a safe and healthful manner while protecting the environment through the use of motivational or innovative techniques and when necessary through the use of a disciplinary program.
3. A description of safety, health, environmental awareness and motivation programs that include documented safety meetings and safety awareness training for employees. (Onsite contractors shall document their safety meeting statistics in the MSFC Supervisors Safety Web page (SSWP).
4. A method of performing and documenting self evaluations of the contractor's safety, health and environmental program including the frequency of these evaluations.
5. A method of ensuring the flowdown of MSFC safety, health, and environmental responsibilities and requirements applicable to the contracted effort are passed between all company levels and to all subcontractors, when applicable.
6. The identification by title the individual who is assigned the responsibility for implementing the contractor's SHE program elements and serve as the SHE Point of Contact (POC) for the contracted effort.

b. System and worksite analysis:

1. The methods of identifying potentially hazardous conditions in the work area and operations, e.g., hazard analysis, safety assessment, change analysis, risk assessment and employee identified concerns.
2. A description of the OSHA programs that require documented programs that are applicable to the contracted effort (e.g., Respiratory Protection, Hazard Communication, Confined Space, and Lockout/Tagout, etc. Address their interrelationships with the applicable MSFC SHE programs.)
3. The methods of conducting and documenting formal worksite safety inspections as required by OSHA.

c. Hazard prevention and control:

1. The methods of controlling potentially hazardous conditions in the work area or in operations. This includes the generation of plans, procedures, and other working documents which clearly identify the hazardous situations in the work area or operation and the necessary cautions taken to mitigate the hazards. NOTE: MSFC requires an annual review of these plans and procedures. MSFC Safety Department concurrence is required for onsite hazardous procedures.

DRD Continuation Sheet

TITLE: Safety, Health, and Environmental (SHE) Plan

DRD NO.: **1125SA-001**

DATA TYPE: 2

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15. **DATA PREPARATION INFORMATION (CONTINUED):**

2. The methods of ensuring controls over the procurement, storage, issuance, and use of hazardous chemical and materials are in accordance with MPR 8500.1 and the recycling and disposal of any hazardous waste is in accordance with MWI 8550.1.
 3. The methods of ensuring the investigation of all mishaps and close calls to determine root cause and the reporting requirements are in accordance with MWI 8621.1. (Reference DRD 1125SA-002, *Mishap and Safety Statistics Report*).
 4. The methods employees have to suspend work where safety, health or environmental conditions warrant such action.
- d. Safety, health and environmental training:
1. The methods for ensuring each employee is trained to recognize hazards, avoid accidents, know the hazards specific to their job, and fully understands the contractor's disciplinary program.
 3. The methods for training and documenting this training when designating employees to be competent, qualified, authorized or certified to perform operations that require specific training in accordance with 29 CFR 1910 or 29 CFR 1926.
 4. A list of identified job categories under the contracted effort that require MSFC safety certification in accordance with MWI 3410.1, "Personnel Certification Program". Example job categories that require MSFC safety certification include, but not limited to, operating MSFC lifting equipment (forklifts, cranes, etc.), working with chemicals, hazardous waste, pressure systems, etc. Personnel Certification for onsite job categories identified in MWI 3410.1 shall be tracked in the MSFC Certification Database (CERTRAK). (NOTE: offsite contracts shall list the job categories under the contracted effort that require OSHA documented training and certification.)
- e. Environmental compliance - The methods to ensure compliance with environmental laws and regulations 40 CFR, Alabama Department of Environmental Management (ADEM), and MPR 8500.1 by:
1. Reporting hazardous and toxic substance use.
 2. Implementing and reporting green procurements in accordance with MWI 8540.2.
 3. Reducing, reusing, and recycling of hazardous and toxic substances prior to disposal in accordance with MWI 8550.1.
 4. Minimizing stormwater pollution in accordance with MWI 8550.2.
 5. Ensuring equipment and processes permitted by applicable laws.
 6. Disposing of solid and liquid materials as permitted by applicable laws.
- 15.4 **FORMAT**: Contractor format is acceptable.
- 15.5 **MAINTENANCE**: Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125SA-002**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Mishap and Safety Statistics Reports
7. **DESCRIPTION/USE:** To provide reporting of metrics, mishaps, close calls, and serious non-occupational injuries or illnesses.
8. **OPR:** QD50 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:**
 - a. Safety Statistics (e.g., contract number, subcontractors, SIC/NAIC codes, number of employees, number of supervisors, hours worked, etc.): submitted on MSFC Form 4371 by the 10th of each month following contract award.
 - b. Mishaps, Close Calls, and serious non-occupational injuries or illnesses
 1. Type A or B mishaps, high visibility mishaps or close calls, and onsite Type C lost time injury or illness: Immediate telephone notification to the Contracting Officer, and Industrial Safety (256-544-0046 or 4-HELP, Safety Option) so that Center Director notifies the NASA Administrator within 24 hours of occurrence or awareness. Include location and time of incident, number of fatalities, number hospitalized, type of damage, estimated cost, brief description, and contact person and phone number.
 2. Non-occupational fatality or serious injury occurring onsite or to an onsite contractor employee: Notification to Contracting Officer and S&MA so that Center Director notifies the NASA Administrator within 24 hour of occurrence or awareness. (Offsite non-occupational injury or illness notification is at the discretion of the family.)
 3. Offsite Mishaps and Close Calls Type C and below: Initial notification by next MSFC 4371.
 4. All Mishaps (Type A, B, C, Incidents and Close Calls): Mishap Report NASA Form 1627 or electronic update of NASA Incident Reporting Information System (IRIS) record within 6 calendar days of Mishap.
 5. Type A, B, and Close Calls with high Type A or B potential: Mishap Board Report after completion of investigation.
 6. All Mishaps: Monthly Follow-up Corrective Action Plan/Status as required until closed.
12. **SUBMISSION FREQUENCY:**
 - a. MSFC Form 4370 or electronic equivalent - Each occurrence of a mishap except as identified in section 11.b.
 - b. NASA Form 1627 or electronic equivalent - Each occurrence of a mishap. Corrective action status reports are due every 30 days until the final report is submitted.
 - c. MSFC Form 4371 - By the 10th of each month.
 - d. Mishap Board Report - Each occurrence of a Type A or B mishap, or as directed by Center management.
13. **REMARKS:**
14. **INTERRELATIONSHIP:** DRD 1125SA-001, *Safety, Health, and Environmental (SHE) Plan*. SOW paragraph 8.1

DRD Continuation Sheet

TITLE: Mishap and Safety Statistics Reports

DRD NO.: 1125SA-002

DATA TYPE: 3

PAGE: 2/2

15. **DATA PREPARATION INFORMATION:**

15.1 **SCOPE:** The Mishap and Safety Statistics Reports document all mishaps and close calls as required in NPR 8621.1.

15.2 **APPLICABLE DOCUMENTS:**

NPR 8621.1 *NASA Procedural Requirements for Mishap Reporting, Investigating, and Recordkeeping*

MWI 8621.1 *Close Call and Mishap Reporting and Investigation Program*

15.3 **CONTENTS:** The Mishap and Safety Statistics Reports shall contain the information required by NPR 8621.1 and MWI 8621.1. The contractor shall use the forms listed in 15.4 to report mishaps and related information required to produce the safety metrics.

15.4 **FORMAT:** The following formats or electronic equivalent shall be submitted:

- a. MSFC Form 4370, "MSFC Flash Mishap Report."
- b. NASA Form 1627, "NASA Mishap Report."
- c. MSFC Form 4371, "MSFC Contractor Accident and Safety Statistics."
- d. Mishap Board Report using the format provided in NPR 8621.1.

15.5 **MAINTENANCE:** None required

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125SE-001**
3. **DATA TYPE:** 1
4. **DATE REVISED:**
5. **PAGE:** 1/1
6. **TITLE:** Specifications
7. **DESCRIPTION/USE:** A technical document used to describe the functional and physical characteristics of a Configuration Item (CI) and how these characteristics are met. The specification may describe a system, subsystem, component, or support equipment.
8. **OPR:** ED03 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of Prototype RCE System Requirements Review (PSRR) data package
12. **SUBMISSION FREQUENCY:** Update as required
13. **REMARKS:** A draft specification document will be prepared by the government and provided to the contractor in the RFP. An update will also be provided to the contractor at ATP. The contractor will use the requirements listed in this document as a baseline for the final Specification document to be presented at PSRR.
14. **INTERRELATIONSHIP:** SOW paragraph 7.0
15. **DATA PREPARATION INFORMATION:**
 - 15.1 **SCOPE:** Specifications provide the performance, design detail, and verification requirements for a CI.
 - 15.2 **APPLICABLE DOCUMENTS:**

MIL-STD-961	<i>Department of Defense Standard Practices for, Defense Specifications</i>
MSFC-STD-3394	<i>Standard for Contractor Configuration Management, MSFC Programs/Projects</i>
 - 15.3 **CONTENTS:** The specifications shall be prepared in accordance with MIL-STD-961.
 - 15.4 **FORMAT:** The format shall be in accordance with the instructions in MIL-STD-961.
 - 15.5 **MAINTENANCE:** Changes shall be incorporated by complete reissue. When a specification is placed under Government configuration control, proposed changes shall be submitted by Engineering Change Proposal (ECP) in accordance with MSFC-STD-3394.

DATA REQUIREMENTS DESCRIPTION (DRD)

- | | |
|-------------------------|--------------------------------------|
| 1. DPD NO.: 1125 | 2. DRD NO.: 1125SE-002 |
| 3. DATA TYPE: 1 | 4. DATE REVISED: |
| | 5. PAGE: 1/1 |
6. **TITLE:** Interface Definition Document (IDD)
7. **DESCRIPTION/USE:** To provide and control the functional interface definition for engine-to-vehicle interfaces (interstage, upper stage, first stage, etc) and engine-to-test facility interfaces.
8. **OPR:** JP30 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** Preliminary IDD as part of Prototype RCE System Requirements Review (PSRR) data package
12. **SUBMISSION FREQUENCY:** Update at Prototype RCE Preliminary Design Review (PPDR) and Prototype RCE Critical Design Review (PCDR) data packages
13. **REMARKS:**
14. **INTERRELATIONSHIP:** SOW paragraph 4.2 and 7.0
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** The Interface Definition Document contains all information necessary to describe and control the interface between two end items or elements.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** The Interface Definition Document shall contain all requirements (physical, functional, and performance) necessary to describe and control the interface between two end items or elements. IDD content shall be sufficient to assure hardware, software and associated data and functional compatibility of the interfacing end items.
- 15.4 **FORMAT:** Contractor format is acceptable. Electronic submission is required.
- 15.5 **MAINTENANCE:** Changes shall be incorporated by change page or complete reissue.

DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.:** 1125 **ISSUE:** RFP
2. **DRD NO.:** **1125SE-003**
3. **DATA TYPE:** 3
4. **DATE REVISED:**
5. **PAGE:** 1/2
6. **TITLE:** Mass Properties Report
7. **DESCRIPTION/USE:** To report on the status of the contractor's predicted mass properties, which includes allocated and non-allocated growth. The report also provides the mass properties required for other technical analyses and/or trade studies.
8. **OPR:** EV12 9. **DM:** ER32
10. **DISTRIBUTION:** Per Contracting Officer's letter
11. **INITIAL SUBMISSION:** As part of the Prototype RCE System Requirements Review (PSRR) data package
12. **SUBMISSION FREQUENCY:** Monthly reports shall be submitted after Prototype RCE System Requirements Review (PSRR); updates shall be presented as part of all major review packages
13. **REMARKS:** Reference is made to AIAA/ANSI R-020A-199, *Recommended Practice for Mass Properties Control for Satellites, Missiles and Launch Vehicles*.
14. **INTERRELATIONSHIP:** SOW paragraph 4.1
15. **DATA PREPARATION INFORMATION:**
- 15.1 **SCOPE:** Periodic Mass Properties Reports provide insight to the status of the mass properties of the program throughout all of its phases. The basis (Estimated, Calculated, or Measured) of each component mass shall be included as part of the recorded component data. Totals of each of these categories shall be recorded to provide an indication of the mass properties confidence.
- 15.2 **APPLICABLE DOCUMENTS:** None
- 15.3 **CONTENTS:** For the purposes of mass properties, coordinate systems for all flight elements shall be separate but parallel to the system coordinate system with defined offsets. The Mass Properties Report shall include the following:
 - a. Dry Mass Properties:
 1. Mass summary (last, predicted, contract end item (CEI), maturity level in percent).
 2. Comprehensive reasons for changes since the previous status report.
 3. List of pending and potential changes.
 4. Weight history plot.
 5. Status of basic and predicted weight versus control weight.
 6. Mass properties coordinate system description.
 7. Detailed mass properties reflecting the predicted mass (sufficient detail in the report to reflect major items and subsystems). A copy of the complete electronic mass properties database must be provided to MSFC upon request.
 8. Summary performance margins.
 9. References, if applicable.
 10. Critical mass properties status.
 11. Government Furnished Equipment (GFE).

DRD Continuation Sheet

TITLE: Mass Properties Report

DRD NO.: **1125SE-003**

DATA TYPE: 3

PAGE: 2/2

15. **DATA PREPARATION INFORMATION (CONTINUED):**

15.4 **FORMAT:** The contractor and the government shall agree to a functional breakdown of the mass properties data. Microsoft Excel or compatible or other electronic transmission must be acceptable to MSFC.

15.5 **MAINTENANCE:** None required