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MILITARY STANDARD

**PARTS, MATERIALS, AND PROCESSES
CONTROL PROGRAM
FOR
SPACE AND LAUNCH VEHICLES**



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FOREWORD

MIL-STD-1546B (USAF)

Parts, Materials, and Processes Control Program for Space and Launch Vehicles

1. This Military Standard is approved for use by the Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to:

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by using the self-addressed Standardization Document Improvement Proposal (DD form 1426) appearing at the end of this document or by letter.

3. The requirements of this standard were developed for long life and/or high reliability space and launch vehicles and equipment. To ensure successful operation of space equipment, attention to every detail is required at every level of assembly throughout development, manufacture, qualification, and testing, starting with the parts, materials, and processes used. For space and launch vehicles, if parts, materials, and processes have defects or lack the required reliability, success may never be achieved.
4. Analysis of space mission failures and on orbit anomalies by USAF Space and Missile Systems Center revealed that the non-availability of reliable space quality electronic piece parts was a serious deterrent to achieving space mission success. In responding to this problem, the USAF Space and Missile Systems Center initiated a program with the objective of establishing a "space quality baseline" of parts, materials, and processes that have a proven track record of high reliability. In addition, this standard was developed to document the management requirements for parts, materials, and processes for space and launch vehicles.
5. The objective of this parts, materials, and processes control program standard is to ensure integrated and coordinated management of the selection, application, procurement, control and standardization of parts (electrical and mechanical), materials, and processes for space and launch vehicles. The requirements presented herein should reduce program costs and should improve the reliability of space and launch vehicles. The requirements in this standard revise the Parts Control Program requirements stated in MIL-STD-965 by expanding particular requirements to satisfy space and launch vehicle acquisitions and extend the requirements to apply to materials and processes.

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SECTION 1

SCOPE

1.1 **Purpose**

This standard establishes the requirements for the preparation, implementation, and operation of a parts, materials, and processes control program for use during the design, development, and production of space and launch vehicles. The implementation of these requirements is intended to:

- a. Assure integrated management of the selection, application, procurement, control, and standardization of parts, materials, and processes (PMP).
- b. Improve the reliability of program PMP to reduce PMP failures at all levels of integration, assembly, and test.
- c. Reduce program life cycle costs.
- d. Improve procurement and test of small quantities of piece parts and materials that meet system requirements.

1.2 **Application**

This standard is intended for use in acquisition of space and launch vehicles. The standard should be cited in the contract statement of work. This standard differentiates between space vehicle and expendable launch vehicle requirements in selected applications. Unless otherwise stated in the contract statement of work, the unique launch vehicle requirements are applicable to launch and upper stage systems. This standard may be tailored by the acquisition activity for the specific application or program.

1.3 **Compliance with System Requirements.**

The requirements of this standard shall not relieve the contractor of the responsibility for complying with all the equipment, system performance, and reliability requirements as set forth in the applicable specification and contract.

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SECTION 2

APPLICABLE DOCUMENTS

NONE

SECTION 3

DEFINITIONS AND ACRONYMS

3.1 DEFINITIONS

3.1.1 Acquisition Activity. The acquisition activity is the Government office or contractor acquiring the equipment, system, or subsystem for which this standard is being contractually applied.

3.1.2 Categories of Contractor. The term "contractor" signifies a producer of modules or higher level items of equipment. A contractor that provides items to another contractor can be identified as a "subcontractor". Some system programs have one major contractor identified as a "prime contractor", who is responsible directly to the acquisition activity. Other programs may have two or more major contractors, each responsible directly to the acquisition activity (neither one subordinate to the other), which are called "associate contractors". In the case of programs with associate contractors, the acquisition activity may designate one associate contractor as responsible for managing the program Parts, Materials, and Processes Control Program. In this standard, when the term contractor is used, it applies to the prime, the associate, or the subcontractor, whichever is applicable.

3.1.3 Commercial Off-The-Shelf (COTS) Item. A commercial off-the-shelf (COTS) item is an item which has been developed and produced to military or commercial standards and specifications, is readily available for delivery from an industrial source, and may be acquired without change to satisfy a military requirement.

3.1.4 Contracting Officer. A contracting officer is a person with the authority to enter into, administer, or terminate contracts and make related determinations and findings. The term includes authorized representatives of the contracting officer acting within the limits of their authority as delegated by the contracting officer.

3.1.5 Destructive Physical Analysis. A destructive physical analysis (DPA) is a systematic, logical, detailed examination of parts during various stages of disassembly, conducted on a sample of completed parts from a given lot, wherein parts are examined for a wide variety of design, workmanship, and processing problems that may not show up during normal screening tests. The purpose of these analyses is to maintain configuration control and determine those lots of parts, delivered by a vendor, which have anomalies or defects such that they could, at some later date, cause a degradation or catastrophic failure of a system.

3.1.6 Electronic Parts. The term "electronic" is used in a broad sense in this standard and includes electrical, electromagnetic, electromechanical, and electro-optical. These parts are associated with electronic assemblies such as computers, communications equipment, electrical power, guidance, instrumentation, and space vehicles. Electronic parts also include connectors.

3.1.7 Electrostatic Discharge (ESD). A transfer of electrostatic charge between bodies at different electrostatic potentials caused by direct contact or induced by an electrostatic field.

3.1.8 Expendable Launch Vehicle (ELV) Quality Baseline. The expendable launch vehicle space quality baseline defines the standard parts, materials, and processes which are approved for use in expendable launch vehicle systems. (See Appendix C).

3.1.9 Long Lead PMP. Long lead PMP are those that require special procurement actions to assure program schedules are met.

- 3.1.10 Manufacturing Baseline.** The manufacturing baseline is a description, normally in the form of a flow chart, of the sequence of manufacturing operations necessary to produce a specific item, part, or material. The manufacturing baseline includes all associated documentation that is identified or referenced, such as: that pertaining to the procurement and receiving inspection, storage, and inventory control of parts and materials used; the manufacturing processes; the manufacturing facilities, tooling, and test equipment; the in-process manufacturing controls; the operator training and certification; and the inspection and other quality assurance provisions imposed. Each document is identified by title, number, date of issue, applicable revision, and date of revision.
- 3.1.11 Material.** Material is a metallic or nonmetallic element, alloy, mixture, or compound used in a manufacturing operation which becomes either a temporary or permanent portion of the manufactured item.
- 3.1.12 Material Lot.** A lot for material refers to material produced as a single batch or in a single continuous operation or production cycle and offered for acceptance at any one time.
- 3.1.13 Mechanical Parts.** The term mechanical parts (non-electrical parts) is used in a broad sense in this standard and includes such simple mechanical parts as nuts, bolts, washers, pins, and terminals, as well as more complex assemblies such as, clamps and glass-to-metal seals. Such mechanical parts have a single, nonelectrical function (other than electrical grounding), and contain one or more necessary material items. Formed, shaped or otherwise processed portions of packages used by electronic assemblies, such as substrates and lids, shall be considered as mechanical parts.
- 3.1.14 Military Parts Control Advisory Group (MPCAG).** The MPCAG is a Department of Defense organization which provides advice to the military departments and military contractors on the selection of parts in assigned commodity classes, and collects data on nonstandard parts for developing or updating military specifications and standards.
- 3.1.15 Part.** A part is one piece, or two or more pieces joined together, which are not normally subjected to disassembly without destruction or impairment of its designed use.
- 3.1.16 Parts, Materials, and Processes Control Board (PMPCB).** The PMPCB is a formal contractor organization established by contract to manage and control the selection, application, procurement, and documentation of parts, materials, and processes used in equipment, systems, or subsystems.
- 3.1.17 Part/Material and Process Approval Request** A documented analysis/assessment which provides technical justification for adding parts (PAR), or materials and processes (MAR) to the PMPSL.
- 3.1.18 Parts, Materials, and Processes Lists.**
- 3.1.18.1 Parts, Materials, and Processes Selection List (PMPSL).** The PMPSL is a list of all parts, materials, and processes which are approved for design use in a specific contract. (See DI-MISC-81277)
- 3.1.18.2 As Designed Parts, Materials and Processes List (ADPMPL).** The ADPMPL shall consist of all the parts, materials and processes selected to be used in end-item hardware. It shall also include the expected quantity of parts and materials. (See DI-MISC-81276)
- 3.1.18.3 As Built PMP List.** The as built PMP List shall identify all the PMP used in each deliverable end item. The list shall include the PMP types listed for each next assembly.

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3.1.19 Process. A process is an operation, treatment, or procedure used during a step in the manufacture of a material, part, or an assembly.

3.1.20 Production Lot. Unless otherwise specified in the detail specification, a production lot of parts refers to a group of parts of a single part type; defined by a single design and part number; produced in a single production run by means of the same production processes, the same tools and machinery, same raw material, and the same manufacturing and quality controls; and tested within the same period of time. All parts in the same lot have the same lot date code, batch number or equivalent identification.

3.1.21 Program Technical Requirements These requirements are either stated directly or derived from the System Performance Specification (SPS) or listed as technical compliance documents in the contract. The SPS is sometimes referred to as the "A" or "B" level prime item development specification. Examples of PMP requirements stated or derived from the SPS are: natural space environments, radiation hardness performance levels, reliability requirements, etc. Examples of technical compliance documents are: DOD-E-8983, MIL-A-83577, MIL-STD-975, and MIL-STD-1547.

3.1.22 Prohibited PMP. Prohibited PMP are those items which do not meet PMP technical requirements under any circumstances.

3.1.23 Redundant System / Circuit. Any system / circuit consisting of two or more independent paths performing the same function, which can function normally with the failures of all but one path shall be considered redundant. (Applies to ELV only).

3.1.24 Registered PMP. A registered PMP is a part, material, or process which is registered with the PMPCB to call attention to special reliability, quality, or other concerns, relating to its procurement or application. Registered PMP includes, but is not limited to application specific integrated circuits, customized or specially designed parts, new part types or technologies not having prior spaceflight usage, reliability suspect PMP, limited application PMP, and PMP involving restricted or specially controlled usage, storage, or handling due to safety or environmental concerns.

3.1.25 Space Quality PMP Baseline. The Space Quality PMP Baseline defines the standard parts, materials, and processes which are approved for space and launch vehicle use. See Appendix A.

3.2 ACRONYMS

ADPMPL	As Designed Parts, Materials and Processes List (DI-MISC-81276)
COTS	Commercial Off the shelf equipment.
DPA	Destructive Physical Analysis
EEE	Electrical, Electronic, and Electromagnetic parts
ELV	Expendable Launch Vehicle
ESD	Electrostatic Discharge
FSAR	Failure Summary and Analysis Report (DI-RELI-80255)

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MAR	Material and Process Approval Request.
MPCAG	Military Parts Control Advisory Group (See 3.1.14)
PAR	Part Approval Request (Data Item Description, DI-MISC-80071)
PMP	Parts, Materials, and Processes
PMPCB	Parts, Materials, and Processes Control Board
PMPSL	Parts, Materials, and Processes Selection List (Data Item Description, DI-MISC-81277)
QML	Qualified Manufacturers List
QPL	Qualified Parts List
RHA	Radiation Hardness Assurance
SQ	Space Quality

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SECTION 4.0

GENERAL REQUIREMENTS

4.1 Parts, Materials and Processes Control Program.

A Parts, Materials, and Processes (PMP) Standardization, Management and Control Program shall be implemented by the contractor. The contractor shall establish a Parts, Materials, and Processes Control Board (PMPCB) to coordinate the program's PMP control program. A member of the acquisition activity shall be an active member of the PMPCB and retains the right of disapproval of PMPCB decisions. All program contractors and subcontractors shall support the PMPCB performing and/or implementing the decisions, findings and action items of the PMPCB. The contractor shall prepare and submit to the acquisition activity for review and approval a Parts, Materials, and Processes Control Program Plan.

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SECTION 5.0

DETAILED REQUIREMENTS

5.1 Parts, Materials & Processes Control Program Planning

The contractor shall establish and conduct a parts, materials, and processes standardization, management and control program plan in accordance with the requirements of this standard. This parts, materials, and processes control program shall be documented in a plan (Data Item Description, DI-MISC-80526) that addresses how the requirements of this standard are to be met. Existing contractor in-house documentation may be used and referenced in the plan as applicable; these documents shall be made available for review by the acquisition activity. All appropriate subcontractors shall also participate in the parts, materials, and processes control program to the extent required in order to meet the requirements of this standard. The plan shall address how the contractor ensures the flow down of the applicable parts, materials, and processes control program requirements to the subcontractors. The plan shall include:

- a. PMPCB operating procedures, membership, responsibilities, authority, meeting schedules, PMP review procedures, PMP approval/disapproval procedures, acquisition activity involvement, and plans for updating the operating procedures; the definition of the role and authority of each PMPCB member; and relationships with various groups within the prime, associate, and subcontractor organizations. (see 5.2).
- b. Definition of the Program PMP Baseline, procedures for approving PMP not included in the SQ Baseline or the ELV quality baseline, and the requirements for listing PMP in the Program Parts, Materials and Processes Selection List (PMPSL).
- c. Procedures for identification and control of long lead, registered, and prohibited PMP. (See 3.1.9, 3.1.24 and 3.1.22)
- d. Shelf life control plan. (See 5.4.6)
- e. Parts and materials application derating. (See 5.4.3).
- f. PMP vendor surveillance and audit plan. (See 5.5.2)
- g. PMP qualification plan that describes how new PMP will be qualified for the intended end item application. (See 5.10)
- h. Incoming inspection and test plan. (See 5.4.5)
- i. Destructive Physical Analysis (DPA) plan. This plan shall include a list of those part types that require DPA as part of incoming inspection. (See 5.4.5)
- j. Defective parts and components controls program. (See 5.11)
- k. PMPCB coordination and interactions with other program control boards; i.e., configuration (CCB), failure review (FRB), mass properties (MPCB), and material review (MRB).
- l. Coordinated procurement plan, if applicable. (See 5.5.3).
- m. Radiation hardness assurance program plan as required. (See 5.6).
- n. Electrostatic discharge (ESD) control plan.

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- o. Corrosion prevention and control plan.
- p. Contamination Prevention and Control Plan, as required.
- q. Implementation plan for using the Defense Electronics Supply Center (DESC) JAN Class S Operating Stock Program for the procurement of JAN Class S parts. (See 5.5.4).
- r. Subcontractor PMP management plan.
- s. Standardization of program PMP.
- t. VLSI qualification and procurement plan
- u. Alternate QCI and small lot sample plans, as required. (See 5.4.7).

5.2 Parts, Materials, and Processes Control Board (PMPCB)

A Parts, Materials and Processes Control Board (PMPCB) shall be instituted and operated by the contractor. The board shall be responsible for the planning, management, and coordination of the selection, application, and procurement requirements of all parts, materials and processes intended for use in the deliverable end item(s). PMPCB findings, decisions, and directions shall be within the contractual requirements, and shall be binding on all applicable contractors and subcontractors. Participation of the acquisition activity at PMPCB meetings is encouraged to ensure real-time approval/disapproval of PMPCB decisions and actions. When necessary, the acquisition activity decisions shall be provided within a mutually agreed upon period.

5.2.1 Chairmanship

The PMPCB Chairman shall prepare and distribute PMPCB meeting agenda, conduct PMPCB meetings, prepare and distribute meeting minutes (Data Item Description, DI-A-7089), and manage the PMPCB.

5.2.2 Membership

The PMPCB membership shall include at least one member from each appropriate contractor and subcontractor. The responsible contractor shall appoint the PMPCB chairman. The acquisition activity shall appoint a representative and shall be an active member of the PMPCB. Other members may be designated by the acquisition activity or the PMPCB chairman. Each member shall be supported in technical matters as required. Each member shall have the authority to commit his activity, organization, or company to PMPCB decisions within the scope of the applicable contract. Representation at individual meetings shall be required, consistent with the scheduled subject matter on the agenda. The acquisition activity representative shall be afforded the opportunity for attendance at all PMPCB meetings.

5.2.3 Delegation

The authority to conduct PMPCB's may be delegated by the prime contractor PMPCB chairman to major contractors/subcontractors. Each organization so delegated shall supply the responsible activity PMPCB with meeting minutes documenting decisions in a timely manner. All information shall be made available to each higher acquisition activity. Each higher acquisition activity retains the right of disapproval of delegated PMPCB decisions.

5.2.4 Meetings

The PMPCB shall conduct meetings as follows:

- a. A post award organizational PMPCB meeting shall be convened by the contractor. The chairman shall coordinate the date and location of the meeting with the acquisition activity, and inform proposed member activities of the schedule and meeting agenda. The purpose of this

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initial meeting is to establish responsibilities, procedures, and working relationships to allow the rapid transition to an operational PMPCB.

- b. Regularly scheduled meetings shall be held as determined necessary by the PMPCB chairman. These meetings shall address, as a minimum, predefined agenda items for discussion.
- c. Special PMPCB meetings may be called by the PMPCB chairman to discuss special items which may require expeditious resolution. Adequate notification shall be provided to all PMPCB members.
- d. PMPCB meetings may be accomplished either in person, via telephone, or other media such as tele/video conference.

5.2.5 PMPCB Responsibilities

- a. The PMPCB shall establish operating procedures in accordance with this standard.
- b. The PMPCB shall establish and maintain a Parts, Materials and Processes Selection List (PMPSL). The PMPCB shall review and approve the initial version and subsequent revisions to the PMPSL. The PMPCB shall review and approve all Parts (Materials or Processes) Approval Requests (PARs) (MARs), with supporting details.
- c. Through interface with design activity, the PMPCB shall ensure the design selection and use of PMP which meets the technical program requirements. The order of precedence shall be the basis of PMP selection. (See 5.5.5).
- d. The PMPCB shall ensure the procurement of PMP in the orders of precedence as specified in the contractual program requirements. (See 5.5.5).
- e. The PMPCB shall ensure derating of all electronic parts and adequate design margins for mechanical parts used in deliverable end items. The PMPCB shall review and approve any proposed deviations from the technical program requirements.
- f. The PMPCB shall ensure the establishment of Destructive Physical Analysis (DPA) policies, procedures and reporting formats. DPA problems and anomalies of concern shall be reviewed by the PMPCB.
- g. The PMPCB shall ensure the review of the results of DPA, Material Review Board (MRB) actions, failure analyses, and any other details pertaining to PMP. All PMP problems shall require disposition by the PMPCB.
- h. The PMPCB shall ensure the timely identification of long lead and other problem procurements.
- i. The PMPCB shall ensure the identification and configuration control of any changes to PMPCB approved documentation.
- j. The PMPCB shall ensure that laboratories and analysis facilities used for evaluation of PMP are reviewed for capabilities of equipment and personnel before performing analyses in compliance with this standard.
- k. The PMPCB shall ensure that all screening and testing of parts is conducted by laboratories with personnel, equipment and software that are capable and controlled.

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5.2.6 PMPCB Authority

The PMPCB shall ensure that all PMP approved for use meets system performance and reliability requirements. All PMPCB decisions will be documented in the meeting minutes. All supporting technical analysis will be provided and any additional analysis and tests in accordance with PMPCB direction will be conducted and attached to the meeting minutes. The PMPCB shall have the authority to approve technical changes to the detail PMP requirements under the following conditions:

- a. When baseline changes fall into one or more of the categories specified below:
 1. Variation from design and construction requirements of the detail specification
 2. Screening and lot acceptance tests and acceptance criteria deviations from the detail specifications.

5.3 Management of PMP Selection

The contractor shall manage the selection of PMP in accordance with criteria specified in this standard. PMP shall be selected to meet the established reliability and environmental conditions specified for the using system. The contractor shall develop a Parts, Materials, and Processes Selection List (PMPSL) (Data Item Description, DI-MISC-81277) and an As-designed Parts, Materials, and Processes List (ADPMPL) (Data Item Description, DI-MISC-81276) to be used by all contractors and subcontractors on the program for design and manufacture of flight and qualification hardware. When appropriate, subcontractors may have a PMPSL which meet all requirements of this standard. The initial version of the PMPSL shall be submitted to the acquisition activity for approval. Subsequent revisions to the PMPSL shall be reviewed and approved by the PMPCB. The PMPSL shall include all PMP identified in the Space Quality PMP Baseline (3.1.25) as tailored for the program's use or the ELV Quality PMP Baseline (3.1.8). PMP not included in the PMPSL shall be documented on a Parts Approval Request (PAR) or Material Approval Request (MAR) and submitted to the PMPCB for review and approval.

5.3.1 Parts, Materials, and Processes Selection List (PMPSL)

The PMPSL shall be in accordance with the requirements specified in Appendix D and Data Item Description, DI-MISC-81277. Limited application and registered PMP shall include information on applicable restrictions and reasons in the PMPSL.

5.3.2 Part/Material and Process Approval Request (PAR/MAR). The use of PMP not approved for use must be technically justified and added to the PMPSL. A PAR/MAR will be prepared and submitted to the PMPCB for approval. The PAR/MAR must include appropriate justification that shows that an existing PMPSL PMP nor any other space qualified PMP is satisfactory, and that the reliability analysis supports the use of the non-standard PMP. When required by a Contract Data Requirements List (CDRL), the PAR/MAR shall be in accordance with DI-MISC-80071.

An exception to this requirement is where a part is procured to program technical requirements and processed on a space qualified line by a supplier maintaining current space quality Class S QPL, or Classes V or K QML status.

Additional exceptions for unique ELV requirements are included in Appendix C.

5.3.3 As-designed Parts, Materials and Processes List (ADPMPL). The ADPMPL shall be in accordance with Appendix E and DI-MISC-81276. An as-built parts, materials and processes list may be substituted for the ADPMPL.

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5.4 Management of PMP Engineering Requirements.

5.4.1 System Design. The PMPCB is responsible to ensure that PMP used throughout the system meets the application, reliability, quality, and survivability requirements as derived from the System Level requirements. PMP selected for use shall be selected from the PMPSL. PMP engineering shall review and approve all drawings and specifications (A level, B level, device detail specifications, etc.) to ensure that PMP requirements are met. The requirements of Appendix B, paragraph 20.6, shall be considered for all PMP with radiation hardness requirements; however, the general provisions of paragraph 20.6 shall be considered for all PMP selection.

5.4.2 Reuse of Parts and Materials. Parts and materials which have been installed in an assembly, and are then removed from the assembly for any reason, shall not be used again in any item of flight or spare hardware without prior approval of the PMPCB.

5.4.3 Derating. A uniform derating policy to meet the system requirements shall be established by the PMPCB and used by all contractors in the program. Exceptions to this derating policy shall require the approval of the PMPCB. The derating policy shall address degradation sensitive parameters and maximum rated variations expected over the program mission life. The policy shall also include derating for radiation effects.

5.4.4 Traceability and Lot Control. The contractor shall develop and maintain a traceability and lot control plan in accordance with the requirements specified below and approved by the PMPCB. When given a lot date code or batch number, the contractor shall be capable of determining the unique piece of equipment (black box level) by serial number in which the part or material is installed or used. Traceability to the serial number of an individual device or to a lower level of assembly shall be as determined and specified by the PMPCB.

5.4.4.1 Electronic Parts. All EEE parts and cable assemblies shall have 100% traceability to the production lot. Any other parts not included in the above which require traceability shall be identified in the traceability lot control plan.

5.4.4.2 Mechanical Parts and Materials. One hundred percent (100%) lot traceability is required for parts and materials used in applications where a failure could jeopardize component or mission success. Traceability and production or batch lot control for parts and materials used in other applications shall be maintained where risk and cost so dictate.

5.4.5 Incoming Inspection Requirements. Each contractor shall perform, or be responsible for the performance of applicable incoming tests and inspections including DPA's of parts and materials to ensure that they meet the requirements of the procurement specification. Unless previously accomplished and accepted by government or contractor field personnel, incoming testing and inspections shall be accomplished upon receipt of the parts or materials. The inspection and testing of parts and materials shall be conducted in accordance with a plan approved by the PMPCB.

5.4.6 Shelf-Life Control. The contractor shall develop a shelf life control program that identifies the shelf life limitations for all parts and materials to be stored. This plan shall specify the length of time required and minimum requirements for reinspection, retest, or any other action required to ensure maintenance of space flight quality and reliability. The plan shall be reviewed and approved by the PMPCB and controls shall be identified to ensure that the plan is followed before parts and materials are issued to assembly. Separate plans for material shelf life control and parts shelf life control are permissible.

5.4.6.1 Material Shelf Life Control. In addition to general age limitation considerations, the plan shall identify any specific temperature and humidity requirements for

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storage and any associated limitations on life. Any special environmental requirements (e.g., storage in dry nitrogen) shall be identified.

5.4.6.2 Parts Shelf Life Control. A plan which requires the automatic retesting of all part types is not required. The plan shall identify those part types considered to be potentially age sensitive. The plan shall identify specific actions necessary in association with the potentially age sensitive parts. In general, the plan should consider a pedigree review and actions similar to that shown below for parts older than 5 years (suggested limit). The plan shall define the specific limit for each part based upon logistical considerations of parts procurement schedules, program manufacturing schedules, and required program life. When parts exceed specified age limits in storage, actions shall be taken as specified in the control plan or the PMPCB shall provide direction based upon the following considerations:

- a. Assess original part quality (Class S, SCD, Class B, etc.)
- b. Assess lot history (supplier's percent defective, quantity used to date, number of failures, etc.).
- c. Review of original screening/test data.
- d. Review of problem/GIDEP Alerts.
- e. Review of original DPA.
- f. Review storage environment controls (temperature, ESD protection, handling, etc.).
- g. When possible, consider application criticality, redundancy, etc.
- h. When retest/rescreen appears warranted, assess availability of retest equipment, outside rescreen facilities, potential for part damage during rescreening, etc.
- i. Program technical requirements for screening shall be used as guidance for any planned rescreening of product due to shelf life limitations.

5.4.7 Use of Alternate Quality Conformance Inspection and Small Lot Sampling Plans. The contractor may implement an alternate Quality Conformance Inspection (QCI) plan and a small lot sample plan for small lot quantities in accordance with the program's technical requirements. The PMPCB shall review and approve these plans. These plans may be used under the following conditions:

- a. The product(s) being purchased is not listed in the program's space quality baseline.
- b. The product(s) being purchased meets the order of precedence requirements of 5.5.5.1, 5.5.5.2.1, or 5.5.5.2.2 herein (except for the space quality baseline).
- c. Implementation criteria as defined in the program's technical requirements is satisfied.

5.5 Management of Parts, Materials and Processes Procurement.

5.5.1 Supplier and Vendor Selection and Surveillance. The PMPCB is responsible for the selection and qualification of PMP suppliers, vendors, laboratories and manufacturers.

5.5.2 PMP Supplier and Manufacturer Surveillance (Monitoring). The PMPCB shall establish a policy and procedures for the periodic surveillance and auditing of suppliers, vendors, laboratories and manufacturers to ensure compliance to procurement, quality, reliability and

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survivability requirements. Contractor surveillance of laboratories, suppliers, vendors, and manufacturers which have been approved as a part of QPL or QML program for products listed in the space quality baseline is not required. When surveillance/audit data is available from other sources (e.g. other contractor programs, other contractors/subcontractors, independent audits reports, etc.) the contractor may utilize the results of the data contingent on the review and approval by the PMPCB. Acceptability of the data shall be based on technical considerations, as well as timeliness and confidence in the source of the data.

5.5.3 Coordinated Procurements. Implementation of a coordinated procurement program is highly encouraged. When appropriate, the PMPCB shall establish policies for the use of coordinated procurements for all contractors and subcontractors use. This may include the use of common specifications, management responsibilities, purchase agreements, monitoring, and quality assurance. The PMPCB (and procurement organizations) may ensure that a master purchase agreement allows authorized subcontractors to initiate their own procurements within the scope and framework of the master purchase agreement.

5.5.4 JAN Class S Operating Stocking Program. A JAN Class S Operating Stock has been initiated by the Defense Logistics Agency (DLA) to allow contractors to procure JAN Class S parts that are readily available from stock (inventory). This reduces procurement lead times, and allows small quantity ordering. Contractors are encouraged to procure from the JAN Class S Operating Stock. The PMPCB shall provide a forecast semi-annually (when requested) for the expected JAN Class S parts usage to USAF/Space and Missile Systems Center (SMC).

5.5.5 Electronic Parts Procurement Order of Precedence. EEE parts shall be procured in the order of precedence defined for space vehicle or expendable launch vehicle programs as applicable:

5.5.5.1 Space Vehicle Programs. The procurement order of precedence shall be as follows:

1st Order: Space Quality Baseline

2nd Order: Parts procured to contractor prepared drawings meeting program technical requirements. The contractor is encouraged to place orders with manufacturers willing to pursue qualification to space quality baseline QPL/QML.

3rd Order: Parts procured to QPL/QML not listed in the SQ baseline (e.g., Class B microcircuits and JANTXV semiconductors) and screened to program technical requirements.

Order of precedence #3 is intended for use on a very limited basis and only in cases where there is a major threat to the program schedule. Parts procured to the requirements in #3 may be approved by the PMPCB for use under the following circumstances:

- a. Parts procured to #1 or #2 cannot be accomplished in time to satisfy program schedules.
- b. Order of precedence #3 will be used on a limited basis until parts meeting the requirements of #1 or #2 are available. A purchase order to the requirements of #1 or #2 should be awarded prior to the use of parts procured to the requirements of #3. Exceptions to this requirement shall be approved by the PMPCB.

5.5.5.2 Expendable Launch Vehicle Programs. The procurement order of precedence shall be as follows:

5.5.5.2.1 Single String Systems / Circuits. Parts for use in non-redundant

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systems/applications shall be procured in the order of precedence below:

a. Microcircuits, semiconductors and hybrids:

1st Order. Space vehicle space quality baseline or ELV quality baseline

2nd Order. Parts procured to contractor prepared drawings meeting program technical requirements; or

Parts procured to QPM/QPL not listed in Appendices A and C (e.g., Class B microcircuits and JANTEXV semiconductors) and screened to program technical requirements

5.5.5.2.2 Redundant Systems / Circuits. Parts for use in redundant applications shall be procured in the order of precedence as specified below:

Space or ELV quality baseline; or,

Parts procured to contractor prepared drawings meeting program technical requirements; or,

Parts procured to QML/QPL not listed in Appendices A and C (e.g., Class B microcircuits and JANTEXV semiconductors) and screened to program technical requirements

5.6 Radiation Hardness Assurance (RHA)

When required, the contractor, through the PMPCB, shall develop and conduct a hardness assurance program in accordance with Appendix B. The hardness assurance program plan shall address all phases of the flight hardware program including the design, test, and production.

5.7 Government Furnished Equipment

PMP contained in unmodified government furnished equipment used in the end item of the contract shall not be subject to PMP control.

5.8 Commercial Off-the-Shelf Item (Equipment) (COTS)

The requesting user shall demonstrate to the PMPCB that the COTS items meet the reliability, environmental, and survivability (if required) requirements of the contract end item.

5.9 USAF SMC Space Parts Working Group (SPWG)

The contractor is encouraged to provide representation to the USAF SMC Space Parts Working Group meetings. These meetings are usually held periodically (approximately annually) at or near the USAF SMC. The purpose of these meetings is to provide a forum for the exchange of information relating to technical, procurement, application, and status issues of interest involving space programs and especially space quality parts, materials and processes. The primary focus is on general PMP issues or items including their selection and procurement.

5.10 PMP Qualification.

5.10.1 General. All PMP, including any processes developed to accomplish rework or retrofit, shall be qualified for program use. Only qualified PMP shall be used on flight hardware. For each nonqualified PMP, the contractor(s), through the PMPCB, shall prepare a qualification plan and procedure. For electronic parts, the qualification plans and procedures shall be based on the program technical requirements. The qualification plan shall identify all conditions and testing

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necessary to meet the program and mission reliability and qualification requirements. These plans and procedures shall be reviewed and approved by the PMPCB. A summary report of qualification test results shall be submitted to the PMPCB. The PMPCB shall maintain an up-to-date listing of the qualification status of all program PMP. Test methods used for qualification of PMP shall be in accordance with applicable specifications and shall include test methods for any additional tests necessary to fully qualify the part for its intended use in the system.

Qualification of PMP may be expedited by the following:

- a. Initial selection of PMP using applicable military specified PMP previously qualified for use on space and launch vehicle programs.
- b. Proof testing of all parts and materials to the program requirement levels.
- c. Vendor audits and certification.
- d. Satisfactory completion of tests on engineering models that use the PMP.

5.10.1.1 Manufacturing Baseline. As part of the qualification plan for each nonqualified PMP item, the contractor(s) shall insure that the nonqualified PMP item supplier has an established manufacturing baseline (3.1.10) as determined by the PMPCB and review the manufacturing baseline for compliance to the program's technical requirements. The manufacturing baseline for all other PMP shall be reviewed and controlled as determined by the PMPCB.

5.10.2 Qualification by Extension. Parts, materials, or processes may be qualified by extension when either of the following criteria are met:

- a. The part, material, or process was successfully used in a prior but recent space application in which the application environment conditions of use and test were at least as severe as those required of the candidate PMP for qualification.
- b. The part or material is of identical construction or contains constituents identical in composition and near identical in significant properties as the previously qualified part or material. The part or material is manufactured by the same manufacturing facility to the same manufacturing baseline as the previously qualified part or material, and the utilization of the part or material does not result in critical stresses or mechanical strain (such as due to thermal mismatch) greater than the previously qualified part or material.

Qualification by extension shall be based on a review of supporting data by the PMPCB.

5.11 Defective Parts and Components Control Program. The PMPCB shall review and evaluate Government Industry Data Exchange Program Alerts (GIDEP ALERTS), industry problem alert bulletins, and other available information relating to defective PMP to ensure that defective PMP are not selected for the design or procured for use, or used in system equipment. PMP indicated as defective in any GIDEP ALERT, industry problem alert bulletins, industry problem notices or alerts, or other sources of problem information shall not be approved for use unless the indicated defects or failures have been corrected or identified, and approved preventions implemented to eliminate the cause of the defects or failures in the parts to be used in the flight hardware.

5.12 Failure Analysis. As determined by the PMPCB, failure analysis shall be performed on part and material failures experienced during assembly and testing. Failures shall be analyzed to the extent necessary to understand the failure mode and cause, to detect and correct out-of-control processes, to determine the necessary corrective actions, and to determine lot disposition. When

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required, a Failure Summary and Analysis Report (FSAR) in accordance with DI-RELI-80255 and Appendix F herein shall be prepared and reviewed by the PMPCB. The PMPCB shall determine and implement appropriate corrective action for each PMP failure. All failures, and the results of final failure analysis, shall be reported to the PMPCB. Failure analysis reports shall be retrievable for the duration of the contract, and shall be available to the acquisition activity. When required, a Failed Item Analysis Report in accordance with DI-RELI-80253 shall be prepared and reviewed by the PMPCB. Failure of parts procured from the DESC JAN Class S Operating Stock Program require immediate notification to DESC, the PMPCB, and the acquisition activity.

5.13 Preservation and Packaging. Preservation, packaging, and packing shall be in accordance with both the item and the system requirements. All parts which are subject to degradation by electrostatic discharge shall be packaged in accordance with PMPCB approved ESD procedures.

5.14 Handling and Storage. Handling and storage procedures shall be instituted to prevent part and material degradation. These procedures shall apply until the parts and materials lose their individuality when assembled into modules, boards, or higher indented items. The handling and storage procedures shall be retained through inspection, kitting, and assembly and shall be identified on "build to" documentation. The following criteria shall be used as a minimum for establishing handling and storage procedures for parts and materials:

- a. Control of environment, such as temperature, humidity, contamination, and pressure.
- b. Measures and facilities to segregate and protect parts and materials routed to different locations such as, to the materials review crib, or to a laboratory for inspection, or returned to the manufacturer from unaccepted shipments.
- c. Easily identifiable containers to identify space quality parts shall be used.
- d. Control measures to limit personnel access to parts and materials during receiving inspection and storage.
- e. Facilities for interim storage of parts and materials.
- f. Provisions for protective cushioning, as required, on storage area shelves, and in storage and transportation containers.
- g. Protective features of transportation equipment design to prevent packages from being dropped or dislodged in transit.
- h. Protective bench surfaces on which parts and materials are handled during operations such as test, assembly, inspection, and organizing kits.
- i. Required use of gloves, finger cots, tweezers, or other means when handling parts to protect the parts from contact by bare hands.
- j. Provisions for protection of parts susceptible to damage by electrostatic discharge.
- k. Unique parts and materials criteria.

5.15 Data Retention. The program shall maintain records or incoming inspection tests, lot qualification and acceptance test data, radiation hardness assurance test data, traceability data and other data as determined by the PMPCB for a period of time specified by the acquisition activity.

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SECTION 6

NOTES

The contents of this section are intended for guidance and information only.

6.1 Intended Use

The standard is intended for use in acquisition contracts for space vehicles, upper stage vehicles, payloads, launch vehicles, and for their subtier equipments. This standard should be cited in the contract schedule, or the statement of work, to specify the requirements for the parts, materials, and processes management, standardization and control program for applicable equipment. Note that this standard is not an appropriate reference in any specification since it is a management standard and does not contain technical requirements for the parts, materials, and processes to be used in the equipment. All requirements for data delivery must be listed in the Contract Data Requirements List of the acquisition contract.

There may be acquisition contracts for other types of equipment requiring high reliability where the special parts, materials, and processes control requirements stated in this standard should be applied. For those acquisition contracts, this standard may be cited to specify the applicable requirements. However, a statement should be included in the contract or the statement of work indicating that the words "space and launch vehicle" in this standard are to be interpreted as the applicable equipment. The requirements in this standard should therefore be interpreted as applying to the parts, materials, and processes control program requirements for the acquisition of the applicable equipment.

The requirements in the text of this standard expand the applicable Parts Control Program requirements as stated in MIL-STD-965 in order to satisfy space and launch vehicle acquisition requirements. This standard also expands the requirements to apply to materials and processes.

Contracts for ground equipment (e.g., control segments and user segments of space systems) could apply MIL-STD-965 for those segments unless it is determined that a tailored application of this standard would be more appropriate for the reliability or standardization objectives of the program. Note that many space and launch vehicle acquisition contracts include both space and ground equipment, so if both MIL-STD-965 and this standard are referenced, care should be taken to ensure that the applicability of each document is clear.

6.1.1 Related Management Requirements. In addition to this standard other critical management requirements to be implemented in the statement of work may include requirements for:

- a. Quality program (MIL-STD-1586, MIL-STD-1535, MIL-STD-1520, and MIL-Q-9858)
- b. Reliability program (MIL-STD-1543)
- c. Contamination Prevention and Control program (MIL-STD-1246)
- d. Safety program (MIL-STD-882 and MIL-STD-1574)
- e. Hardness and Survivability program, if applicable (DOD-STD-1766)
- f. Program reviews (MIL-STD-1521)

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6.1.2 Related Technical Requirements. Critical technical requirements to be implemented in the equipment specifications may include:

- a. PMP technical requirements for space and launch vehicles (MIL-STD-1547)
- b. DPA technical requirements for parts (MIL-STD-1580)
- c. Corrosion control requirements for materials (MIL-STD-1568)
- d. Electrostatic discharge control program (MIL-STD-1686 and DOD-HDBK-263)
- e. Electrical and electronic equipment design (DOD-E-8983, DOD-W-83575, and MIL-STD-454)
- f. Moving mechanical assembly design (MIL-A-83577)

6.2 Tailored Application

The parts, materials, and processes control program requirements in each contract may be tailored to the needs of that particular acquisition. Military specifications and standards need not be applied in their entirety. All tailored applications of this standard shall be clearly identified in the compliance document section of the statement of work of the contract.

6.3 Tailoring to Contract Phase

This standard contains a comprehensive management program that requires reliability and standardization considerations be applied during all phases of the program. When this standard is made compliant in a contract for a concept development phase or for a validation and demonstration phases, it does not imply that space quality technical requirements and management procedures apply to anything other than qualification and flight hardware (e.g. they do not apply to ground demonstration models). Contracts for the demonstration and validation phase are encouraged to require the development of a parts, materials, and processes control program plan and at least a first draft of the PMPSL. The contractor should, therefore, have a complete understanding of the entire PMP program to successfully transition into subsequent phases of the contract. The standard is intended to be "self tailoring" in this respect so that specific tailoring to each phase of the contract would not be required.

6.4 Data Item Descriptions

Data requirements of this document are not to be considered deliverable unless specifically identified as deliverable data in the contract or purchase order and the appropriate Data Item Description (DID) is referenced. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below should be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of the DoD FAR clause on data requirements (currently DoD FAR Sub Part 27.475-1) are invoked and the DD Form 1423 is not used, the data specified below should be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs:

<u>Paragraph No.</u>	<u>Data Requirement Title</u>	<u>Applicable DID No.</u>
3.1.18.1, 5.3, 5.3.1, App D	PMP Selection List	DI-MISC-81277
3.1.18.2, 5.3.3, & App E	As Designed PMP List	DI-MISC-81276
5.1	Parts Control Program Plan	DI-MISC-80526
5.2.1	Conference Minutes	DI-A-7089
5.3.2	Parts Approval Requests	DI-MISC-80071
5.12 & App F	Failure Summary and Analysis Report	DI-RELI-80255

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5.12

Failed Item Analysis Report

DI-RELI-80253

(Data item descriptions related to this standard are listed in DoD 5010.12-L., AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

- a. **Parts, Materials, and Processes Control Plan.** Data Item Description, DI-MISC-80526, *Parts Control Program Plan*. The preliminary parts, materials, and processes control program plan should be provided to the PMPCB for review and to the acquisition activity for approval within 30 days after contract award, or as decided by the PMPCB. The final parts, materials, and processes control program should be provided to the PMPCB for review and to the acquisition activity for approval prior to the Preliminary Design Review.
- b. **Parts, Materials, and Processes Selection List (PMPSL).** Data Item Description, DI-MISC-81277, *Parts, Materials and Processes Selection List (PMPSL)*. It is important to require that the contractor list the industry generic number on the PMPSL to allow independent computer searches for suspect parts. The initial issue of the PMPSL should be provided to the PMPCB for review and to the acquisition activity for approval shortly after contract award and always prior to the Preliminary Design Review.
- c. **Electromagnetic Medium.** Delivery of data in electromagnetic medium is required. The PMPSL (see Appendix D), ADPMPL (see Appendix E), and FSAR (see Appendix F) DID's require data to be generated and delivered on an electromagnetic medium; however, they are designed to allow flexibility by the contractor for determining format. For existing programs where a contractor's in-house data management system is not electromagnetic medium based and it may not be cost effective to transfer the data to electromagnetic medium, the acquisition activity may approve acceptance of paper submittals. This should be done on a case by case basis.

6.5 Contractor Proposal

The contractor proposal should clearly set forth the plans and procedures for implementing a cost effective high reliability PMP management program. The proposed plan should define the scope and depth of the contractors efforts including his management approach, organization, staffing planning, technical aspects, and the relationship of the PMP program to the contractors other technical and management programs. This should cover the technical and management requirements of the standard.

6.5.1 Application of PMP Baseline. Compliance with the Space Quality PMP Baseline, Appendix A, to the maximum extent practicable. Note that on contracts for follow-on production of existing designs, the Space Quality PMP Baseline may be the as-designed parts and materials list for the earlier production, updated to account for recommended PMP improvements.

6.6 MPCAG Functions

The function of the MPCAG is to act as an advisor to the acquisition activities and contractors in its assigned commodity classes. The MPCAG would recommend standard parts or inventory parts that meet the design requirements of the equipment or system in which the part is to be used. Moreover, the MPCAG accepts technical information about specification changes necessary to make a specification usable, and request action with the military activity responsible for that specification to expedite appropriate changes. NOTE: For a complete listing of the commodity classes for which the MPCAG is responsible as well as a listing of contact points with addresses and telephone numbers, see MIL-STD-965.

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6.7 Reference Documents. The following specifications, standards, handbooks and data item descriptions are for reference purposes only. They do not add PMP management requirements beyond the scope of this document; however, they can be used to aid in the development of the various PMP plans and procedures stated herein.

DI-A-7089	MIL-STD-1535
MIL-A-83577	MIL-STD-1543
MIL-Q-9858	MIL-STD-1547
MIL-W-83575	MIL-STD-1568
MIL-STD-454	MIL-STD-1574
MIL-STD-965	MIL-STD-1580
MIL-STD-975	MIL-STD-1586
MIL-STD-882	DOD-STD-1686
MIL-STD-1246	DOD-STD-1766
MIL-STD-1520	DOD-HDBK-263
MIL-STD-1521	DOD-E-8983

Unless otherwise indicated, copies of federal and military specifications, standards, handbooks, and data item descriptions are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

6.8 SUBJECT TERM (KEY WORD) LISTING

Baseline	parts
Class S	PMP
control board	PMP baseline
JAN Class S	PMPCB
lot	PMPSL
materials	processes
MPCAG	registered
operating stock	selection list
space	

Custodians	Preparing Activity
Air Force - 19	Air Force - 19

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APPENDIX A SPACE QUALITY BASELINE

This appendix is a mandatory part of the standard. The information contained is intended for compliance. This section lists those PMP items that are approved for use in space systems by the acquisition activity and shall be listed in the PMPSL.

PMP space quality baseline is listed in three sections:

- I. Approved Parts
- II. Approved Materials
- III. Approved Processes

Section I Approved Parts

- a. Microcircuits MIL-M-38510, Class S, Part I or Part II of QPL.
- Integrated Circuits MIL-I-38535, Class V QML.
- Hybrid circuits MIL-H-38534, Class K.
- b. Diodes MIL-S-19500, JANS, QPL, Part I or II.
- c. Transistors MIL-S-19500, JANS, QPL, Part I or II.
- d. Ceramic Capacitors MIL-C-123, QPL.
- d. Tantalum (solid) Capacitors MIL-C-39003/10, failure rate level C, QPL.
- e. Mica Capacitors MIL-C-87164, QPL.
- f. Fixed Film Capacitors MIL-C-87217/1, /3, and /4, QPL.
- g. Metal-Film Resistors MIL-R-87254, QPL.
- h. Low pass RF/EMI Filters MIL-F-28861, Class S, QPL.
- i. Connectors:
 - Circular MIL-C-38999: For Series I and II: Classes G & H
 For Series III and IV: Classes G & H
 - Rectangular D MIL-C-24308: Classes: D, K, and M.
 - Rectangular Microminiature MIL-C-83513 Class M, Finish N
 - Printed Wiring Board MIL-C-55302
 - RF (Microwave) MIL-C-39012

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APPENDIX A

Section II
Approved Materials

a. Wire and Cable procured to:

MIL-W-22759/33, 44, 45, and 46
MIL-C-27500 Types SC, SR, SS, and ST

b. Aluminum Alloys

QQ-A-250 Plate and Sheet
QQ-A-200 Bar and Rod, Extruded
QQ-A-225 Bar, Rod and Wire
QQ-A-591 Die Castings
MIL-A-21180 Sand Castings
QQ-A-367H(2) Hand Forging

c. Copper

QQ-C-576
QQ-C-502

d. Corrosion Resistant Steels

MIL-S-5059
QQ-S-763
QQ-S-766
MIL-S-2504

e. Magnesium

QQ-M-44
QQ-M-31

f. Tungsten

MIL-T-21014

g. Nickels Alloys

MIL-N-8550
QQ-N-286

h. Steels

MIL-T-6736
MIL-S-6758
MIL-S-5000
MIL-S-8844
MIL-S-18729
MIL-S-5626

i. Solder

QQ-S-571
MIL-F-14256 Types R and RMA

NON-METALLICS

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- a. Adhesives
MIL-A-2546
- b. Ceramics
MIL-174
- c. Coating, Foaming Molding and Potting Compounds

MIL-I-16923
MIL-I-46058
- d. Cord and Core
MIL-I-3158
MIL-C-7438
- e. Elastomers
MIL-R-83248
MIL-R-25988
- F. Gas and Liquids
MIL-A-18455
MIL-C-81302
MIL-P-27401
MIL-P-27404
MIL-P-27407
- g. Lubricants
MIL-L-46010
- h. Marking, Primers Paints
MIL-I-43553
MIL-P-23377
MIL-C-83286
- I. Plastics, Laminates and Fabrics Rubbers.
MIL-P-22241
MIL-P-81390
MIL-P-24074
MIL-P-46036
MIL-M-14
MIL-I-17205
MIL-P-18177
MIL-P-13949
MIL-R-83248
- i. Tapes
MIL-I-43435
MIL-I-15126
MIL-I-23594
- j. Thermal Control Materials
MIL-I-631

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MIL-P-46112
MIL-F-21840

- k. Tubing
MIL-I-23053
MIL-Y-1140
MIL-S-85848

Section III Approved Processes

- a. Platings and coatings as follows:

Gold	MIL-G-45208
Nickel	QQ-N-290
Electroless Nickel	MIL-C-26074
Silver	QQ-S-365
Copper	MIL-C-14550
Chromium	QQ-C-320
Rhodium	MIL-R-46085
Tin-Lead	MIL-P-81728

- b. Soldering in accordance with the follows:

MIL-STD-2000
NHB 5300.4 (3A)

- c. Brazing, soldering (nonelectrical), and welding in accordance with the following:

MIL-W-6858
MIL-W-6873
MIL-B-7883

- d. Heat Treating and Surface Hardening

MIL-H-81200
MIL-H-6875
MIL-A-22771
MIL-H-7199

- e. Metal Fabrication Assembly

MIL-S-13165
MIL-A-21180

- f. Metal Machining Chemical Milling

MIL-C-81769

- g. Adhesive Bonding

MIL-A-83376	Non-structural adhesive bonding
MIL-A-83377	Structural adhesive bonding

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**APPENDIX B
HARDNESS ASSURANCE****10. Scope**

This appendix is a mandatory part of the standard. The information contained is intended for compliance. This appendix provides the detailed requirements for managing a PMP radiation hardness assurance program for space and launch vehicles.

20. Radiation Hardness Assurance Program

The contractor shall develop and implement a Radiation Hardness Assurance (RHA) Program for the design, development and production of all space flight hardware. The hardness assurance program shall be through the RHA Program Plan.

20.1 Radiation Hardness Assurance (RHA) Program Plan

The contractor shall develop, document and maintain a RHA Program Plan that details radiation hardness assurance tasks and responsibilities for assuring parts and materials meet RHA requirements. The RHA Program Plan shall include the following:

- a. Organizational responsibility and lines of interaction.
- b. Prime contractors interaction with subcontractors.
- c. Part/material selection and qualification.
- d. Alternative design and procurement considerations for risk assessment.
- e. Method for derivation of radiation requirements for parts and materials.
- f. Method for determining part and material specification requirements in consideration of radiation environments and system engineering applications.
- g. Development and maintenance of a radiation characterization data base for parts and materials.

20.2 Hardness Assurance Design Documentation

The contractor shall prepare a RHA Design Guidelines which details or references all radiation analysis procedures, test procedures, data formatting and reporting requirements for materials and for electronic piece parts. This document shall include, but not be limited to:

- a. Circuit schematic, functional description, pin-out, operation conditions, and application of each critical circuit. Only required for electronic piece parts.
- b. Specification of worst case radiation environment for each critical material and for piece parts in each critical circuit.
- c. Specification of end point electrical parameters, tolerances, recovery times following a nuclear event, and parameter values at the end of mission.
- d. The list of piece parts for each critical circuit showing the radiation design margin between worst cast circuit requirements and the degradation of piece parts due to radiation.
- e. The list of materials subject to radiation degradation showing the radiation design margin between the worst case requirements and the anticipated degradation of the material over its

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design life.

- f. Part categorization in each critical circuit and each environment.
- g. Results of hardness verification analyses and tests.
- h. Testability requirements and description of hardness assurance test items/test structures and process monitors.
- i. List of critical design, layout rules, and processing parameters in each radiation environment.
- j. Lot acceptance criteria and test results.
- k. Special controls, screening and testing specified for parts with inadequate design margin.

20.3 Representation of RHA Issues at Audits and Design Reviews

The contractor shall have an RHA representative at all applicable design reviews, including preliminary and critical design reviews. The contractor shall ensure that all system design decisions are evaluated for their effect upon the hardness assurance of the system and its components. In addition, the representative shall ensure that the RHA Program Plan, the RHA Design Document, and the detailed specification are updated to incorporate any hardness assurance critical decisions made at the design reviews.

20.4 Integrating Subcontractor RHA Capabilities.

The prime contractor shall flow down the applicable RHA requirements, as determined by the PMPCB, to the subcontractors to ensure system hardening requirements are met. This includes ensuring the subcontractors have the capability to meet program RHA requirements. Timely communication channels between the subcontractor's RHA activity and the prime contractor's RHA organizations shall be maintained.

20.5 Hardness Assurance Requirements

The order of precedence of 5.5.5 shall apply to radiation hardened parts. When hardness assured parts and materials in accordance with the space quality baseline (3.1.25) are unavailable or do not meet the program's radiation requirements, the contractors may develop detailed specifications or contractor prepared drawings for parts and materials upon approval by the PMPCB. All technical requirements for radiation hardness shall be included in the detail specifications or contractor documentation, either directly stated or by reference to other documents. In addition, the procurement document should include a list of approved radiation test facilities. The detail specification or contractor prepared drawings shall include:

- a. Radiation test methods and test circuits.
- b. Sample size and sampling method.
- c. Radiation types and specification level.
- d. Pre- and post-radiation response parameters and failure criteria.
- e. Data reporting and analysis.
- f. Dosimetry requirements.
- g. Special radiation tests such as electrical or radiation screening tests.

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20.5.1 Radiation Characterization Tests.

The contractor shall ensure radiation characterization of parts and materials for the specified radiation environments. The radiation characterization may be based upon existing data bases analyses and/or design margins with review and approval by the PMPCB.

20.5.2 Hardness Assurance Verification Analyses.

The contractor shall perform and document radiation analyses based on the part or material radiation characterization data to ensure that under worst case conditions, critical circuits or materials are capable of meeting the RHA requirements.

20.6 Consideration and Assessment of RHA Technologies.

Consideration of various RHA technologies shall be made prior to their selection for use. Trade studies that optimize performance, cost, schedule, power, weight, producibility, and technical risk shall be accomplished. When possible, proven technologies should be chosen before emerging technologies to mitigate technical risk. Selection preference should also be given to those technologies produced by more than one supplier. *Not only will competition effect the cost of hardware, but second source availability reduces the risk to program associated with supplier failures.*

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APPENDIX C

EXPENDABLE LAUNCH VEHICLE (ELV)
QUALITY BASELINE

This appendix is a mandatory part of the standard. The information contained is intended for compliance. This section lists those PMP items that are approved for use in expendable launch vehicle applications by the acquisition activity. The ELV quality baseline may be tailored by the acquisition activity for each specific program.

The ELV quality baseline is listed in three sections:

Section I	Approved Parts
Section II	Approved Materials and Processes
Section III	ELV PAR/MAR Additional Provisions

SECTION I
APPROVED PARTS

a. Microcircuits	Same as Appendix A
b. Semiconductors	Same as Appendix A
c. Hybrids	Same as Appendix A
d. Capacitors	MIL-C-123, QPL MIL-C-87164, QPL MIL-C-87217/1, /3, and /4, QPL MIL-C-39003/10 failure rate C, QPL MIL-C-20, failure rates S, C, D, or E, QPL MIL-C-19976, failure rates S, C, D, or E, QPL MIL-C-23269, failure rates S, C, D, or E, QPL MIL-C-39006, failure rates S, C, D, or E, QPL MIL-C-39014, failure rates S, C, D, or E, QPL MIL-C-55365, failure rates S, C, D, or E, QPL MIL-C-55681, failure rates S, C, D, or E, QPL MIL-C-83421, failure rates S, C, D, or E, QPL
e. Resistors	MIL-R-87254, QPL MIL-R-39005, failure rate S or R (if S not QPL), QPL MIL-R-39007, failure rate S or R (if S not QPL), QPL MIL-R-39009, failure rate S or R (if S not QPL), QPL MIL-R-39017, failure rate S or R (if S not QPL), QPL MIL-R-55182, failure rate S or R (if S not QPL), QPL MIL-R-55342, failure rate S or R (if S not QPL), QPL
f. Relays	MIL-R-39016, failure rate P or R, QPL MIL-R-6106, failure rate P or R, QPL
g. EMI Filters	MIL-F-22861, Class S QPL
h. Fuses	MIL-F-23419, QPL

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- i. Magnetics MIL-STD-981, Class S QPL
MIL-T-27, Class S QPL
MIL-21038, Class S QPL
- j. Connectors MIL-C-38999, QPL
MIL-C-24308, QPL
MIL-C-26482, QPL
MIL-C-55302, QPL
MIL-C-83723, QPL
MIL-C-83733, QPL
MIL-C-3655, QPL
MIL-C-5015, QPL
MIL-C-39012, QPL
- k. Crystal Oscillator MIL-O-55310, QPL
- l. Mechanical Parts procured to military specifications listed in the Department of Defense Index of Specifications and Standards (DODISS), QPL, selected per MIL-STD-970 and listed in the program's approved PMPSL.

**SECTION II
APPROVED MATERIALS AND PROCESSES**

- a. Wire and Cable MIL-W-22759/16, /17, /18, /19, /32, /33, /34, /35, /41, /42, /43, /44, /45, and /46
MIL-W-81381/7, /8, /9, /10, /11, /12, /13, /14, /17, and /19.
MIL-C-27500 (equivalent types listed above)
 - Internal Box Only MIL-W-22759/28, /29, /30, and /31.
- b. Soldering MIL-STD-2000
NHB 5300.4
- c. PWB Assembly MIL-P-55110
MIL-P-50884
MIL-C-28809
- d. EEE Component Mounting MIL-STD-275
MIL-STD-2118
MIL-S-45743
- e. Others Materials and processes certifiable to specifications listed in the Department of Defense Index of Specifications and Standards (DODISS) selected in accordance with MIL-STD-970 and listed on the program's approved PMPSL.

**SECTION III
ELV PAR/MAR ADDITIONAL PROVISIONS**

For ELV applications, product procured in accordance with program technical requirements or QML/QPL product screened in accordance with program technical requirements do not require preparation and approval of a PAR/MAR. However, the detailed specification must be approved by the PMPCB.

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APPENDIX D

PARTS, MATERIALS, AND PROCESSES SELECTION LIST (PMPSL)

10. Scope. This Appendix provides the detail requirements for submitting a list of Parts, Materials and Processes (PMP) in electromagnetic format that are approved for design in a specific contract.

20. Format. The PMPSL, as generated by the work task of paragraph 5.3, shall comply with the format of Tables D-1 thru D-5. The PMPSL shall be in electromagnetic medium to the requirements of paragraph 20.3.

The PMPSL shall be divided into five sections (note: "DB" is abbreviation for database):

Section 1: General heading (Table D-5).

Section 2: General electronic parts including electromagnetic, electro-optical, optics, and motors (Table D-1).

Section 3: General materials (Table D-2).

Section 4: General processes (Table D-4).

Section 5: General mechanical parts including nuts, bolts, fasteners, valves, and hydraulic and fluid fittings. Note: Subassembly/Assembly level devices shall not be listed in the PMPSL. The PMP used in the design of the Subassembly/Assembly shall be listed in the PMPSL (Table D-3).

A letter "L" shall be placed in the "LTD" field column for each ITEM which has LIMITED APPLICATIONS.

20.1 Contents. The PMPSL shall include all the items identified as being required in Tables D-1 thru D-5.

a. Part type shall be in accordance with Federal Cataloging Handbook H6 and name modifiers. Related description data such as physical size, hardness assurance capability, and special handling or material requirements should be added to the part description field, and carried over to comments field if extra room is required.

b. The comment field need not be completed for each PMP entry. It should be used for QPL status, part qualification, part shortages, part restrictions part usage, special screening requirements, limited application, documentation status, long lead time, health and safety considerations, or any other appropriate remarks.

c. If identical parts from more than one manufacturer are approved for usage, the PMPSL shall have a separate entry for each manufacturer.

d. All subcontractors parts shall be included in the appropriate section of the PMPSL and be identified by their cage code number.

note: The word part refers to parts, materials, or processes.

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20.2 Revisions to the PMPSL. When the contractor revises the PMPSL, a new copy shall be in accordance to the same requirements as stated in para 20, 20.1, 20.3, and Table D-5 (herein).

20.3 Procedures for Electromagnetic Medium. The PMPSL shall be in electromagnetic medium such as tape or floppy disk at the contractor's option. The submittal shall be in accordance with the requirements below:

- a. Disk submittal shall be either:
 - 5.25" DOUBLE SIDED DOUBLE DENSITY (360 KBYTES)DISK
 - 5.25" HIGH DENSITY (1.2 MBYTES) DISK.
 - 3.5" DOUBLE SIDED DOUBLE DENSITY (720 KBYTES)DISK
 - 3.5" HIGH DENSITY (1.44MBYTES) DISK
- b. Documentation as shown in Table D-5 shall accompany each disk.
- c. Database file types shall be either:
 - LOTUS 123; FOCUS; EXCEL; QUATRO/QUATRO PRO;
 - DATABASE 3+ OR 4; ALPHA 4; R:BASE; PARADOX; ORACLE;
 - FOX PRO; OMNIS 5; OR OTHER TYPES WITH APPROVAL.
- d. American National Standard Code for Information Interchange (ASCII) files may be used provided the fields are delimited or padded with spaces to maintain a constant record length. Each record shall be terminated by a carriage return/ line feed.
- e. Magnetic tape is acceptable when the following criteria is met:
 - Tape Structure: 1600, 6250 (REEL)/ 3480 (CARTRIDGE)
 - Tape Type: Nine (9) Track
 - Tape Labeled: Process (Standard/Non Standard) Describe.

File Structure:

 - Name: Dsname
 - Written Format (Code Formation): - ASCII / EBCDIC
 - Record Format (RECFM): Fixed, Fixed Block, or Variable
 - Logical Record Length (LRECL = n): Size of Record
 - Block Size (BLKSIZE = n): Number of Records in the Block
 - Density: 1600 OR 6250 BPI

SAMPLE OF RECORD LAYOUT

<u>FIELD #</u>	<u>FIELD NAME</u>	<u>CHARACTER WIDTH</u>	<u>SIZE</u>	<u>DESCRIPTION</u>
1	PRTTYPE	10	01-10	
2	PARTCHAR	15	11-25	

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20.4 Part Classifications Codes. Parts shall be classified according to the qualification codes as follows:

JANS or JAN CLASS S	A
JANB or JAN CLASS B	B
QML	C
JANTXV	D
JANTX	E
JAN (no longer available)	F
PASSIVE PARTS FAILURE LEVEL L (2% per 1000 hours)	L
PASSIVE PARTS FAILURE LEVEL M (1% per 1000 hours)	M
PASSIVE PARTS FAILURE LEVEL P or B (0.1% per 1000 hours)	P
PASSIVE PARTS FAILURE LEVEL R or C (0.01% per 1000 hours)	R
PASSIVE PARTS FAILURE LEVEL S or D (0.001% per 1000 hours)	S
PASSIVE PARTS FAILURE LEVEL T (0.0001% per 1000 hours)	T
CONTRACTOR SCD REQUIREMENTS	G
LOCKHEED (LMSC) MONITORED LINE PART	H
SOURCE CONTROL DRAWING IMPOSING MIL-STD-1547 REQUIREMENTS	J
SMD	K

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APPENDIX D

TABLE D-1. PMPSL DB field requirements for electronic parts

Required fields and minimum field widths with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Part type (Resistor, Diode, etc.)(note 4)	PRTTYPE	10	YES
2	Part characteristic (Family type)(note 4)	PRTCHAR	15	YES
3	Part description (Voltage, Current, etc.)(note 4)	PRTDESC	40	OPT
4	Part usage (Where is the part used)(note 4)	PRTUSAGE	26	OPT
5	Contractor specification number	SPECNO	20	YES
6	Supplier/part manufacturer name	MFGNAME	20	YES
7	Part manufacture/cage code (Use Federal H4/H8 Cage Code Dictionary)	MFGCAGE	6	YES
8	Manufacturer part number	MFGPRTNO	26	OPT
9	Generic part number (Commonly accepted commercial part number)	GENERIC	20	YES
10	Military part number (As defined per applicable MIL SPEC)	MILPRTNO	20	YES
11	National stock number	NSN	20	OPT
12	Limited application for part	LIMITED	1	YES
13	Part classification (See para 20.4)	CLASS	1	YES
14	Radiation Hardened (note 4)	RAD	1	YES
15	Comments (shall be filled out for limited application or any other pertinent data)(note 2)	COMMENT	160	YES

NOTES

1. "OPT" found in the REQ'D field column indicates that data need not be entered for that field, but shall be PART of the database structure.
2. Field # 15 (COMMENTS) May be left blank if no pertinent information exist.
3. Field # 14 to be left blank for non radiation hardened parts.
4. Sample inputs for part types.

<u>PART TYPE</u>	<u>PART CHAR</u>	<u>PART DESCRIPTION</u>	<u>PART USAGE</u>
MICRO CIRCUIT	DIGITAL CMOS	DUAL FLIP/FLOP	HIGH SPD CLOCK
RESISTOR	WIRE VARIABLE	1/8W 0-115K	PREC TIMING CKT
RESISTOR	FILM CHIP	1/16W 5K	HYBRID
CAPACITOR	TANTALUM SOLID	60V 32MF	FILTER
CAPACITOR	CERAMIC CHIP	50V .001MF	COUPLING

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APPENDIX D

TABLE D-2. PMPSL DB field requirements for materials

Required fields and minimum field widths along with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Material (Metal, organic, composite etc.)	MAT	10	YES
2	Material Type (Tin, gold, polymer, etc)	TYPE	10	YES
3	Material Form (Bar, rod, sheet, wire, etc.)	FORM	10	YES
4	Trade Name (Common industry usage name)	TRNAME	20	YES
5	Supplier/Manufacturer (mfg) name	MFGNAME	20	YES
6	Supplier/Manufacturer Cage Code	MFGCAGE	6	YES
7	Contractor Specification Number	SPECNO	26	YES
8	Generic or Military (MIL) Part Number	MILPRTNO	20	YES
9	Hazardous Material (note 1)	CAUT	2	YES
10	Shelf-Life Control Item (note 2)	SHELF	1	YES
11	Qualification Status (note 5)	QUAL	1	YES
12	Limited Application for Material (note 3)	LIMITED	1	YES
13	Comments (note 4)	COMMENT	160	YES

NOTES:

1. The following codes shall be used in hazardous material field number 9:
 - a. Creates health hazard if not handled properly.
 - b. Environmental hazard.
 - c. Fire/explosive hazard.
 - d. Other (explain in comment field).
2. If the material has a limited shelf life add "L" to field number 10.
3. If the material has a limited application for a specific function/job add "L" to field number 12 and specify application in comments field.
4. Comment field may be left blank if no applicable information is required.
5. If the material is qualified use "Q" in field number 11 and state in comment field 13 how it is qualified.

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APPENDIX D

TABLE D-4. PMPSL DB field requirements for processes

Required fields and minimum field widths with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Process Title (Heat Treatment, Soldering etc.)	TITLE	20	YES
2	Process number (MIL, Federal, Industry, Contractor, etc.)	NUM	20	YES
3	Process Description (Ag plating, quenching, soldering, etc.)	DESCR	40	YES
4	Qualification Status	QUAL	1	OPT
5	Limited Application (note 3, Table D-2)	LIMITED	1	YES
6	Hazardous Process (note 1, Table D-2)	HAZARD	1	YES
7	Need Code	NEED	1	OPT
8	Comments (note 4, Table D-2)	COMMENT	160	OPT

TABLE D-5. PMPSL database documentation requirements for each submittal

REQUIRED DATA TO BE SUPPLIED WITH EACH NEW OR REVISED PMPSL SUBMITTED
EACH ENTRY FOR INFORMATION TO BE ON A SEPARATE LINE

CONTRACTOR NAME _____
 CONTRACTOR CAGE CODE _____
 CONTRACTOR ADDRESS _____
 CONTRACTOR CITY _____
 CONTRACTOR STATE _____
 CONTRACTOR ZIP _____
 PMPSL CONTROL # _____
 PMPSL REVISION # _____
 CONTRACT # _____
 USER (NASA, NAVY, SMC) _____
 PROGRAM NAME (IUS, DSCS) _____
 DATA ITEM TITLE _____
 DATE OF LAST REVISION _____
 RESPONSIBLE GROUP PHONE # _____
 TOTAL NUMBER OF RECORDS _____
 COMMENTS _____

Documentation paper shall be furnished with each disk or tape containing the following:
Type of disk/tape, Name of file, Name of each field and its width, plus the electromagnetic medium requirements in para 20.3 herein.

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APPENDIX E

AS-DESIGNED PARTS, MATERIALS, AND PROCESSES LIST (ADPMPL)

10. Scope. This Appendix provides the detail requirements for submitting a list of Parts, Materials and Processes (PMP) in electromagnetic format that are approved for design in a specific contract.

20. Format. The ADPMPL, as generated by the work task of paragraph 5.3, shall comply with the format of Tables E-1 thru E-5. The ADPMPL shall be in electromagnetic medium to the requirements of paragraph 20.3.

The ADPMPL shall be divided into five sections (note: "DB" is abbreviation for database):

Section 1: General heading (Table E-5).

Section 2: General electronic parts including electromagnetic, electro-optical, optics, and motors (Table E-1).

Section 3: General materials (Table E-2).

Section 4: General processes (Table E-4).

Section 5: General mechanical parts including nuts, bolts, fasteners, valves, and hydraulic and fluid fittings. Note: Subassembly/Assembly level devices shall not be listed in the ADPMPL. The PMP used in the design of the Subassembly/Assembly shall be listed in the ADPMPL (Table E-3).

A letter "L" shall be placed in the "LTD" field column for each ITEM which has LIMITED APPLICATIONS.

20.1 Contents. The ADPMPL shall include all the items identified as being required in Tables E-1 thru E-5.

- a. Part type shall be in accordance with Federal Cataloging Handbook H6 and name modifiers. Related description data such as physical size, hardness assurance capability, and special handling or material requirements should be added to the part description field, and carried over to comments field if extra room is required.
- b. The comment field need not be completed for each PMP entry. It should be used for QPL status, part qualification, part shortages, part restrictions part usage, special screening requirements, limited application, documentation status, long lead time, health and safety considerations, or any other appropriate remarks.
- c. If identical parts from more than one manufacturer are approved for usage, the ADPMPL shall have a separate entry for each manufacturer.
- d. All subcontractors parts shall be included in the appropriate section of the ADPMPL and be identified by their cage code number.

note: The word part refers to parts, materials, or processes.

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20.2 Revisions to the ADPMPL. When the contractor revises the ADPMPL, a new copy shall be in accordance to the same requirements as stated in para 20, 20.1, 20.3, and Table E-5 (herein).

20.3 Procedures for Electromagnetic Medium. The ADPMPL shall be in electromagnetic medium such as tape or floppy disk at the contractor's option. The submittal shall be in accordance with the requirements below:

- a. Disk submittal shall be either:
 - 5.25" DOUBLE SIDED DOUBLE DENSITY (360 KBYTES)DISK
 - 5.25" HIGH DENSITY (1.2 MBYTES) DISK.
 - 3.5" DOUBLE SIDED DOUBLE DENSITY (720 KBYTES)DISK
 - 3.5" HIGH DENSITY (1.44MBYTES) DISK
- b. Documentation as shown in Table E-5 shall accompany each disk.
- c. Database file types shall be either:
 - LOTUS 123; FOCUS; EXCEL; QUATRO/QUATRO PRO
 - DATABASE 3+ OR 4; ALPHA 4; R:BASE; PARADOX; ORACLE;
 - FOX PRO; OMNIS 5; OR OTHER TYPES WITH APPROVAL.
- d. American National Standard Code for Information Interchange (ASCII) files may be used provided the fields are delimited or padded with spaces to maintain a constant record length. Each record shall be terminated by a carriage return/ line feed.
- e. Magnetic tape is acceptable when the following criteria is met:
 - Tape Structure: 1600, 6250 (REEL)/ 3480 (CARTRIDGE)
 - Tape Type: Nine (9) Track
 - Tape Labeled: Process (Standard/Non Standard) Describe.

File Structure:

 - Name: Dsname
 - Written Format (Code Formation): - ASCII / EBCDIC
 - Record Format (RECFM): Fixed, Fixed Block, or Variable
 - Logical Record Length (LRECL = n): Size of Record
 - Block Size (BLKSIZE = n): Number of Records in the Block
 - Density: 1600 OR 6250 BPI

SAMPLE OF RECORD LAYOUT

<u>FIELD #</u>	<u>FIELD NAME</u>	<u>CHARACTER WIDTH</u>	<u>SIZE</u>	<u>DESCRIPTION</u>
1	PRTTYPE	10	01-10	
2	PARTCHAR	15	11-25	

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APPENDIX E

20.4 Part Classifications Codes. Parts shall be classified according to the following codes:

JANS or JAN CLASS S	A
JANB or JAN CLASS B	B
QML	C
JANTXV	D
JANTX	E
JAN (no longer available)	F
PASSIVE PARTS FAILURE LEVEL L (2% per 1000 hours)	L
PASSIVE PARTS FAILURE LEVEL M (1% per 1000 hours)	M
PASSIVE PARTS FAILURE LEVEL P or B (0.1% per 1000 hours)	P
PASSIVE PARTS FAILURE LEVEL R or C (0.01% per 1000 hours)	R
PASSIVE PARTS FAILURE LEVEL S or D (0.001% per 1000 hours)	S
PASSIVE PARTS FAILURE LEVEL T (0.0001% per 1000 hours)	T
CONTRACTOR SCD REQUIREMENTS	G
LOCKHEED (LMSC) MONITORED LINE PART	H
SOURCE CONTROL DRAWING IMPOSING MIL-STD-1547 REQUIREMENTS	J
SMD	K

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APPENDIX E

TABLE E-1. ADPMPL DB field requirements for electronic parts

Required fields and minimum field widths with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Part type (Resistor, Diode, etc.)(note 4)	PRTTYPE	10	YES
2	Part characteristic (Family type)(note 4)	PRTCHAR	15	YES
3	Part description (Voltage, Current, etc.)(note 4)	PRTDESC	40	YES
4	Contractor specification number	SPECNO	20	YES
5	Supplier/part manufacturer name	MFGNAME	20	YES
6	Generic or Military (MIL) part number	PARTNUM	22	YES
7	Number parts used per vehicle	TOTQUANT	6	YES
8	Limited application (add "L" for limited application and describe in Comment field)	LIMITED	1	YES
9	Radiation Hardened part (note 3)	RADHARD	1	YES
10	End item part number (black box part used in)	ITEMDWG	20	YES
11	End item name (black box part used in)	ITEMNAME	20	YES
12	Number parts used per black box	QUANTITY	6	YES
13	Comments (shall be filled out for limited application or any other pertinent data)(note 2)	COMMENT	160	YES

NOTES

1. "OPT" found in the REQ'D field column indicates that data need not be entered for that field, but shall be PART of the database structure.
2. Field # 13 (COMMENTS) May be left blank if no pertinent information exist.
3. Field # 9 add "R" for radiation hardened parts. If the part is rad hard and tested, the level may be added to Comment field 13.
4. Sample inputs for part types.

<u>PART TYPE</u>	<u>PART CHAR</u>	<u>PART DESCRIPTION</u>	<u>PART USAGE</u>
MICRO CIRCUIT	DIGITAL CMOS	DUAL FLIP/FLOP	HIGH SPD CLOCK
RESISTOR	WIRE VARIABLE	1/8W 0-115K	PREC TIMING CKT
RESISTOR	FILM CHIP	1/16W 5K	HYBRID
CAPACITOR	TANTALUM SOLID	60V 32MF	FILTER
CAPACITOR	CERAMIC CHIP	50V .001MF	COUPLING

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APPENDIX E

TABLE E-2. ADPMPL DB field requirements for materials

Required fields and minimum field widths along with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Material (Metal, organic, composite etc.)	MAT	10	YES
2	Material Type (Tin, gold, polymer, etc)	TYPE	10	YES
3	Material Form (Bar, rod, sheet, wire, etc.)	FORM	10	YES
4	Trade Name (Common industry usage name)	TRNAME	20	YES
5	Supplier/Manufacturer (mfg) name	MFGNAME	20	YES
6	Contractor Specification (SPEC) Number	SPECNO	26	YES
7	Generic or Military (MIL) part number	PARTNUM	22	YES
8	Hazardous Material (note 1)	CAUT	2	YES
9	Shelf-Life Control Item (note 2)	SHELF	1	YES
10	End Item part number (black box material (mat) used in)	ITEMDWG	20	YES
11	End Item name (black box mat used in)	ITEMNAME	20	YES
12	Total amount of mat used per black box	QUANTITY	6	YES
13	Total amount of mat used per space craft/launch vehicle	TOTQUANT	6	YES
14	Limited Application for Material (note 3)	LIMITED	1	YES
15	Qualification Status (note 5)	QUAL	1	YES
16	Comments (note 4)	COMMENT	160	YES

NOTES:

1. The following codes shall be used in hazardous material field number 8:
 - a. Creates health hazard if not handled properly.
 - b. Environmental hazard.
 - c. Fire/explosive hazard.
 - d. Other (explain in comment field).
2. If the material has a limited shelf life add "L" to field number 9.
3. If the material has a limited application for a specific function/job add "L" to field number 14 and specify application in comments field.
4. Comment field may be left blank if no applicable information is required.
5. If the material is qualified use "Q" in Qualification field number 15 and state in Comment field number 16 how it is qualified.

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APPENDIX E

TABLE E-3. ADPMPL DB field requirements for mechanical parts and assemblies

Required fields and minimum field widths with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Part type/name (note 4)	PRTTYPE	20	YES
2	Part description (note 4)	PRTCHAR	15	YES
3	Part material (note 4)	PRTMAT	25	YES
4	Contractor specification number	SPECNO	26	YES
5	Generic or Military (MIL) part number	PARTNUM	22	YES
6	Supplier/part manufacturer name	MFGNAME	20	YES
7	End Item part number (black box part used in)	ITEMDWG	20	YES
8	End Item name (black box part used in)	ITEMNAME	20	YES
9	Number of parts used per black box	QUANTITY	6	YES
10	Number of parts used per vehicle	TOTQUAN	6	YES
11	Limited Application for Parts (note 1)	LIMITED	1	YES
12	Qualification Status (note 3)	QUAL	1	YES
13	Comments (note 2)	COMMENT	160	YES

NOTES:

- If the material has a limited application for a specific function/job add "L" to field number 11 and specify application in comment field 12.
- Comment field 12 may be left blank if no applicable information is required.
- If part is qualified use the following codes to describe how it is qualified:

NAS STD	A
FED-STD	B
MIL-STD	C
DESIGN & TEST	D
SIMILARITY - State in comment field 11 the program and conditions for qualification	S
OTHER -State in comment field 11 the program and the conditions for qualification.	O
- Sample inputs for part types

<u>PART TYPE</u>	<u>PART DESCRIPTION</u>	<u>PART MATERIAL</u>	<u>COMMENTS</u>
NUT	10X32, 1" DIAM	CRES	
VALVE	FUEL	BRASS	HYDROGEN
CABLE TIES	1/4 INCH	NYLON 66	120 lb RATING

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APPENDIX E

TABLE E-4. ADPMPL DB field requirements for processes

Required fields and minimum field widths with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DB NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Process Title (Heat Treatment, Soldering etc.)	TITLE	20	YES
2	Process number (MIL, Federal, Industry, Contractor)	NUM	20	YES
3	Process Description (Ag plating, soldering, etc.)	DESCR	40	YES
4	Limited Application (note 1)	LIMITED	1	YES
5	Hazardous Process (note 3)	HAZARD	1	YES
6	End Item part number (black box process used in)	ITEMDWG	20	YES
7	End Item name (black box process used in)	ITEMNAME	20	YES
8	Comments (note 2)	COMMENT	160	YES

NOTES:

1. If the material has a limited application for a specific function/job add "L" to field number 4 and specify application in comment field 8.
2. Comment field 8 may be left blank if no applicable information is required.
3. The following codes shall be used in hazardous material field number 8:
 - a. Creates health hazard if not handled properly.
 - b. Environmental hazard.
 - c. Fire/explosive hazard.
 - d. Other (explain in comment field).

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APPENDIX E

TABLE E-5. ADPMPL database documentation requirements for each submittal

REQUIRED DATA TO BE SUPPLIED WITH EACH NEW OR REVISED ADPMPL SUBMITTED
EACH ENTRY FOR INFORMATION TO BE ON A SEPARATE LINE

CONTRACTOR NAME	_____
CONTRACTOR CAGE CODE	_____
CONTRACTOR ADDRESS	_____
CONTRACTOR CITY	_____
CONTRACTOR STATE	_____
CONTRACTOR ZIP	_____
ADPMPL CONTROL #	_____
ADPMPL REVISION #	_____
CONTRACT #	_____
USER (NASA, NAVY, SMC)	_____
PROGRAM NAME (IUS, DSCS)	_____
DATA ITEM TITLE	_____
DATE OF LAST REVISION	_____
RESPONSIBLE GROUP PHONE #	_____
TOTAL NUMBER OF RECORDS	_____
COMMENTS	_____

Documentation paper shall be furnished with each disk or tape containing the following:
Type of disk/tape, Name of file, Name of each field and its width, plus the electromagnetic
medium requirements in para 20.3 herein.

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APPENDIX F

FAILURE SUMMARY AND ANALYSIS REPORT (FSAR)

10. Scope. This appendix provides the detail requirements for submitting the parts and materials Failure Summary and Analysis Report (FSAR) in electromagnetic format over the life of a program for a specific contract. This appendix is used by the procuring activity to monitor/evaluate all program piece part failures.

20. Format. The FSAR as generated by the work task paragraph 5.12 shall comply with the format of Tables F-1 and F-2.

20.1 Contents. The FSAR shall include all the items identified as being required in Table F-1.

- a. Part type shall be per Federal Cataloging Handbook H6 and name modifiers.
- b. Each part analyzed, shall be a separate record.
- c. A separate FSAR record shall be required for each part or material number/type analyzed.

20.2 Revisions to the FSAR. When the contractor revises the FSAR, a new copy shall be in accordance to the same requirements as stated in para 20, 20.1, 20.3, 20.4 and Table F-2.

20.3 Procedures for Electromagnetic Medium. The FSAR shall be in electromagnetic medium such as tape or floppy disk at the contractor's option. The submittal shall be in accordance with the requirements below:

- a. Disk submittal shall be either:
 - 5.25" DOUBLE SIDED DOUBLE DENSITY (360 KBYTES)DISK
 - 5.25" HIGH DENSITY (1.2 MBYTES) DISK.
 - 3.5" DOUBLE SIDED DOUBLE DENSITY (720 KBYTES)DISK
 - 3.5" HIGH DENSITY (1.44MBYTES) DISK
- b. Documentation as shown in Table F-2 shall accompany each disk.
- c. Database file types shall be either:
 - LOTUS 123; FOCUS; EXCEL; QUATRO/QUATRO PRO
 - DATABASE 3+ OR 4; ALPHA 4; R:BASE; PARADOX; ORACLE;
 - FOX PRO; OMNIS 5; OR OTHER TYPES WITH APPROVAL.
- d. American National Standard Code for Information Interchange (ASCII) files may be used provided the fields are delimited or padded with spaces to maintain a constant record length. Each record shall be terminated by a carriage return/ line feed.
- e. Magnetic tape is acceptable when the following criteria is met:
 - Tape Structure: 1600, 6250 (REEL)/ 3480 (CARTRIDGE)
 - Tape Type: Nine (9) Track
 - Tape Labeled: Process (Standard/Non Standard) Describe.
 - File Structure:
 - Name: Dsname
 - Written Format (Code Formation): - ASCII / EBCDIC
 - Record Format (RECFM): Fixed, Fixed Block, or Variable
 - Logical Record Length (LRECL = n): Size of Record
 - Block Size (BLKSIZE = n): Number of Records in the Block
 - Density: 1600 OR 6250 BPI

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APPENDIX F

SAMPLE OF RECORD LAYOUT

<u>FIELD #</u>	<u>FIELD NAME</u>	<u>CHARACTER WIDTH</u>	<u>SIZE</u>	<u>DESCRIPTION</u>
1	PRTTYPE	10	01-10	
2	PARTCHAR	15	11-25	

TABLE F-1. FSAR database field requirements

Required fields and minimum field widths along with a recommended format and structure

<u>FIELD NUM</u>	<u>FIELD DATA DESCRIPTION</u>	<u>DBASE NAME</u>	<u>FIELD WIDTH</u>	<u>REQ'D</u>
1	Failure Analysis Report (FAR) number	FARNO	16	YES
2	Failed part type (Resistor, Diode, Capacitor, etc.)(para 20.4.5)	PRTTYPE	10	YES
3	Part characteristic (Film, Ceramic, Mica, etc.)	PRTCHAR	15	YES
4	Part description (Voltage, Current, etc.)	PRTDESC	40	OPT
5	Contractor specification number	SPECNO	20	YES
6	Part supplier/manufacturer name	MFGNAME	20	YES
7	Generic, Military or Industry part number	PARTNUM	22	YES
8	Program name where part failed	PRG	8	YES
9	Lot date code (LDC) Start (note 4)	LDCSTRT	10	YES
9a	Lot Date Code (LDC) End (note 4)	LDCEND	10	YES
10	Serial number of end item (black box)	SN	10	YES
11	NR: Report Number that caused FAR to be opened	NR	10	YES
12	Next assembly drawing (dwg) number of printed wiring board	PWBDWG	20	YES
13	End item usage (black box) dwg number	EIDWG	20	YES
14	End item usage name (Receiver)(name of black box)	EINAME	20	YES
15	Vehicle dwg/identification where box installed	VEHNUM	10	YES
16	Date failure occurred	DATEO	8	YES
17	Date FAR closed	DATEC	8	YES
18	Failure review board number that closed FAR	FRBNO	6	YES
19	Cause of part failure (summary in words)	CAUSE	160	YES
20	Corrective action summary	CA	60	
21*	Phase of manufacturing (mfg) when failure occurred (para 20.4.1)	PHASE	3	YES
22*	Test event when failure occurred (para 20.4.3)	TEST	5	YES
23*	Level of assembly when failure occurred (20.4.2)	LEVEL	3	YES
24*	Part defect caused by: see para 20.4.4	DEFECT	5	YES
25	Sub Contractor Name (mfg of black box)	SUBCONT	20	YES
26	Comment (note 3)	COMMENT	160	OPT

NOTES:

- "OPT" found in the REQ'D (required) field column indicates that data need not be entered for that field, but shall be part of the database structure.
- "*" found in the Field Num column indicates that database field shall be filled with the failure/defect codes identified in the applicable para referenced in the data description field.
- The Comment field need only be used when appropriate.
- Use Symbol ">" after LDC to indicate all subsequent LDCs are suspect. Use Symbol "<" after LDC to indicate all prior LDCs are suspect. Use symbol "S" after LDC to indicate a multiple of LDCs between LDCSTART and LDCEND are suspect.

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APPENDIX F

20.4 Recommended code definitions for the applicable database fields. The contractor may use their own codes or add additional codes to describe when, where, and how the failure occurred. The contractor shall provide documentation to describe these codes in accordance with para 20.4.4 (herein).

20.4.1 Phase of manufacturing when failure occurred (Table F-1 #21)

	<u>NAME</u>	<u>CODE</u>
a.	Assembly and Integration (A/I)	AI
b.	System	SYS
c.	Post System	POS
d.	Launch Preparations/OPS	OPS
e.	Other	OTH

20.4.2 Level of assembly when failure occurred (Table F-1 #23)

	<u>NAME</u>	<u>CODE</u>
a.	Destructive Physical Analysis	DPA
b.	Receiving Inspection	REC
c.	Lot Acceptance Test	LAT
d.	Printed Wiring Board	PWB
e.	Component (Black Box)	BOX
f.	Subsystem	SUB
g.	Vehicle	VEH
e.	Other	OTH

20.4.3 Testing event where failure occurred (Table F-1 #22)

	<u>NAME</u>	<u>CODE</u>
a.	Pre Acceptance Test Procedure (ATP)	PRATP
b.	1st Electrical	FSTEL
c.	Thermal Cycle Test	TC
d.	Thermal Vacuum Test	TV
e.	Shock Test	SHOCK
f.	Sine Vibration Test	VIBSI
g.	Random Vibration Test	VIBRA
h.	Acceleration Test	ACCEL
i.	Acoustic	ACUST
j.	Climatic (Humidity, Altitude, etc.)	CLIMA
k.	Burn-In Test	BURIN
l.	EMI Test	EMI
m.	Special Test	SPEC
n.	Leak Test	LEAK
o.	Pressure Test	PRESS
p.	Mechanical Test	MECH
q.	Final Electrical	FINEL
r.	Other	OTH

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APPENDIX F

20.4.4 Cause code of part failure (Table F-1 #24)

<u>PART DEFECT CAUSED BY PART MANUFACTURE</u>		<u>CODE</u>
a.	Contamination	MC
b.	Short	MS
c.	Open	MO
d.	Out Of Tolerance	MT
e.	Drift	MD
f.	Mechanical Damage	MM
g.	Friction	MF
h.	Wrong Material/Defective Material	MD
i.	Wrong Heat Treatment	MH
j.	Part Workmanship	MW
k.	Part anomaly could not be detected/duplicated	NP
l.	Manufacturer Other (added to comments Table F-1 #26)	MOTH

PART DEFECT CAUSED BY CONTRACTOR

m.	Misapplication/Design	CM
n.	Mishandling	CH
o.	Planning Paper Error	CP
p.	Workmanship	CW
q.	Contractor Others (added to comments Table F-1 #26)	COTH

20.4.5 Sample inputs for part types (see Table F-1, Field Num 1,2, & 3)

<u>PART TYPE</u>	<u>PART CHAR</u>	<u>PART DESCRIPTION</u>	<u>PART USAGE</u>
MICRO CKT (CIRCUIT)	DIGITAL CMOS	DUAL FLIP/FLOP	HIGH SPD CLOCK
RESISTOR	WIRE	VAR 1/8W 0-115K	PREC TIMING CKT
RESISTOR CHIP	FILM	1/16W 5K	HYBRID
CAPACITOR	TANTALUM SLUG	60V 32MF	FILTER
10 x 32, 1" DIAM	CRES		
VALVE	FUEL	BRASS	HYDROGEN
CABLE TIES	1/4 INCH	NYLON 66	120 Lb RATING

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APPENDIX F

TABLE F-2. FSAR database documentation requirements for each submittal

REQUIRED DATA TO BE SUPPLIED WITH EACH NEW OR REVISED FSAR SUBMITTED
EACH ENTRY FOR INFORMATION TO BE ON A SEPARATE LINE

CONTRACTOR NAME	_____
CONTRACTOR CAGE CODE	_____
CONTRACTOR ADDRESS	_____
CONTRACTOR CITY	_____
CONTRACTOR STATE	_____
CONTRACTOR ZIP	_____
FSAR CONTROL #	_____
FSAR REVISION #	_____
CONTRACT #	_____
USER (NASA, NAVY, SMC)	_____
PROGRAM NAME (IUS, DSCS)	_____
DATA ITEM TITLE	_____
DATE OF LAST REVISION	_____
RESPONSIBLE GROUP PHONE #	_____
TOTAL NUMBER OF RECORDS	_____
COMMENTS	_____

Documentation paper shall be furnished with each disk or tape containing the following:
Type of disk/tape, Name of file, Name of each field and its width, plus the electromagnetic
medium requirements in para 20.3 herein.
