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George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ED33

MULTIPROGRAM/PROJECT COMMON-USE DOCUMENT

MSFC FASTENER MANAGEMENT & CONTROL PRACTICES

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Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 2 of 19

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
–	–		Baseline release.
Revision	A	6/24/97	Supercedes baseline in its entirety.
Revision	B	11/14/01	General Revision – Updated to reflect current MSFC document numbering system, applicable documents, requirements, and definitions, as well as custodian code (ED33). Revised document call-outs and improved clarity of text. Substituted "Audited Vendor List" for "Approved Fastener Manufacturers List."
Revision	C	5/1/02	Updated to change the export restriction from EAR to Approved for Public Release.

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Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 3 of 19

FOREWORD

1. This standard specifies fastener management and control practices for use by George C. Marshall Space Flight Center (MSFC) and its contractors.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the custodian: Wayne R. Gamwell/ED33; Materials, Processes, & Manufacturing Department; NASA/George C. Marshall Space Flight Center; Huntsville, AL 35812.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 4 of 19

CONTENTS

<u>PARAGRAPH</u>	<u>PAGE</u>
<u>DOCUMENT HISTORY LOG</u>	2
<u>FOREWORD</u>	3
1. <u>SCOPE</u>	5
1.1 Applicability to MSFC Contractors	5
1.2 Applicability to Other Centers and Agencies.....	5
2. <u>APPLICABLE DOCUMENTS</u>	5
3. <u>DEFINITIONS</u>	6
4. <u>GENERAL REQUIREMENTS</u>	10
5. <u>DETAILED REQUIREMENTS</u>	11
6. <u>NOTES</u>	16
 <u>TABLE</u>	
I. Certification Validation Test (CVT) Requirements	14
 <u>APPENDICES</u>	
A Contractor-Supplied Fastener Management & Control Requirements	17
B Fastener Management & Control Requirements for Independent Organizations.....	19

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 5 of 19

1. SCOPE

This standard documents fastener management and control policy, responsibilities, and practices for structural fasteners, fracture critical fasteners, and safety critical fasteners (as defined by the program/project) that are procured, received, tested, inventoried or installed for space flight by George C. Marshall Space Flight Center (MSFC) or its contractors.

1.1 Applicability to MSFC Contractors. MSFC major subcontractors shall meet the intent of this document and the requirements of Appendix A. The definitions in section 3.0 also apply to Appendix A.

1.2 Applicability to Other Centers and Agencies. All NASA centers, NASA partners, and other independent hardware organizations that produce hardware which is integrated by the MSFC Program and Project Offices into an MSFC mission, payload, or element shall be advised of a requirement issued by a Johnson Space Center (JSC) Safety Panel to procure fasteners according to an approved plan, which should meet the requirements of Appendix B. MSFC as the integrator is not responsible for a hardware producer's compliance to the JSC requirement. The definitions in section 3.0 also apply to Appendix B.

2. APPLICABLE DOCUMENTS

The most recent revisions (unless otherwise specified) of the following specifications, standards, and handbooks form a part of this document to extent specified herein.

2.1 Government Documents.

2.1.1 MIL-S-8879, "Screw Threads, Controlled Radius Root with Increased Minor Diameter"

2.1.2 NASA-STD-5001, "Structural Design and Test Factors of Safety for Spaceflight Hardware"

2.1.3 NASA-STD-5003, "Fracture Control Requirements for Payloads Using the Space Shuttle"

2.1.4 NSTS 1700.7, "STS Payloads, Safety Policy and Requirements"

2.1.5 NPD 8730.2, "NASA Parts Policy"

2.1.6 MPG 8040.3, "Product Traceability"

2.1.7 MPG 8040.1, "Configuration Management, MSFC Programs/Projects"

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 6 of 19

2.1.8 MPG 8730.1, "Inspection and Testing"

2.1.9 MPG 8730.3, "Control of Nonconforming Product"

2.1.10 MPG 5000.1, "Purchasing"

2.1.11 MWI 5330.1, "Evaluation of Contractors, Suppliers, and Vendors"

2.1.12 MSFC Form 847, "Deviation/Waiver Approval Request"

2.1.13 QS10-QA-001, "Acceptance Reporting Instruction"

2.1.14 QS01-QE-001, "Quality Engineering Instruction"

2.2 Non-Government Publications.

2.2.1 ANSI/ASQC Q9001/9002-1994, "Quality Systems — Model for Quality Assurance in Design, Development, Production, Installation, and Servicing" (Requests for copies should be addressed to American Society for Quality Control, 310 West Wisconsin Avenue; Milwaukee, WI 53203.)

2.2.2 WI-15-PC-02, "Storage" (Requests for copies should be addressed to AI Signal Research, Inc., 3411 Triana Boulevard, Huntsville, AL 35805.)

3. DEFINITIONS

3.1 Acronyms Used in This Standard. The acronyms used in this standard are defined as follows:

- a. ADP Acceptance Data Package
- b. ARSI AI Signal Research, Inc.
- c. ANSI American National Standards Institute
- d. ASQC American Society for Quality Control
- e. AFML Approved Fastener Manufacturers List
- f. AVL MSFC Audited Vendor List
- g. BXA Bureau of Export Administration, U.S. Department of Commerce
- h. CFR Code of Federal Regulations

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 7 of 19

- i. COC Certificate of Compliance
- j. CVT Certification Validation Test
- k. DAR Deviation/Waiver Approval Request
- l. EAR Export Administration Regulations, U.S. Department of Commerce
- m. ED MSFC Engineering Directorate
- n. ED30 MSFC Materials, Processes, & Manufacturing Department
- o. ED33 MSFC Metallic Materials & Processes Group
- p. GIDEP Government-Industry Data Exchange Program
- q. JSC Johnson Space Center
- r. MIL Military
- s. MSFC George C. Marshall Space Flight Center
- t. MTR Manufacturer's Test Report
- u. MPG Marshall Procedures & Guidelines
- v. MRB Material Review Board
- w. MWI Marshall Work Instruction
- x. NASA National Aeronautics & Space Administration
- y. NPD NASA Policy Directive
- z. NSTS National Space Transportation System
- aa. PSRP NSTS Payload Safety Review Panel
- bb. QA Quality Assurance
- cc. QE Quality Engineering
- dd. QS01 MSFC Safety & Mission Assurance Office
- ee. QS10 MSFC System Safety, Reliability, & Quality Assurance Department

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Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 8 of 19

ff. STS Space Transportation System

gg. STD Standard

3.2 Acceptance Data Package. Documentation required for each lot of fasteners for acceptance by QA receiving inspection (QS01).

3.3 Accredited Laboratory. A laboratory that has been recognized by national and/or international standard-setting organizations to competently carry out specific tests according to established quality, management, administrative, and test method accreditation criteria.

3.4 Catastrophic Hazard. A hazard which can result in the potential for a disabling or fatal personnel injury or loss of the Orbiter, ground facilities, or NSTS equipment (reference NSTS 1700.7).

3.5 Certificate of Compliance. A document signed by an authorized party, affirming that the supplier of a product or service has met the requirements of the relevant specifications, contract, or regulation (e.g., affirms that the fasteners are of the quality specified and conform in all respects with the contract requirements, including specifications, drawings, preservation, packaging, packing, marking requirements, and physical item identification part number) and are in the quantity shown on the acceptance document.

3.6 Certification Validation Test. Receiving inspection test(s) which are performed to assure conformance to the procurement specification requirements. For fasteners, this is an elemental analysis and mechanical property testing.

3.7 Contained Fastener. A fastener for which released pieces due to its failure (that violate the low mass requirement) are completely contained in the payload and will not cause a catastrophic hazard to the Space Shuttle as a result of subsequent damage to the payload in which it was installed (reference NASA-STD-5003).

3.8 Distributor. A supplier of fasteners who buys and resells fasteners.

3.9 Fail-Safe Fastener. A redundant structural fastener shown to be a non-fracture-critical component by meeting the requirements of NASA-STD-5003, paragraph 4.2.2.3.

3.10 Fastener. Any metallic element which joins other structural elements and transfers loads from one element to the other element across a joint.

3.11 Fracture-Critical Fastener. A fastener with a classification which assumes that fracture or failure of the fastener resulting from the occurrence of a crack will result in a catastrophic hazard, as defined in NSTS 1700.7.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 9 of 19

3.12 Lot. A collection of units or items manufactured from a homogeneous batch of material of the same continuous uninterrupted production.

3.13 Low-Released-Mass Fastener. A fastener that satisfies one of two conditions: (1) Total mass of the fastener or any other released part is less than 4 ounces or (2) Total mass supported by the fastener is not more than 14/x pounds, where x is the part's travel distance in feet to the aft bulkhead of the Space Shuttle cargo bay (reference NASA-STD-5003).

3.14 Low-Risk Fracture Fastener. A fastener that meets the criterion specified in NASA-STD-5003, paragraph 4.2.2.4.

3.15 Material Review Board. A formal board established for the purpose of reviewing, evaluating, and dispositioning of specific nonconforming supplies or services, and for assuring the implementation and accomplishment of corrective action to preclude recurrence.

3.16 MSFC Audited Vendor List. A list of suppliers approved to provide fasteners for MSFC programs/projects.

3.17 Project Fastener Inventory List. A Project-maintained list of fastener numbers purchased by the Project.

3.18 Quality-Sensitive Fastener. Any fastener or group of fasteners whose failure could result in a catastrophic hazard or affect the success of an MSFC mission. This term includes structural fasteners, fracture critical fasteners, low-risk fracture fasteners, safety critical fasteners, and fasteners performing a function related to mission success.

3.19 Safety-Critical Fastener. A fastener or group of fasteners whose failure to perform as designed or produce the intended results would pose a threat of serious personal injury or loss of life (reference NASA-STD-5001).

3.20 Structural Fastener. Fasteners that are 0.190" in diameter or larger and are contained within the primary load path for all subsystems, components, and other structures of a flight payload and/or fasteners of any diameter for which the program/project has determined that a margin of safety shall be calculated.

3.21 Supplier. A manufacturer or distributor.

3.22 Traceability. For the purposes of this document, this term refers to documentation that demonstrates a solid chain of possession from fastener manufacturer *through all intermediate distributors* to the buyer. Normally, traceability is demonstrated by a string of purchase orders from manufacturer and each distributor, which link the sale of a particular lot of fasteners identified with a unique manufacturer's lot number.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 10 of 19

4. GENERAL REQUIREMENTS

This section covers general requirements for fasteners governed by this standard.

4.1 Product Control. All fasteners used in space flight hardware shall be controlled from fastener manufacture through procurement, receiving inspection, storage, testing, and final assembly. MSFC fastener management and control practices for space flight hardware shall be in accordance with this document.

4.2 Vendors. Quality-sensitive fasteners shall be procured from audited and approved manufacturers and distributors. Quality-sensitive fasteners may be purchased from non-audited distributors or manufacturers if CVT testing (excluding fracture critical fasteners) is performed at MSFC.

4.3 Lot Testing. Quality-sensitive fasteners shall be purchased as single lots of fasteners that have been tested to a statistically significant level at the time of their manufacture, in order to verify that the lots meet the part number or its noted procurement specification requirements (e.g., chemical composition, minimum load-carrying capability, fatigue, macro/micro, etc.). The purchase of commingled lots is acceptable when traceability is provided for each lot within a commingled lot.

4.4 Traceability. Quality-sensitive fasteners shall have traceability from the manufacturer to controlled storage and shall be controlled into the build. Fasteners for which traceability has been compromised shall be dispositioned as nonconforming hardware. They may be used when they are dispositioned "for-use," as specified in paragraph 5.6, "Nonconformances."

4.5 Manufacturer's Test Report. MTR's shall be procured for all quality-sensitive fasteners.

4.6 Certificate of Compliance. COC's shall be obtained for all flight fasteners.

4.7 Inspections & Reviews. The acceptability of fasteners shall be determined by conducting receiving inspections and reviewing ADP's on the fasteners. Traceability records shall be maintained on all quality-sensitive fasteners. Separate lots of fasteners shall be identified by part number and lot number on the packaging containing the fasteners.

4.8 Storage. Fasteners shall be maintained in storage until they are issued for use. Commingling of lots of stored fasteners is prohibited, except for those purchased in that condition.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 11 of 19

5. DETAILED REQUIREMENTS

This section provides detailed requirements for fasteners governed by this standard.

5.1 Fastener Selection. Fasteners shall be controlled by specifications that include engineering, design, performance, and quality assurance requirements. Specifications for fasteners shall be under the configuration control of one of the following: National Aerospace Standards Committee, Society of Automotive Engineers Committee E-25, manufacturer specifications, NASA, other Federal Agencies and/or standards organizations, or the flight hardware contractor.

5.2 Supplier Selection. Quality-sensitive fasteners shall be procured from suppliers listed in the MSFC AVL maintained by QS01.

5.2.1 Manufacturers and distributors shall be placed on the AVL after verification by QS01 that they have been audited and approved by an MSFC Prime Contractor, an MSFC Major Subcontractor, MSFC personnel, or an MSFC delegated agency.

5.2.2 Maintenance of the AVL will be done by performing periodic audits and/or evaluating the manufacturer's performance. Periodic re-audits will be performed in accordance with paragraph 5.4, "Quality Assurance."

5.2.3 Removal from the AVL may be required if the supplier's performance deteriorates to an unacceptable level (e.g., consistent failure to provide acceptable products, to adhere to requirements imposed by purchase orders, or to maintain a QA plan that includes, as a minimum, the quality audit attributes specified in paragraph 5.4.1, "Quality Audits and Re-Audits of Fastener Manufacturers," as determined by re-audit).

5.3 Data Requirements. MPG 5000.1 provides policies and responsibilities for incorporation within procurement requests of all requirements for documentation and for all special requirements for delivery, storage, or testing of procured items, including items that require receiving inspections, as specified by the requesting organization.

5.3.1 Acceptance Data Package. A record of compliance to all of the ADP items listed shall be submitted to QA receiving inspection (QS01) simultaneously with the fasteners. The data package shall include, as applicable, but not be limited to the following items.

5.3.1.1 Requirements for quality-sensitive fasteners (including structural, fracture critical, low-risk fracture, and safety critical) include:

5.3.1.1.1 An ADP index

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 12 of 19

5.3.1.1.2 A COC, noting each lot of fasteners shipped. The lot number will be listed on each end item packing list and shipping document. The COC shall state: "The fasteners have been manufactured according to the requirements of the applicable standards and specifications, have been inspected and tested by an accredited laboratory and/or within the manufacturer's facility or laboratory, and an original laboratory testing report is on file with the manufacturer or under such custody that they are available for inspection."

5.3.1.1.3 Identification of manufacturer and manufacturer's lot number, as well as any subsequent modifying manufacturer and lot number.

5.3.1.1.4 Part number and procurement specification.

5.3.1.1.5 Quantity delivered.

5.3.1.1.6 Compliance to fastener procurement specification technical requirements, provided in the form of quantitative physical, chemical, or mechanical test results and inspection reports (raw data). As a minimum, MTR's shall contain the following information:

- a. All applicable specification numbers and revisions.
- b. Name of the company that performed the tests.
- c. Manufacturer's lot number for the fastener tested.
- d. Sample size and methods employed for sample size selection for each test.
- e. Clear identification of test results (including individual fastener failures) for acceptable lots.
- f. Documented notification of all nonconformances occurring at the manufacturer's facility relative to the fastener lot being tested.
- g. Special traceability for quality-sensitive fasteners, as follows:
 - (1) The original manufacturer will have lot traceability back through the manufacturing process to the raw material test certifications.
 - (2) Any subsequent modifying manufacturer will have lot traceability through the manufacturing processes performed and back to the original manufacturer.
 - (3) Any subsequent supplier shall have lot traceability back to the original manufacturer.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 13 of 19

5.3.2 Records Retention. Purchase orders shall specify that manufacturers retain all records associated with the procurement, manufacture, inspection, and testing of each lot of fasteners for a period of 5 years after final lot acceptance. These records shall be made available to MSFC personnel upon request.

5.3.3 Traceability. Traceability requirements for flight hardware programs/projects shall be in accordance with MPG 8040.3.

5.4 Quality Assurance.

5.4.1 Quality Audits & Re-Audits of Fastener Manufacturers.

5.4.1.1 All prospective fastener manufacturers will be audited by QS01 personnel or their representative agencies to the requirements of MWI 5330.1. Quality audit teams will consist of QA representatives and appropriate technical personnel (e.g., materials engineers, fastener engineers, etc.), as necessary.

5.4.1.2 Quality audits shall be conducted to verify that manufacturers implement acceptable QA systems and perform test and analyses in accordance with procurement specification requirements. Quality audit nonconformances and/or issues shall be resolved prior to procurement. Audits shall be performed using MWI 5330.1.

5.4.1.3 Distributors shall be audited to verify that they implement acceptable quality control systems.

5.4.2 Source Inspections. Source inspections will be conducted at the manufacturer's facility by QS01 personnel or their representative agencies, as required. The policy for delegation of source inspections is specified in QS01-QE-001. Frequency of source inspections will be based on contract performance. Source inspections shall satisfy the following requirements:

5.4.2.1 The dimensional integrity and overall acceptability of each lot of fasteners will be verified through a combination of dimensional inspections, witness of manufacturer inspection, surveillance of processes, and/or manufacturer data review.

5.4.2.2 Lots not in full compliance with specification requirements will either be documented in accordance with paragraph 5.6, "Nonconformances" or withdrawn from source release consideration by the fastener manufacturer.

5.4.3 QA Receiving Inspections. Fastener lots will be examined by QA receiving inspection (QS01) to verify compliance with procurement requirements, fastener specifications, and the ADP. External-type fastener lots received from suppliers not on the AVL may be used for redundant fastener applications, provided they are CVT-tested by ED30. Table I specifies the type and number of CVT tests required. Any lot of fasteners not meeting the fastener procurement and part number specification

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 14 of 19

requirements shall be dispositioned in accordance with paragraph 5.6, "Nonconformances." The project/program materials representative shall be consulted regarding all other fastener-type test requirements.

TABLE I. Certification Validation Test Requirements

Minimum Sample Sizes per Lot Size	Dimensional – System 22	Tensile Test	Macro/Micro Examination	Chemistry
1 - 100	5	2	2	1
101 - 500	10	3	3	2
501 and over	15	5	5	3

5.5 Inventory Control. Once accepted, fasteners shall be placed in controlled limited access storage, with strict lot separations (e.g., no commingling of lots allowed) and precise issuance and inventory controls maintained. Fasteners awaiting CVT results shall be held in controlled storage that will not allow their use until final acceptability is determined. Records shall be maintained to assure the control and traceability of stored fasteners. These records shall indicate whether a fastener is suitable for quality-sensitive applications and also indicate any other attributes that limit use (e.g., no MTR, supplier not audited). Storeroom operating procedures are specified in ASRI procedure WI-15-PC-02.

5.6 Nonconformances. The following requirements pertain to fasteners governed by this standard.

5.6.1 Hardware found to be nonconforming by the manufacturer at the manufacturer's facility shall be documented on the manufacturer's nonconformance form. Nonconforming material submitted to MSFC for acceptance shall be documented on MSFC Form 847, "Deviation/Waiver Approval Request," per processing instruction requirements for MSFC Form 847-3. Deviation approval request requirements shall be per MPG 8730.3. Hardware found to be nonconforming at QA receiving inspection (QS01) will be processed to the requirements of QS10-QA-001. Nonconforming hardware contractually accepted at QA receiving inspection shall be handled in accordance with MPG 8730.1 and shall be placed in an MRB crib until dispositioned.

5.6.2 Hardware implicated as being nonconforming or potentially nonconforming as indicated by GIDEP Alert, NASA Preliminary Alert, Office of the Inspector General Alert, etc. shall be handled in accordance with MPG 8730.3.

5.6.3. Fasteners received without MTR's which have a COC stating that MTR's are either on file or are available for inspection (as specified in paragraph 5.3.1.1.2) and lot traceability to the manufacturer (as specified in paragraph 5.3.1.1.6[g]) may be dispositioned for "use-as-is" in fail-safe applications, if accepted by the MRB in accordance with MPG 8730.3.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 15 of 19

5.6.4. Fasteners received without lot traceability to the manufacturer which have a general COC from the supplier stating that they meet the part number requirements may be dispositioned "for-use" in fail-safe applications using an engineering analysis (e.g., redundancy, high margins, de-rated mechanical properties, etc.), if accepted by the MRB in accordance with MPG 8730.3.

5.7 Databases. The following requirements pertain to fasteners governed by this standard.

5.7.1 A list of purchased fasteners shall be maintained at the project level.

5.7.2 A list of approved fastener manufacturers shall be maintained in the AVL.

5.8 Responsibilities. Organizational and functional responsibilities for requirements are as follows.

5.8.1 The MSFC Safety & Mission Assurance Office (QS01) shall:

5.8.1.1 Identify and disposition fastener nonconformances.

5.8.1.2 Provide QA and ADP requirements for purchase orders and contracts.

5.8.1.3 Coordinate and conduct/participate in source inspections and quality audits for all fastener manufacturers and distributors who will subsequently be placed on the AVL.

5.8.1.4 Provide audit data and certifications and maintain audit files for all fastener manufacturers audited by MSFC.

5.8.1.5 Conduct QA receiving inspections for fasteners.

5.8.1.6 Develop and maintain the AVL.

5.8.2 The MSFC Engineering Directorate (ED01) shall:

5.8.2.1 Participate in source inspections and audits of fastener manufacturers and distributors, as necessary.

5.8.2.2 Support MRB activities with expertise and testing, as required.

5.8.2.3 Provide fastener technical requirements for design drawings and specifications, as necessary.

5.8.2.4 Perform CVT testing on fasteners, as appropriate and necessary.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 16 of 19

5.8.3 MSFC Program/Project Managers shall:

5.8.3.1 Implement this standard on all programs, projects, and experiments, as applicable.

5.8.3.2 Approve and maintain records of all waivers to this plan and submit a summary of waivers and MRB's to the PSRP, if hardware is a NSTS payload.

5.8.3.3 Assure that contractor-implemented fastener plans meet the requirements of this plan.

5.8.3.4 Review independent organization information submittals and coordinate response to the PSRP, if hardware is a payload.

5.8.3.5 Provide sources for fasteners (e.g., bolts, nuts, nut-plates, inserts, etc.) on procurement requests. (See AVL.)

6. NOTES

6.1 Modifications or Changes. Recommendations for modifications or changes to the requirements specified herein shall be submitted in writing to ED30 for consideration.

6.2 Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 17 of 19

APPENDIX A

CONTRACTOR-SUPPLIED FASTENER MANAGEMENT & CONTROL REQUIREMENTS

A.1 MSFC contractors shall establish fastener management and control policy, responsibilities, and practices for space flight fasteners, as required.

A.2 Quality-sensitive fasteners used in space flight hardware shall be controlled from manufacture through procurement, receiving inspection, storage, testing, fabrication, and final assembly.

A.3 Quality-sensitive fasteners shall be procured from audited manufacturers and distributors. Intermediate distributors shall be audited, as well. Audits may be performed by the independent organization, MSFC, another NASA center, major aerospace corporation, or any independent auditing organization, provided the guidelines and attributes in paragraph 5.4.1, "Quality Audits and Re-Audits of Fastener Manufacturers" are used during the site audit. Quality-sensitive fasteners used in applications that produce redundant load paths may be purchased from non-audited distributors or manufacturers if CVT testing is performed.

A.4 Statistical testing shall be performed for quality-sensitive fasteners at the time of their manufacture to verify that the lot meets the part number and/or procurement specification requirements. Commingled lots are acceptable when complete traceability and MTR's (as required) are provided for each homogeneous lot within a commingled lot.

A.5 Testing is not required for quality-sensitive fasteners fabricated by the user out of certified raw material stock if no modification is made to the material that could reasonably affect mechanical properties (e.g., heat treating or forging).

A.6 All quality-sensitive fasteners shall have traceability from the manufacturer into controlled storage. The flight hardware build process shall be controlled to ensure that only proper fasteners are installed. Fasteners received without lot traceability to the manufacturer that have a COC from the supplier stating that the fasteners meet the part number requirements may be dispositioned "for-use" in fail-safe applications using an engineering analysis (e.g., redundancy, high margins, de-rated mechanical properties, etc.), if accepted by the MRB.

A.7 MTR's shall be obtained for all quality-sensitive fasteners.

A.8 COC's shall be obtained for all flight fasteners.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 18 of 19

APPENDIX A

A.9 Acceptability of fasteners shall be determined through receiving inspections, reviews of ADP's on the fasteners, and, when required, CVT testing of fasteners.

A.10 Quality-sensitive fasteners shall be maintained in controlled storage until issued for use. Commingling of lots of stored fasteners is prohibited, except for those received in that condition.

A.11 Traceability records shall be maintained on all quality-sensitive fasteners.

Multiprogram/Project Common-Use Document ED33		
Title: MSFC Fastener Management & Control Practices	Document No.: MSFC-STD-2594	Revision: C
	Effective Date: 05/01/02	Page 19 of 19

APPENDIX B

FASTENER MANAGEMENT & CONTROL REQUIREMENTS FOR INDEPENDENT ORGANIZATIONS

B.1 Independent organizations shall establish fastener management and control policy, responsibilities, and practices for all space flight fasteners, as required.

B.2 Quality-sensitive fasteners used in space flight hardware shall be controlled from procurement through fabrication, receiving inspection, storage, testing, and final assembly.

B.3 Quality-sensitive fasteners shall be procured from audited manufacturers and distributors. Intermediate distributors shall be audited, as well. Audits may be performed by the independent organization, MSFC, another NASA center, major aerospace corporation, or any independent auditing organization, provided the guidelines and attributes in paragraph 5.4.1, "Quality Audits and Re-Audits of Fastener Manufacturers" are used during the site audit. Quality-sensitive fasteners used in applications that provide redundant load paths may be purchased from non-audited distributors or manufacturers if CVT testing is performed.

B.4 Statistical testing shall be performed for quality-sensitive fasteners at the time of their manufacture to verify that the lot meets the part number and/or procurement specification requirements. Commingled lots are acceptable when complete traceability and MTR's (as required) are provided for each homogeneous lot within a commingled lot.

B.5 Testing is not required for quality-sensitive fasteners fabricated by the user out of certified raw material stock if no modification is made to the material that could reasonably affect mechanical properties (e.g., heat treating or forging).

B.6 All quality-sensitive fasteners shall have traceability from the manufacturer into controlled storage. The flight hardware build process shall be controlled to ensure that only proper fasteners are installed.

B.7 MTR's and COC's shall be obtained for all quality-sensitive fasteners.

B.8 COC's shall be obtained for all flight fasteners.

FILE NO. MSFC-STD-2594

203 -

DR060PRO

PACKAGE NO. 10443R

DOCUMENTATION RELEASE LIST
GEORGE C. MARSHALL SPACE FLIGHT CENTERMSFC CODE IDENT 14981/339B2
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PAGE 1

C H	DOCUMENT NUMBER	DRL DRL DSH REV	TITLE	CCBD NO.	PCN	PC	EFFECTIVITY
*	MSFC-STD-2594	203 -	MSFC THREADED FASTENER MGMT AND CONTROL PRACTICES	000-00-0000	0000000	ZA	NONE
CHG NO.	CHG REV	CHG NOTICE	RESPONSIBLE ENGINEER	RESPONSIBLE ORGANIZATION	ACTION DATE	DESCRIPTION	
1	A	DCN000	W. R. GAMWELL	EH23	06/24/97	REV. 'A' SUPERSEDES BASELINE DOCUMENT IN ITS ENTIRETY.	
*	2	A	DCN000	EUGENA GOGGANS	EO03	02/22/07	DOCUMENT RELEASED THRU PDS. NO LONGER TRACKED IN ICMS.

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DOCUMENTATION PACKAGE/ROUTING REPORT

02/22/07 DR120PRO PAGE 1

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PROGRAM/PROJECT: MULTI

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NOMENCLATURE: MSFC-STD- GOING TO NONE EFFECTIVITY

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DWG SIZE	DRAWING NUMBER	DWG REV	EPL/DRL/DDS NUMBER	DWG REV	EPL DSH	EPL REV	EO DASH NUMBER	EO REV	PART NUMBER
			MSFC-HDBK-1453		202	-			
			MSFC-HDBK-1674		202	-			
			MSFC-HDBK-2221		203	-			
			MSFC-HDBK-505		202	-			
			MSFC-HDBK-670		202	-			
			MSFC-MNL-1951		209	-			
			MSFC-PROC-1301		202	-			
			MSFC-PROC-1721		202	-			
			MSFC-PROC-1831		202	-			
			MSFC-PROC-1832		202	-			
			MSFC-PROC-404		202	-			
			MSFC-PROC-547		202	-			
			MSFC-QPL-1918		204	-			
			MSFC-RQMT-1282		202	-			
			MSFC-SPEC-1198		202	-			
			MSFC-SPEC-1238		202	-			
			MSFC-SPEC-1443		202	-			
			MSFC-SPEC-164		202	-			
			MSFC-SPEC-1870		202	-			
			MSFC-SPEC-1918		203	-			
			MSFC-SPEC-1919		206	-			
			MSFC-SPEC-2083		202	-			
			MSFC-SPEC-2223		202	-			
			MSFC-SPEC-2489		206	-			
			MSFC-SPEC-2490		205	-			
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			MSFC-SPEC-2492		203	-			
			MSFC-SPEC-2497		211	-			
			MSFC-SPEC-250		202	-			
			MSFC-SPEC-445		202	-			
			MSFC-SPEC-504		202	-			
			MSFC-SPEC-521		202	-			
			MSFC-SPEC-548		202	-			
			MSFC-SPEC-560		202	-			
			MSFC-SPEC-626		202	-			
			MSFC-SPEC-684		202	-			
			MSFC-SPEC-708		202	-			
			MSFC-SPEC-766		202	-			
			MSFC-STD-1249		202	-			
			MSFC-STD-1800		202	-			
			MSFC-STD-246		202	-			
			MSFC-STD-2594		203	-			

DOCUMENTATION PACKAGE/ROUTING REPORT

02/22/07 DR120PR0 PAGE 2

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DWG SIZE	DRAWING NUMBER	DWG REV	EPL/DRL/DDS NUMBER	DWG REV	EPL DSH	EPL REV	EO DASH NUMBER	EO REV	PART NUMBER
			MSFC-STD-2903		202	-			
			MSFC-STD-2904		202	-			
			MSFC-STD-2905		202	-			
			MSFC-STD-2906		202	-			
			MSFC-STD-2907		202	-			
			MSFC-STD-366		202	-			
			MSFC-STD-383		202	-			
			MSFC-STD-486		202	-			
			MSFC-STD-506		203	-			
			MSFC-STD-531		202	-			
			MSFC-STD-557		202	-			
			MSFC-STD-561		203	-			
			MSFC-STD-781		202	-			

SUBMITTED BY ENGINEERING AREA:	BASIC	CHANGE	PARTIAL	COMPLETE	CLOSES	ACTION
EO03		X		X	EO03	

PREPARED BY:
EUGENA GOGGANS
12/19/06

SUBMITTED BY:

CONCURRENCE:

TRANSMITTAL DATES
TO RELEASE DESK 02/22/07 10:00
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MSFC DOCUMENTATION REPOSITORY - DOCUMENT INPUT RECORD

I. GENERAL INFORMATION

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II. ENGINEERING DRAWINGS

20. REVISION:	21. ENGINEERING ORDER:	22. PARTS LIST:	23. CCBD:
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III. REPORTS, SPECIFICATIONS, ETC.

24. REVISION: C	25. CHANGE:	26. VOLUME:	27. BOOK:	28. PART:	29. SECTION:
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IV. EXPORT AND DISTRIBUTION RESTRICTIONS

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40. NAME: Clyde S. Jones	41. SIGNATURE: <i>Clyde S. Jones</i>	42. ORG. CODE: ED33	43. PHONE NUMBER: (256) 544-2701	44. DATE: 05/01/2002
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