



Langley Research Center
Directives Management
Transmittal Sheet

March 26, 2010

Material Transmitted

Review request

LAPD 5330.3, Langley Research Center (LaRC) Standards for the Acquisition of Threaded Fasteners (Bolts)

Summary

This directive is undergoing periodic review per CP/CID 1410.2, Langley Management System Document Control.

The material has been reviewed by the owning organization, SMAO, with the following outcome(s):

Significant additions were made; review as a new LAPD.

- 1. Policy revisions were made to the Non-spaceflight and Spaceflight Hardware Applications.*
 - 2. The following policy subjects were added: Fastener Selection, Approved Manufactures and Distributors, Manufacture's Test Report, Certificate of Conformance, Traceability, Complete Traceability, Partial Traceability, Audits and Storage, Fasteners Critical for Mission Success, Fasteners in Commercial-Off-The-Shelf Hardware, and Specialized Fasteners.*
 - 3. Formatting changes were made.*
 - 4. Definitions were added.*
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Proposed Modification

LANGLEY

Directive: LAPD 5330.3

POLICY

Effective Date: _____

DIRECTIVE

Expiration Date: _____

Responsible Office: Safety and Mission Assurance Office

SUBJECT: Langley Research Center (LaRC) Standards for the Acquisition or Use of Threaded Fasteners

P.1 POLICY

P.1.1 This directive sets for policy, definitions and responsibilities for the acquisition or use of threaded fasteners to be used at Langley Research Center (LaRC). Requirements for receipt inspection of safety critical fasteners are found in LAPD 4520.1, "Langley Research Center (LaRC) Requirements for Safety-Critical Product Testing," and LMS-CP-4520.6, "Receipt Inspection for Fastener, Insert and Nut Products."

P.1.2 Non-spaceflight hardware applications: All fasteners, such as threaded bolts/nuts/inserts/washers/rivets/shear-pins/set-screws/retention-devices, procured (via purchase request, credit card, stock, excess, contractor, or other) for non-spaceflight, safety-critical applications (construction, modifications of facilities, flight and/or model hardware, and/or wind tunnels) at Langley Research Center shall be high strength alloy steel threaded fasteners. Requirements for receipt inspection of safety critical fasteners are found in LAPD 4520.1, "Langley Research Center (LaRC) Requirements for Safety-Critical Product Testing," and LMS-CP-4520.6, "Receipt Inspection for Fastener, Insert and Nut Products."

a. All high-strength fasteners procured for use at LaRC for non-spaceflight safety-critical applications may be subject to the provisions of Public Law 101-592 (as amended), Fastener Quality Act, and shall:

- (1) Include manufacturer's registered trademark, and any style names or other identification.
- (2) Include within the packaging the manufacturer's traceability documentation of item identification and lot integrity.
- (3) Be packaged in containers that are coded for identification of the lot to enable traceability of certification and test reports back to the heat treatment of the steel.
- (4) Be packaged to ensure no co-mingling of lots.

P.1.3 Spaceflight hardware applications: All fasteners such as threaded bolts/nuts/inserts/ washers/rivets/shear-pins/set-screws/retention-devices procured (via purchase request, credit card, stock, excess, contractor, or other) for

Verify the correct revision before use by checking the LMS Web site.

spaceflight hardware applications, including Government Furnished Equipment (GFE) or payloads that are flown on spaceflight vehicles, shall be selected based on the criteria set-forth in NASA-STD-6008, “NASA Fastener Procurement, Receiving Inspection, and Storage Practices for Spaceflight Hardware,” and additionally, may be subject to the provisions of Public Law 101-592.

Requirements for receipt inspection of safety critical fasteners are found in LAPD 4520.1, “Langley Research Center (LaRC) Requirements for Safety-Critical Product Testing,” and LMS-CP 4520.6, “Receipt Inspection for Fastener, Insert and Nut Products.”

a. Fastener Selection

- (1) All fasteners used on spaceflight hardware shall be selected so that they are controlled by government or industry specifications that include design, performance, and quality assurance requirements.
- (2) An appropriate LaRC engineering organization shall classify the use of each fastener and fastener-related product based upon engineering analysis techniques. These classifications include, but are not limited to, Fracture Critical, Low-Risk Fracture, Fail Safe, Low Released Mass, and Contained fastener. See LMS-CP-4520.6 or NASA-STD-6008 for definitions of these fastener types.
- (3) Metallic fastener materials shall be selected from tables IA-E of MSFC STD-3029, “Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments,” which lists alloys that exhibit a high resistance to stress corrosion cracking.
- (4) Use of other (non-table I) metallic materials shall require documentation of acceptance rationale in a Material Usage Agreement (MUA) that is approved by the responsible LaRC engineering organization.

b. Approved Manufacturers and Distributors

- (1) Fracture-critical fasteners, low-risk fasteners, and nuts and inserts (see NASA STD-6008 for definitions of these fastener types) used with such fasteners shall be obtained from manufacturers and distributors who have been approved by an on-site quality or product audit conducted by the procuring organization (see section 4.7 of NASA-STD-6008, “NASA Fastener Procurement, Receiving Inspection, and Storage Practices for Spaceflight Hardware”).
- (2) NASA Centers, developers, and prime contractors that do not audit their manufacturers and distributors shall be permitted to procure fasteners from a list of NASA-approved vendors that have been audited according to paragraph 1.b. (2) (a) and section 4.7 of NASA-STD-6008.

- (a) Distributors or vendors that are on a list that has been audited and approved by any of the NASA prime contractors are also acceptable.
 - (b) Fastener types that are not listed in paragraph 1.b.(2)(a) may be procured from non-audited distributors or manufacturers, provided the screening requirement in table 1 of NASA-STD-6008 and the certification validation test (CVT) requirements specified in table 2 of NASA-STD-6008 are performed.
 - (3) All fasteners shall be procured in lots.
 - (4) A single lot of fasteners shall not include fasteners that have traceability to different material batches/lots.
 - (a) The policy for traceability requirements is discussed in paragraph 1.b.(5) below and section 4.6 of NASA-STD-6008
 - (5) All fastener lots shall be packaged in containers that are coded for identification of the lot to enable traceability of certification and test reports back to the heat treatment of the steel.
- c. Manufacturer's Test Report (MTR)**
- (1) An MTR shall be obtained for each fracture-critical, low-risk, and fail safe fastener purchased.
 - (2) In addition, all rivets, shear pins, inserts, and retention devices (such as cotter pins, hitch pins, safety wires, and ties) shall have MTR documentation.
- d. Certificate of Conformance (COC).**
- (1) A COC to the applicable fastener specification is required for every fastener lot and shall be obtained from the manufacturer or distributor selling the fasteners.
 - (2) A COC shall be obtained for all types of fastener hardware referenced in NASA-STD-6008, table 1, such as fracture-critical, low-risk fracture, fail safe, low-released mass and contained devices.
- e. Traceability:**
- (1) Either complete or partial traceability shall be maintained for all spaceflight fasteners.
 - (2) Traceability documentation shall be maintained for all spaceflight hardware, as specified by the appropriate program/project requirement documents.

- (3) Complete traceability shall be required for all fracture-critical fasteners and all inserts and nuts that are used with fracture-critical fasteners.
- (4) Complete traceability documentation includes the entire chain of custody and all of the following stipulations:
 - (a) The original manufacturer shall have lot traceability back through the manufacturing process to the raw material test certifications.
 - (b) Any subsequent manufacturer that modifies a given fastener shall have lot traceability to the manufacturing process performed and back through to the original manufacturer.
- (5) Partial Traceability can be utilized in some cases when complete traceability cannot be achieved.
- (6) Partial traceability shall be acceptable for all non-fracture critical fasteners, including low-risk and fail safe fasteners, provided that lot Certification Validation Testing (CVT) is performed for verification according to section 4.11.2 of NASA-STD-6008.

f. Audits and Storage

- (1) Audits shall be used to verify that a company's processes and products meet the requirements of applicable specifications in accordance with NPD 8730.5, "NASA Quality Assurance Program Policy."
 - (a) Audit approval is limited to the audited location and its product and not to affiliated companies or dissimilar products.
- (2) The supplier shall be audited, approved, and maintained based on the NASA Center's supplier approval and surveillance process for a maximum of 3 years before being re-audited.
 - (a) A given NASA Center may utilize the audits and approved vendor lists from any other NASA Center or from any NASA prime contractor. Once NASA has approved the audit results, the manufacturer shall be placed on the approved vendor list.
- (3) Fasteners shall be maintained in storage according to program requirements until issued for use.
 - (a) Utilization of a storage system where fasteners or inserts from two or more different lots are commingled (co-located or stored in the same bin or other holding container) shall be expressly prohibited.

g. Fasteners Critical for Mission Success

- (1) If the Technical Authority determines that a fastener is critical for mission success, they may impose on it the same traceability and receiving inspection requirements as a fracture-critical fastener, even when the actual fracture classification is of a less critical nature.

h. Fasteners in Commercial-Off-The-Shelf (COTS) Hardware

- (1) Fracture-critical, low-risk, and fail safe fasteners used in COTS hardware shall meet the traceability requirements of this directive.

i. Specialized Fasteners

- (1) Appropriate material, design, processing, and screening requirements, shall be developed for specialized fasteners on a case-by-case basis by the responsible engineering organization.
- (2) These requirements shall be approved by the governing Technical Authority and placed in the program/project requirements document(s).
- (3) Non-metallic fasteners shall be considered specialized fasteners.

P.2 APPLICABILITY

This LAPD is applicable to all LaRC employees and contractors engaged in the acquisition and use of threaded fasteners at LaRC.

P.3 AUTHORITY

None

P.4 APPLICABLE DOCUMENTS

- a. LAPD 4520.1, “Langley Research Center (LaRC) Requirements for Safety-Critical Product Testing.”
- b. LMS-CP-4520.6, “Receipt Inspection for Fastener, Insert and Nut Products.”
- c. NASA-STD-6008, “NASA Fastener Procurement, Receiving Inspection, and Storage Practices for Spaceflight Hardware.”
- d. MSFC-STD-3029, “Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments.”
- e. NPD 8730.5, “NASA Quality Assurance Program Policy.”

P.5 RESPONSIBILITY

P.5.1 Acquiring Organization

- (a) The organization acquiring the fasteners is responsible for ensuring that fasteners obtained (via procurement, credit card, stock, excess, contractor, or other) comply with this Policy. This includes organizations initially buying and using the fasteners, or any organization that gains possession of the fasteners at a later date.
- (b) Each acquiring organization is responsible for maintaining the evidence that fasteners in their possession comply with this Policy.

P.6 DELEGATION OF AUTHORITY

None

P.7 MEASUREMENT/VERIFICATION

Evidence consists of affirmative test documentation.

P.8 CANCELLATION

LAPD 5330.3, dated August 3, 2004

Deputy Director
Stephen G. Jurczyk

Distribution:

Approved for public release via the Langley Management System; distribution is unlimited.

**ATTACHMENT A
DEFINITIONS**

- A.1 Certificate of Conformance (COC)** - a document that is signed by the fastener supplier to affirm that the product has met the requirements of the relevant specifications(s), contract(s), and any other applicable regulations. It attests that the fasteners are of the quality specified in the acceptance document and conform in all respects with contractual requirements, including specifications, drawings, preservation, packaging, packing, marking requirements, applicable heat/lot number, and physical item identification part number.
- A.2 Complete Traceability** - documentation that demonstrates a solid chain of custody from the original fastener manufacturer through all intermediate distributors down to the buyer. Normally, it consists of a string of purchase orders from the original manufacturer down through each distributor or vendor, linking the sale of a particular lot of fasteners with a unique fastener manufacturer's lot number.
- A.3 Fastener** – a screw, nut, bolt, or stud having internal or external threads, or a load-indicating washer.
- A.4 Grade identification marking** – any symbol appearing on a fastener purporting to indicate the fastener's base material, strength or properties.
- A.5 High strength fastener** – a screw, nut, bolt, or stud having internal or external threads which bears a grade identification marking required by a standard or specification, or performance capabilities that conform to a specific standard of a consensus standards organization or government agency (i.e., American Society of Testing Materials (ASTM), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), Military Standards (MS), National Aerospace Standards (NAS).
- A.6 Manufacturer's Test Report (MTR)** - a document that is produced by the fastener manufacturer to certify information required by the applicable fastener specification. The information typically includes fastener lot number, manufacturing date, lot quantity, raw material heat number, chemical composition, and mechanical and metallurgical test results.
- A.7 Partial Traceability** - documentation from a supplier or vendor that does not necessarily include the full chain of custody back to the original fastener manufacturer.
- A.8 Traceability** - the concept that a buyer can trace the history of a given lot of fasteners back through any number of distributors or vendors to the original manufacturer(s).
- A.9 Washer** – a high-strength fastener if it is subject to a standard or specification applicable to a screw, nut, bolt, or stud as defined in this attachment under A.5.

**ATTACHMENT B
EXCEPTIONS TO POLICY**

B.1 Non-Safety-Critical Application Fasteners

- a. Wood screws, sheet metal screws, lag bolts, stove bolts, or screws made of brass or aluminum, shall not to be used in safety-critical applications.

B.2 Special Specification Fasteners

- a. Fasteners designed and fabricated in accordance with special specifications shall not be subject to this Policy, but do require receipt inspection services in accordance with Center Policy.
- b. Special fastener specifications shall be:
 - (1) Described in the specification document (drawings, procurement specifications, Statement of Work, or other area of the solicitation).
 - (2) Approved, in the specification document, in writing, by a governing Technical Authority, such as a standard practice engineer, model system engineer, facility safety head, or a line manager who is cognizant of the application.
 - (3) Any threaded fasteners used under this exception shall be clearly marked as to their strength, grade, and manufacturer identification.
 - (4) Non-metallic fasteners shall be considered specialized fasteners.