MIL-R-24243B
21 September 1987
SUPERSEDING
MIL-R-24243A(SHIPS)
3 June 1968

MILITARY SPECIFICATION

RIVETS, BLIND, NONSTRUCTURAL, RETAINED MANDREL

GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for pull-stem expandable blind rivets. Each rivet consists of a body assembled on a mandrel for fastening where access is available to one side only.

1.2 Classification. Rivets shall be furnished in the head styles, material combinations, and open or closed-end, as specified in the applicable specification sheet (see 3.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

QQ-A-200/13 - Aluminum Alloy 7178, Bar, Rod, Shapes, Tube and Wire, Extruded, 7178

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD) Code 93, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5320

FEDERAL

QQ-A-430	-	Aluminum Alloy Rod and Wire; For Rivets and Cold Heading
QQ-N-281	-	Nickel-Copper Alloy Bar, Plate, Rod, Sheet, Strip, Wire, Forgings and Structural and Special Shaped Sections
QQ-P-35	-	Passivation Treatments for Austenitic, Ferritic and Martensitic Corrosion Resistant Steel (Fastening Devices)
QQ-P-416	-	Plating, Cadmium (Electrodeposited)
QQ-W-428	-	Wire, Steel, Carbon, (High Carbon, Round, for Mechanical Springs General Purpose)
PPP-H-1581	-	Hardware (Fasteners and Related Items), Packaging of

MILITARY

MIL-C-5541	-	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-A-8625	-	Anodic Coatings, for Aluminum and Aluminum Alloys
DOD-P-16232	-	Phosphate Coatings, Heavy, Manganese or Zinc Base (For Ferrous Metals)

(See Supplement 1 for list of associated specifications)

STANDARDS

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-1312	-	Fasteners, Test Methods

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

ASTM

ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
ASTM A313 - Wire, Spring, Chromium, Nickel Stainless and Heat Resisting Steel
ASTM A493 - Stainless and Heat-Resisting Steel for Cold Heading and Cold Foring-Bar and Wire
ASTM A545 - Steel Wire, Carbon, Cold-Heading Quality, for Machine Screws
ASTM A580 - Wire, Steel, Stainless and Heat Resisting
ASTM B633 - Electrodeposited Coatings of Zinc on Iron and Steel

(Application for copies should be addressed to the ASTM, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern.

3.2 Materials. The materials used shall be such as to produce bodies and mandrels in compliance with the requirements of this specification and as specified in the applicable specification sheet and Table I.

3.2.1 Aluminum alloys.

3.2.1.1 Type 1100 (UNS A91100), 5052 (UNS A95052), and 5056 (UNS A95056) aluminum alloys shall conform to the applicable requirements of QQ-A-430.

3.2.1.2 Type 7178 (UNS A97178) aluminum alloy shall conform to the applicable requirements of QQ-A-200/13.

3.2.2 Carbon steel. Carbon steel shall be of the grade required by the applicable specification sheet.

3.2.3 Carbon steel wire. Carbon steel wire employed in the fabrication of mandrels shall conform to the requirements of ASTM A545 or QQ-W-428 (at the supplier's option) as necessary to install rivet bodies to meet the applicable strength requirements of Table I.

3.2.4 Nickel-copper alloy. Nickel-copper alloy bodies shall be in accordance with Class A of QQ-N-281.

3.2.5 Corrosion resistant steel. Corrosion resistant steel employed in the manufacture of bodies and mandrels shall be of the type specified in the applicable specification sheet and in accordance with ASTM A493, ASTM A167, ASTM 4580 or ASTM A313 at the supplier's option.

TABLE I. MATERIAL COMBINATIONS

SYMBOL	MATERIAL	RIVET DIA	MINIMUM SHEAR LOAD LBS	MINIMUM TENSION LOAD LBS
MIL-R-24243/1 (Open-End, Domed Head)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1006-C1025 Steel (UNS G10060-G10250)	.094 .125 .156 .188 .250	90 170 260 380 700	120 220 350 500 920
B	Body: 5052 Al Alloy (UNS A95052) Mandrel: 7178 Al Alloy (UNS A97178)	.094 .125 .156 .188	70 120 190 260	80 150 230 320
D	Body: C1006-C1010 Steel (UNS G10060-G10100) Mandrel: C1030-C1060 Steel (UNS G10300-G10600)	.094 .125 .156 .188 .250	130 260 370 540 1000	170 310 470 680 1240
F	Body: 305 CRES (UNS 530500) Mandrel: 305-431 CRES (UNS S30500-543100)	.125 .156 .188	420 650 950	530 820 1200
G	Body: 305 CRES (UNS S530500) Mandrel: C1040-C1060 Steel (UNS G10400-G10600)	.125 .156 .188	420 650 950	530 820 1240

TABLE I. MATERIAL COMBINATIONS - CONTINUED

SYMBOL	MATERIAL	RIVET DIA	MINIMUM SHEAR LOAD LBS	MINIMUM TENSION LOAD LBS
MIL-R-24243/2 (Open-End, Domed Head)				
E	Body: Nickel Copper Alloy (UNS N04400) Mandrel: C1030-C1060 Steel (UNS G10300-G10600)	.125 .156 .188 .250	350 550 800 1400	450 700 1000 1850
MIL-R-24243/3 (Open-End, Large Domed Head)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1006-C1025 Steel (UNS G10060-G10250)	.125 .188	170 380	220 500
B	Body: 5052 Al Alloy (UNS A95052) Mandrel: 7178 Al Alloy (UNS A97178)	.125 .188	120 260	150 320
D	Body: C1006-C1010 Steel (UNS G10060-G10100) Mandrel: C1030-C1060 Steel (UNS G10300-G10160)	.125	260	310
MIL-R-24243/4 (Open-End, 100° Countersunk Head)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1006-C1025 Steel (UNS G10060-G10250)	.125	170	220
B	Body: 5052 Al Alloy (UNS A95052) Mandrel: 7178 Al Alloy (UNS A97178)	.125	120	150
MIL-R-24243/5 (Open-End, 120° Countersunk Head)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1006-C1025 Steel (UNS G10060-G10250)	.125 .156 .188	170 260 380	220 350 500
B	Body: 5052 Al Alloy (UNS A95052) Mandrel: 7178 Al Alloy (UNS A97178)	.094 .125 .156 .188	70 120 190 260	80 150 230 320

TABLE I. MATERIAL COMBINATIONS - CONTINUED

SYMBOL	MATERIAL	RIVET DIA	MINIMUM SHEAR LOAD LBS	MINIMUM TENSION LOAD LBS
MIL-R-24243/5 (Open-End, 120° Countersunk Head)- Continued				
D	Body: C1006-C1010 Steel (UNS G10060-G10100) Mandrel: C1030-C1060 Steel	.125 .156 .188	260 370 540	310 470 680
E	Body: Nickel-Copper Alloy (UNS N04400) Mandrel: C1030-C1060 Steel (UNS G10300-G10600)	.125 .156 .188	350 550 800	450 700 1000
MIL-R-24243/6 (Closed-End, Domed Head, Hollow Core)				
A	Body: 5056 Al. Alloy (UNS A95056) Mandrel: C-1012-C-1025 C-1045-C-1075 Steel (UNS C10120-C10250) (UNS G10450-G10750)	.125 .156 .188	255 383 460	335 525 680
C	Body: 1100 Al. Alloy (UNS A91100) Mandrel: 7178 Al. Alloy (UNS A97178)	.125 .156 .188	95 120 145	150 155 265
MIL-R-24243/6 (Closed-End, Domed Head, Filled Core)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1012-C1025 C1045-C1075 Steel (UNS G10120-G10250) (UNS G10450-G10750)	.125 .156 .188	320 590 790	335 525 680
MIL-R-24243/7 (Closed-End, 120° Countersunk Head, Hollow Core)				
A	Body: 5056 Al Alloy (UNS A95056) Mandrel: C1012-C1025 C1045-C1075 Steel (UNS G10120-G10250) (UNS G10450-G10750)	.125 .156 .188	255 385 460	335 525 680

TABLE I. MATERIAL COMBINATIONS - CONTINUED

SYMBOL	MATERIAL	RIVET DIA	MINIMUM SHEAR LOAD LBS	MINIMUM TENSION LOAD LBS
MIL-R-24243/7 (Closed-End, 120° Countersunk Head, Filled Core)				
A	Body: 5056 Al Alloy (UNS A95056)	.125	320	335
	Mandrel: C1012-C1025	.156	590	525
	C1045-C1075 Steel (UNS G10120-G10250) (UNS G10450-G10750)	.188	790	680
MIL-R-24243/8 (Open-End, Snap Head)				
A	Body: 5052 Al Alloy (UNS A95052)	.125	210	250
	Mandrel: C1016-C1025 Steel (UNS G10160-G10250)	.156	305	420
		.188	415	590
MIL-R-24243/9 (Open-End, 120° Countersunk Head)				
A	Body: 5052 Al Alloy (UNS A95052)	.125	210	250
	Mandrel: C1016-C1025 Steel (UNS G10160-G10250)	.156	305	420
		.188	415	590
MIL-R-24243/10 (Open-End, Domed Head)				
A	Body: 5052 Al Alloy (UNS A95052)	.125	210	250
	Mandrel: C1016-C1025 Steel (UNS G10160-G10250)	.156	305	420
		.188	415	590

3.3 Surface finish.

3.3.1 Aluminum alloy rivets. Aluminum alloy rivets shall be furnished chemically treated in accordance with MIL-C-5541, or anodically treated in accordance with MIL-A-8625, at the supplier's option.

3.3.2 Carbon steel bodies and mandrels. Carbon steel bodies and mandrels shall be zinc plated in accordance with ASTM B633 Type II, FE/ZN5, cadmium plated in accordance with QQ-P-416 Type II, Class 2, or phosphate coated in accordance with Type Z, Class 2 or 4B of DOD-P-16232, as specified (see 3.1).

3.3.3 Nickel-copper alloy bodies. Nickel-copper alloy bodies shall be zinc plated in accordance with ASTM B633 Type II, FE/ZN5.

3.3.4 Corrosion resistant steel bodies and mandrels shall be passivated in accordance with QQ-P-35, Type I, II or III.

3.4 Construction. Fastener assembly shall be as specified in the applicable specification sheet.

3.4.1 Rivets shall consist of two parts, a body and a mandrel assembled in combination as specified on the applicable specification sheet (see 6.2).

3.4.2 Rivet bodies shall be capable of being expanded mechanically by the action of the mandrel when pulled into the rivet body as shown on Figure 1.

3.4.3 Dimensions shall be as specified in the applicable specification sheet.

3.4.4 Strength. Single shear and tension load capabilities of rivets installed shall not be less than specified in Table I.

3.5 Workmanship. Rivet shall be of uniform quality and free from injurious seams and other injurious defects.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Quality conformance inspection. Quality conformance inspections shall be as specified in Table II.

TABLE II. QUALITY CONFORMANCE INSPECTION

INSPECTION	REQUIREMENT PARAGRAPH	EXAMINATION OR TEST PARAGRAPH
Dimensions	3.4.3	4.2.3
Protective Surface	3.3	4.3.3
Surface Treatment	3.3.4	4.3.4
Single Shear	3.4.4	4.3.1.1
Tension	3.4.4	4.3.1.2

4.2.1 Inspection lot. An inspection lot shall consist of rivet body and mandrel assemblies of the same material, finish and nominal size produced by the same manufacturer under essentially the same conditions and submitted for acceptance at one time.

4.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for inspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separated from new lots, and shall be clearly identified as reinspected lots.

4.2.3 Sampling for visual & dimensional examination. A random sample of body and mandrel assemblies shall be taken from each lot in accordance with MIL-STD-105 Inspection Level I. The Acceptable Quality Level (AQL) shall be indicated in Table III.

4.2.4 Sample for shear strength and tension loads. Sampling for strength and tension loads shall be in accordance with MIL-STD-105 at Inspection Level S-3.

4.3 Methods of inspection.

4.3.1 Mechanical properties. Sample assemblies selected in accordance with 4.2.4 shall be tested as specified in 4.3.1.1 and 4.3.1.2 to assure compliance with Table I of this specification.

4.3.1.1 Single shear load. The shear test shall be performed in accordance with Test No. 20 of MIL-STD-1312.

4.3.1.2 Tension load. The tension test shall be performed in accordance with Test No. 8 of MIL-STD-1312.

4.3.2 Visual and dimensional examination. Samples of rivets shall be examined to verify conformance with this specification. Examination shall be conducted in accordance with Table III.

TABLE III. CLASSIFICATION OF DEFECTS

CATEGORY	DEFECT	INSPECTION METHOD
Critical	None defined	
Major	AQL 1.5% defective	
101	Diameter of rivet body (3.5)	CIE 1/
Minor	AQL 4.0% defective	
201	Diameter of rivet head (3.4)	CIE
202	Length of rivet body	CIE
203	Thickness of rivet body head (3.4)	CIE
204	Diameter of mandrel (3.4)	CIE
205	Radius under head (where applicble) (3.4)	CIE
206	Length of mandrel (3.4)	CIE
207	Angle of rivet head (where applicble) (3.4)	CIE
208	Protective finish and surface treatment missng or incomplete (as applicable) (3.3)	Visual
209	Workmanship (3.5)	Visual

1/ Commercial Inspection Equipment

4.3.3 Protective finish. Samples of aluminum alloy, cabon steel and nickel-copper bodies and/or mandrels, shall be inspected for adequacy of protective finish in accordance with the applicable specification of 3.3.

4.3.4 Surface treatment. Samples of corrosion resistant steel bodies and mandrels, shall be passivated as specified in 3.3.4.

4.3.5 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials used in fabricating the body and mandrel assemblies are in accordance with the requirements of 3.2, prior to such fabrication.

4.3.6 Inspection of packaging. The sampling and inspection of the preservation, packing, and container marking shall be in accordance with the requirements of PPP-H-1581.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with PPP-H-1581 (see 6.2).

6. NOTES

6.1 Intended use. Rivets required by this specification are intended for rapid and permanent fastenings substantially as shown on Figure 1. Rivet setting tools may be manually or power operated.

6.1.1 In general, these rivets are used to fasten metal to metal, wood to metal, and plastics to metal. Typical nonstructural applications are as follows: Attachments such as for handles, hinges, brackets, and clips; lockers such as for food and clothes; bins, metal furniture, racks, shelves; assembly of tube sockets and terminal boards; fastening conduit clips, raceways, electrical boxes, distribution panels; fastening signs, bulletin boards, and safety guards around equipment; installing light fixture mounting brackets; repair of light sheet metal equipment.

6.1.2 Closed-end rivets are intended for application (under the most optimum conditions, i.e., proper hole size, grip length and over coated with sealant, etc.) where gas, oil, water or air tightness is required.

6.1.3 These rivets are not intended for aerospace usage. For aerospace rivets, see MIL-STD-1515, requirements 2 and 3.

6.2 Ordering data.

6.2.1 Acquisition requirements should specify the following:

(a) Title, number, and date of this specification and applicble specification sheet.

(b) Applicable specifiction sheet (see 3.1) part number.

(c) Level (degree) of protection in accordance with PPP-H-1581, ordering data (see 5.1).

6.3 Subject term (Key Word) listing.

Blind Fastener
Pop Rivet
Rivet, Blind
Rivet, Blind, Nonstructural

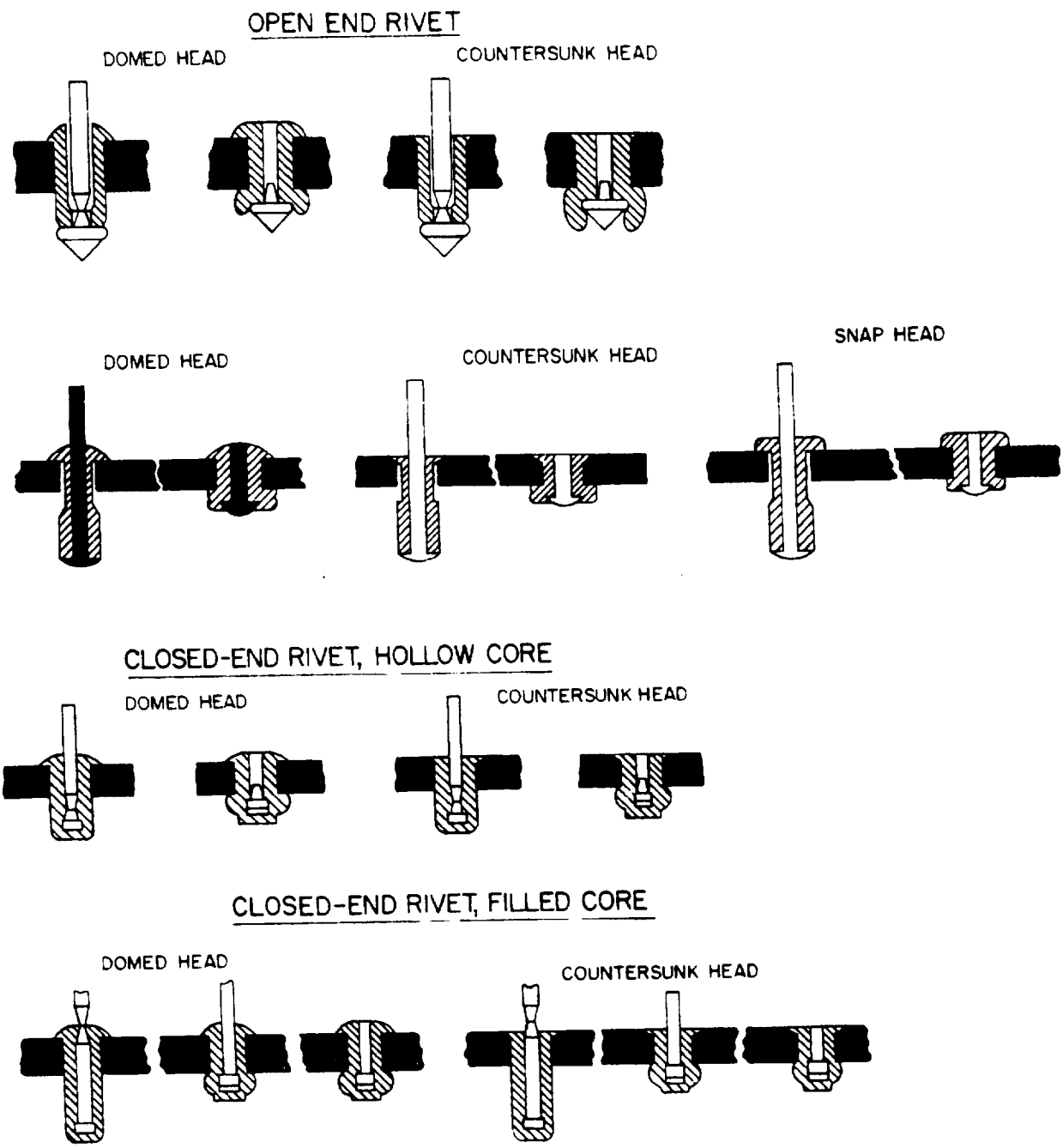

FIGURE 1. ILLUSTRATION OF RIVET STYLES BEFORE AND AFTER SETTING

Custodians:
Army - AR
Navy - AS
Air Force - 99

Review Activities:
Army - AV, MI
Air Force - 11, 82

User Activities
National Security Agency - NS

Preparing Activity:
Navy - AS

(Project 5320-0608)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-R-24243B	Rivets, Blind, Nonstructural, Retained Mandrel, Gen Spec For

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 1426 PREVIOUS EDITION IS OBSOLETE.

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)