

INCH-POUND

MIL-DTL-81905H(AS)

01 December 2016

SUPERSEDING

MIL-DTL-81905G(AS)

04 November 2013

DETAIL SPECIFICATION
ANTI-G GARMENT, CSU-15A/P

This specification is approved for use by the Naval Air Systems Command, Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements and inspections for the anti-gravity (anti-G) garment, CSU-15A/P, worn by U.S. Navy and U.S. Marine Corps aviators of high performance aircraft. The CSU-15A/P is designated as a critical safety item.

1.2 Classification. The anti-G garment, CSU-15A/P furnished under this specification will be of the following classes and sizes (see 6.2).

Class I – Green 3456

Class II – Khaki 3729

Small regular

Medium regular

Large regular

Large extra long

Small long

Medium long

Large long

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 or 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to the Commander Naval Air Warfare Center Aircraft Division Lakehurst, Code 4.1.2.2, Mail Stop 120-3, Route 547, Joint Base MDL, NJ 08733-5100 or emailed to michael.sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

AMSC N/A

FSC 8475



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2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-4	-	Glossary of Fabric Imperfections
FED-STD-191	-	Textile Test Methods

COMMERCIAL ITEM DESCRIPTIONS (CIDS)

A-A-50195	-	Thread, Aramid
A-A-55126	-	Fastener Tapes, Hook and Loop, Synthetic
A-A-55634	-	Zippers (Fasteners, Slide Interlocking)
A-A-55809	-	Insulation Tape, Electrical, 600V Polyvinyl Chloride, Pressure-Sensitive Adhesive
A-A-59826	-	Thread, Nylon

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5038	-	Tape, Textile and Webbing, Textile, Reinforcing, Nylon
MIL-W-5664	-	Webbing, Textile, Elastic
MIL-PRF-6855	-	Rubber, Synthetic, Sheets, Strips, Molded or Extruded Shapes, General Specification For Label; for Clothing, Equipage, and Tentage, (General Use)
MIL-DTL-32075	-	Leather, Cattlehide, Deerskin, and Horseshide, Chrome Tanned
MIL-T-38328	-	Tape, Textile, Nylon, Aromatic, Non-Melting, Reinforcing
MIL-C-43204	-	Cloth, Spacer (Olefin)
MIL-L-43283	-	Leather, Calfskin, Kip, and Cattlehide for Footwear Uppers, Chrome Tanned
MIL-W-81116	-	Webbing, Textile, Polyamide, High Temperature Resistant, Loop
MIL-C-83242	-	Cord, Aromatic Polyamide, Non-Melting
MIL-C-83390	-	Connector, Hose, Quick-Acting, Male, Anti-G Garment (Inactive for new design)
MIL-C-83489	-	Cloth, Coated, Nylon, Polyurethane Coated

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DEPARTMENT OF DEFENSE STANDARD

MS27755 - Connector, Hose Quick Disconnect, Female, Anti-G Suit

(Copies of these documents are available online at <http://quicksearch.dla.mil/>.)

2.2.2 Other Government documents, drawings, and publications. The following drawings form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

NAVAL AIR SYSTEMS COMMAND DRAWINGS

1628AS100 - Top Assembly Drawing, Anti-g Garment CSU-15A/P

3926AS100 - Fasteners, Slide, Anti-g Garment

NAVY CLOTHING AND TEXTILE RESEARCH FACILITY PURCHASE DESCRIPTION

NCTRF PD-01-10 - Cloth, Plain and Basket Weave, Aramid

U.S. AIR FORCE DRAWING

74204 - Spacer, Tube – Anti-G Garment

(Copies of this document are available from Defense Supply Center Philadelphia Clothing and Textiles Directorate, Attn: DLA - Troop Support (Bldg. 3), 700 Robbins Ave., Philadelphia, PA 19111-5902.)

CODE OF FEDERAL REGULATION (CFR)

Title 14 CFR - Aeronautics and Space Part 25 Airworthiness Standards: Transport Category Airplanes

(Copies of CFRs are available online at <http://www.ecfr.gov/>.)

DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT (DFARS)

Provision 252.211-7003 - Item Unique Identification and Valuation

(Copies of this document are available online at <http://www.acq.osd.mil/dpap/dars/dfarspgi/current/index.html>.)

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC Test Method 135 - Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics

(Copies of this document are available online at <http://www.aatcc.org>.)

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

NASM20230 - Grommets, Metallic, Plain and Spur, With Washers, Type I and Type III. (DoD adopted)
NASM27980 - Fastener, Snap, Style 2 (Regular Wire Spring Clamp Type). (DoD adopted)

(Copies of these documents are available online at <http://www.aia-aerospace.org>.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of these documents are available online at <http://www.asq.org>.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM A313/A313M - Standard Specification for Stainless Steel Spring Wire. (DoD adopted)
ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test). (DoD Adopted)
ASTM D6193 - Standard Practice for Stitches and Seams. (DoD Adopted)

(Copies of these documents are available online at <http://www.astm.org>.)

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PARACHUTE INDUSTRY ASSOCIATION (PIA)

PIA-C-3953	-	Cloth, Duck, Nylon. (DoD adopted)
PIA-W-4088	-	Webbing, Textile, Woven, Nylon. (DoD adopted)

(Copies of these documents are available online at <http://www.pia.com>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Anti-G garments furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.3 and 6.5).

3.2 First article. When specified (see 6.2), samples shall be subjected to first article inspection in accordance with 4.4.

3.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials shall be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4 Materials and components. Except for the metallic materials and parts, the materials and components used for fabrication shall have been manufactured not greater than 24 months prior to the date of acceptance of the anti-G garments by the Government, unless otherwise specified. All materials and assembled anti-G garments shall be stored in an environmentally controlled area and protected in a manner to prevent damage from ultra-violet light and environmental contaminants.

3.4.1 Basic materials.

3.4.1.1 High temperature resistant cloth. Except for the bladder, the basic fabric for the anti-G garment, the pull tape for the slide fasteners, the loops for the slide fasteners, and the hanger shall conform to NCTRF PD 01-10, type II. Class designation will be identified as per contract. Test method 5556.1 of FED-STD-191 shall be replaced with AATCC 135 Type V, A iii utilizing 5 wash cycles. Class I will be U.S. Navy shade green 3456, and Class II will be U.S. Navy shade Khaki 3729.

3.4.1.2 Polyurethane coated nylon cloth. The material for the bladder (including the attachment patches) and reinforcement of the inflation external tube covering shall conform to MIL-C-83489, type I, except the finished weight shall be 5.50 to 6.75 ounces per square yard,

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and the minimum tear strength shall be 5 pounds in the warp direction and 4 pounds in the fill direction.

3.4.2 Reinforcements and bindings. Unless otherwise specified herein, the reinforcements shall be made of the basic fabric specified in 3.4.1.1. The bias binding shall be 45 degrees bias cut 1¼ inches to 1½ inches wide from the basic fabric specified in 3.4.1.1.

3.4.3 Spacer material. The spacer material for the bladder and spacer tube of the bladder inflation hose shall conform to MIL-C-43204, type III (see 6.6).

3.4.4 Adjustment laces and lanyard. The cord for the lanyard and for the adjustment laces shall conform to MIL-C-83242, type I and table I and shall approximately match the shade of the basic material in 3.4.1.1.

TABLE I. Adjustment laces.

Size of anti-G Garment	Length of Adjustment Laces (Feet) <u>1/</u>		
	Waist Area <u>2/</u>	Thigh Area <u>2/</u>	Calf Area <u>2/</u>
Small Regular	12	12	14
Small Long	12	13	16
Medium Regular	12	13	16
Medium Long	12	14	17
Large Regular	13	14	17
Large Long	13	16	19
Large Extra Long	13	16	19

1/ Dimensions are approximate and shall be governed by the following requirement: Both ends of each adjustment lace shall extend at least 6 inches beyond the open end of the lacing tape when the adjustment laces are completely extended. Both ends of each adjustment lace shall be dipped in a hot solution of 50 percent beeswax and 50 percent paraffin.

2/ Two per anti-G garment shall be required.

3.4.5 Slide fasteners. The slide fasteners (zippers) shall be brass with a short tab pull. The slide fasteners shall conform to tables II and III of this specification and to A-A-55634 and drawing 3926AS100 except as otherwise specified herein. The crosswise breaking strength of slide fasteners styles 7A, and 8A shall be 190 lb minimum. The slide fasteners for the body opening shall be type III, style 7A, sizes 8-9 and for the leg openings shall be type III, style 7A and 8A, sizes 8-9 with S-25 retainer and pin assembly, metal 0308 with a black oxidized finish. The slide fasteners for the thigh take-ups shall be type I, style 4, size MS and for the pockets shall be type I, style 7, sizes 5-7. A substitute slide fastener for the body opening, the leg openings, and the thigh take-ups shall be used only when specifically approved by the

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contracting officer. The tape and the bead of all slide fasteners (including the body opening) shall be a high temperature resistant polyamide material that has been dyed to approximately match the color of the basic fabric specified in 3.4.1.1. The tape of the slide fastener shall have color fastness in accordance with A-A-55634 except that “fair” colorfastness in lieu of “good” color fastness to light will be acceptable. Slide fasteners from a supplier not identified on the slide fastener ESA (Engineering Support Activity) source control drawing 3926AS100 shall not be used without prior approval of the ESA. The contracting officer shall be contacted for any substitution requests. The finish of the chain and the other metal components shall be black. All automatic-locking sliders shall have a pin-type locking device. A thong (see 3.4.7) shall be permanently fastened to each short tab pull with two bar-tacks.

TABLE II. Slide fasteners.

Location of Slide Fastener	Quantity	A-A-55634		
		Type	Style	Size
Body opening	1	III	7A	8-9
Leg opening	1	III	7A	8-9
Leg opening	1	III	8A	8-9
Thigh take-ups	2	I	4	5-7
Pockets	2	I	7	5-7

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TABLE III. Length of slide fasteners.

Size of anti-G garment	Length (inches of slide fasteners)			
	Body Opening <u>1/</u>	Leg Opening <u>2/</u>	Thigh Take-ups	Pockets
Small Regular	8 ½	26	10 ½	8
Small Long	8 ½	28	11 ½	8
Medium Regular	8 ½	26 ½	11	8
Medium Long	8 ½	28 ½	11 ½	8
Large Regular	8 ½	27	11	8
Large Long	8 ½	29	11 ½	8
Large Extra Long	8 ½	33	11 ½	8

1/ The tolerance for the length of the slide fastener for the body opening shall be $\pm 1/8$ inch.

2/ The tolerance for the length of the slide fastener for the leg opening shall be $\pm 1/4$ inch.

3.4.6 Stiffeners. The stiffeners for the slide fasteners and the stiffeners for the front body and the back body shall be any subdued color made of nylon cloth that conforms to PIA-C-3953, class 2.

3.4.7 Tape nylon aromatic. The tape for the leg and body socket tab assemblies shall be 1½" wide, shall conform to MIL-T-38328, Type IV, and shall have a maximum weight of .80 ounces/yard. The tape shall approximately match the shade of the basic material in 3.4.1.1. Use of package-dyeing to meet shade requirements is acceptable.

3.4.8 Nylon webbing. The webbing for the elastic kneeboard subassembly shall be 1 inch wide, and shall conform to MIL-DTL-5038, type II, and shall approximately match the shade of the basic material in 3.4.1.1.

3.4.9 Wrapping tape for anti-G inflation hose. The tape for wrapping the inflation tube assembly shall be black, 1-inch wide tape conforming to A-A-55809.

3.4.10 Lacer loops. The tape for the lacer loops shall conform to MIL-W-81116 except that the sleeve may have 16 carriers in lieu of 20 carriers, the length shall be 39½ inches in lieu of 45 inches for each yard of webbing, and the color shall approximately match the basic material as specified in 3.4.1.1. Use of package-dyeing to meet the shade requirements is acceptable.

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3.4.11 Thread. Unless otherwise specified herein, the thread for all sewing operations shall conform to size E, soft or bonded, 600 Denier, Tex 60, 3 Ply, 6 turns per inch, or size F, soft or bonded, 800 Denier, Tex 80, 3 Ply, 6 turns per inch, 5 lb minimum break strength, 38 percent elongation conforming to A-A-50195 and shall approximately match the shade of the basic material in 3.4.1.1. (Note: This thread may be used to sew the nylon mesh cloth (see 3.4.21) in lieu of the thread conforming to A-A-59826, type I, class A, size E, which is specified on the drawing.)

3.4.12 Snap fasteners. The snap fasteners for the upper leg (thigh) socket tab, lower leg (ankle) and body (waist) socket tab assemblies shall conform to NASM 27980, Style 2, (socket NASM27980-6B, button NASM27980-1B, stud NASM27980-7B and eyelet NASM27980-8B).

3.4.13 Fastener tape. The hook and pile fastener tape shall be a flame resistant (FR) treated type II, class I of A-A-55126, one inch wide and shall meet the length dimensions of Table IV. The hook and pile for the anti-G garment hose retention shall be one inch wide on the inflation sleeve external covering and two inches wide on the leg cover. The color of the hook and pile fastener tape shall approximately match the color of the basic fabric specified in 3.4.1.1. The hook and pile fastener tape shall meet the requirements of 14 CFR Chapter 1, [Section 25.853 and Appendix F](#), part I (a) (1) (i) 60 second vertical burn test.

TABLE IV. Dimensions of fastener tapes.

Size of anti-G Garment	Dimensions of Fastener Tape (inches) ^{1/}		
	Body Lacer Cover ^{2/}	Thigh Lacer Covers ^{2/}	Calf Lacer Covers ^{2/}
Small Regular	1 by 9½	1 by 10 ^{5/8}	1 by 12½
Small Long	1 by 9½	1 by 11½	1 by 13 ^{1/8}
Medium Regular	1 by 10	1 by 10 ^{7/8}	1 by 12½
Medium Long	1 by 10	1 by 11 ^{3/8}	1 by 13 ^{1/8}
Large Regular	1 by 10	1 by 10 ^{7/8}	1 by 12½
Large Long	1 by 10	1 by 11¼	1 by 13¼
Large Extra Long	1 by 10	1 by 11¼	1 by 17¼

^{1/} Since the requirements of table IV specify that the fastener tape for the lacer covers shall be trimmed, if necessary, so that the fastener tape will be even with the top and the bottom edges of the flap, these dimensions are approximate.

^{2/} Two for each anti-G garment shall be required.

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3.4.14 Adhesive. The adhesive for adhering the attachment patches to the coated bladder material shall be one part polyurethane cement (see 6.6).

3.4.15 Connector. The connector for the inflation tube shall conform to MIL-C-83390.

3.4.16 Rubber Sleeve. The rubber sleeve for the connector shall be tubular conforming to MIL-PRF-6855/4, class 2, type B, grade 40 or 60, shall be $3 \pm 1/16$ inches long; shall have an outer diameter of $3/4 \pm 1/16$ inches and shall have a wall thickness of $1/8 \pm 1/32$ inches. No silicone or any other lubricant shall be applied to either the rubber sleeve or the connector prior to assembling the rubber sleeve to the connector.

3.4.17 Clamps. The clamps for securing the connector to the inflation tube and external inflation tube shall C3122BE-14 and C3122BE-16 be Oetiker Clamp One Ear Step less 25.6 MM (1.01) ID, PN: 16700031.

3.4.18 Leather reinforcement. The leather for the reinforcement patch over the inflation sleeve opening shall be black and shall conform to MIL-L-43283, type I, except that the thickness shall be 2 to $2\frac{1}{2}$ ounces or MIL-DTL-32092, type I, black, thickness 2 to $2\frac{1}{2}$ ounces.

3.4.19 Springs for spacer tube. The material for the springs of the spacer tube shall be round 0.016-inch diameter composition 304, with a minimum tensile strength of 306,000 psi and a maximum of 338,000 psi in accordance with ASTM A313/A313M, form II, condition B, at 28 coils per inch.

3.4.20 Mesh cloth for the spacer tube. The cloth for the spacer tube shall be a netting/mesh with approximately 14 x 12 (+/- 1) strand count per inch, hole size 0.05 x 0.08 (+/- 0.01) inch, 0.020 (+/- 0.010) thick, and weight of 19 pounds per 1000 feet squared or may be a material that has been approved by the procuring activity before bladder manufacture.

3.4.21 Rubber band. The rubber band shall be $3/4$ inch $\pm 1/32$ inside diameter, $1\frac{1}{4} \pm 1/16$ inches long, and 0.035-inch minimum thickness. The color of the rubber band shall be black or a shade that approximately matches the base material. The rubber shall conform to MIL-PRF-6855 class 2, type A.

3.4.22 Webbing textile, elastic. The elastic for the kneeboard subassembly shall conform to MIL-W-5664, type I, class I and shall be 1 inch wide and cut in lengths specified in table V. The color of the elastic shall approximately match the shade of the basic material in 3.4.1.1 or be black.

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TABLE V. Elastic for kneeboard subassembly.

Size of anti-G Garment	Cut Length Elastic (inches)	Cut Length Webbing (inches) <u>1/</u>
	2 each	4 each
Small Regular	7 ³ / ₄	2 ³ / ₄
Small Long	7 ³ / ₄	2 ³ / ₄
Medium Regular	8 ¹ / ₄	2 ³ / ₄
Medium Long	8 ¹ / ₄	2 ³ / ₄
Large Regular	9 ¹ / ₄	2 ³ / ₄
Large Long	9 ¹ / ₄	2 ³ / ₄
Large Extra Long	9 ³ / ₄	2 ³ / ₄

1/ These dimensions are approximate because the requirements of table III specify that the respective free webbing ends of the elastic kneeboard assembly shall be trimmed, if necessary, so that the elastic kneeboard subassembly lays flat across the thigh cover.

3.5 Design. As shown on drawing 1628AS100, the anti-G garment shall be a wrap-around garment that extends from the waist to over the calves of the wearer. It shall have an inflatable bladder that will cover the waist and the leg areas of the wearer and a connector that will provide normal and emergency connection and disconnection of the bladder of the anti-G garment to and from the air pressure source.

Both sides of the anti-G garment shall have external adjustment laces in the waist, thigh, and calf areas; however, the adjustment laces shall have covers that can be unfastened for easy accessibility. The anti-G garment shall have a pocket on the calf of each leg.

3.6 Dimensions, tolerance. Unless otherwise specified, the tolerances for all drawings, patterns and operations shall be as specified in table VI, except the tolerance for all binding operations shall be +¹/₁₆ -¹/₃₂".

TABLE VI. Tolerance dimensions.

Dimension	Tolerance
1/16 inch or under	± ¹ / ₃₂ inch
More than 1/16 inch but less than 2 inches	± ¹ / ₁₆ inch
2 inches or more but less than 10 inches	± ¹ / ₈ inch
10 inches or more but less than 30 inches	± ¹ / ₄ inch
30 inches or more but less than 60 inches	± ³ / ₈ inch
60 inches or more	±1 inch

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3.7 Construction. The anti-G garment shall be constructed as specified in table IX; however, the manufacturer shall not be required to follow the exact sequence of operations as listed therein.

3.7.1 Stitches, seams, and stitching. Stitches, seams and stitching specified in table IX shall conform to ASTM D6193. Thread breaks and ends of all seams stitching, if not caught in other seams or stitching, shall be securely backstitched by reversing the stitching direction and sewing a continuous row of stitching superimposed on the original row of stitching for a distance of ½ inch. Stitch shall be considered caught in another stitching or seam if the two stitches are in opposite directions and superimposed directly on each other for at least 1 inch. All thread ends inside and outside of the anti-G garment shall be trimmed flush with the material or up to ¼ inch maximum. At no time shall any stitching or seam be less than 1/32 inch from the edge.

3.7.2 Bartacks. Bartacks shall be stitched with a setting of 40-42 stitches per inch, unless otherwise specified. Stitches per inch shall be counted in accordance with ASTM D6193. All thread ends inside and outside of the anti-G garment shall be trimmed flush with the material or up to ¼ inch maximum. The bartacks shall be as specified in table IX, unless specified herein. The bartacks joining the spacer material and attaching the patches as specified on figures 6 and 7 shall be ¾ (+/-1/32) inch long, centered. The bartacks for the hanger loop shall be 5/16 (+1/16 -1/32) inch. The bartacks on the zipper pulls and all other bartacks shall be 7/16 (+1/16 -1/32) inches, unless otherwise specified.

3.8 Color. The color of the materials of the anti-G garment shall be as specified herein. Materials for which color requirements have not been specified and which are hidden by the construction may be used in natural or colored form. The color of all sewing threads shall approximately match the color of the basic fabric specified (see 3.4.1.1).

3.9 Identification of product.

3.9.1 Labels. Each anti-G garment shall have an identification label, a size label, blank label, laundering instruction label and an item unique identification (IUID) label positioned in accordance with figures 1 and 2.

3.9.1.1 Identification label. The identification label shall conform to MIL-DTL-32075, type VI, class 1 and shall be 2½ by 1½ inches. The label shall contain the following information:

Anti-G garment, CSU-15A/P
 Specification 1/
 Manufacturer's Identification. 1/
 Contract or Order No. 1/

1/ The manufacturer shall insert the applicable information.

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3.9.1.2 Size label. The size label shall conform to MIL-DTL-32075, type VI, class 2 and shall be 2½ by 1½ inches. In addition to the adjective size, the size label shall contain the stature and the weight ranges (see table VII) and the stock number of the anti-G garment, the serial number assigned to that anti-G garment, and the date of manufacture in the following manner:

Size 1/
 Stature 1/ Weight 1/
 NSN (National Stock Number)
 Lot No. 2/
 Serial No. 3/
 Date of Manufacture 1/

- 1/ The manufacturer shall insert the applicable information.
2/ The manufacturing lot shall be identified by unique consecutive numbers assigned by the manufacturer.
3/ The anti-G garment shall be identified by unique serial numbers assigned by the manufacturer. Serialization shall be by a block of consecutive numbers to cover the entire acquisition document quantity.

3.9.1.3 Height and weight ranges. Proper fitting of the anti-G garment is based on height and weight; other body measurements are not used in selecting the proper size. The applicable height and weight ranges for each size are shown in table VII.

TABLE VII. Height and weight ranges.

Height and Weight Range		
Size of anti-G garment	Stature Range (inches)	Weight Range (pounds)
Small Regular	63 to 67-7/8	131 to 160
Small Long	68 to 72-7/8	131 to 160
Medium Regular	64½ to 69¾	161 to 190
Medium Long	69½ to 74¾	161 to 190
Large Regular	67 to 71¾	191 to 220
Large Long	71½ to 75¾	191 to 220
Large Extra Long	75½ to 79.0	191 to 230

3.9.1.4 Blank label. The blank label shall conform to MIL-DTL-32075, type VI, and shall be 4 by 1½ inches.

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3.9.1.5 Laundering (care) instruction label. The laundering instruction label shall conform to MIL-DTL-32075, type VI, class 3 and shall be 4 by 1½ inches. The instruction label shall contain the following information:

DO NOT MACHINE WASH, MACHINE DRY, IRON OR DRY CLEAN TO AVOID POTENTIAL DAMAGE TO QUICK DISCONNECT HARDWARE AND HOSE ASSEMBLY. PLUG AIR INLET PORT SECURELY TO PREVENT WATER FROM ENTERING BLADDERS AND AS NEEDED, WASH BY HAND (SPOTCLEAN) WITH MILD SOAP AND COLD WATER. HANG ON A WOODEN HANGER OR LAY FLAT IN A WELL VENTILATED AREA TO AIR DRY.

THE MATERIAL OF THE OUTER SHELL OF THIS ANTI-G GARMENT IS AN INHERENTLY FLAME RESISTANT MATERIAL THAT WILL NOT LOSE ITS FLAME RESISTANT PROPERTIES DURING WASHING.

3.9.1.6 Item Unique Identification (IUID) label. The contractor shall attach an Item Unique Identification (IUID) label to each unit in accordance with DFARS Clause 252.211-7003 Item Identification and Valuation.

3.9.1.7 Barcode label. Each item shall be individually bar-coded with a MIL-DTL-32075, type VIII, class 17 label/tag. The label/tag shall be located on the bag so that it is completely visible when it is folded or packaged as specified.

3.10 Special identification. The abdominal area of each anti-G garment that has been subjected to the endurance test specified in 4.9.3 shall be marked, with waterproof ink, in letters that are at least 1 inch high. The marking shall be as follows: ENDURANCE TESTED – NOT TO BE USED IN FLIGHT. The shipping containers for anti-G garments that have been subjected to the endurance test specified in 4.9.3 shall be marked in letters that are at least 1 inch high that repeats ENDURANCE TESTED – NOT TO BE USED IN FLIGHT.

3.11 Patterns and sewing operations. The Government will provide a complete set of patterns (see table VIII) which show size, directional lines, placement marks, and notches for assembly. The Government pattern shall be used to create a working pattern. The Government pattern shall not be altered. Minor modifications are permitted to the working pattern where necessary when using automatic equipment or to accommodate a manufacturing process. These modifications shall not alter the dimensional, serviceability, or appearance requirements cited in this specification. Sewing operations are listed in table IX.

3.12 Government loaned property. A connector conforming to MS27755 to be used to test the anti-G garment will be loaned, upon request, by the Government (see 4.2.2 and 6.2).

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TABLE VIII. List of pattern parts.

Material	Pattern Nomenclature	Computer Nomenclature	Cut Parts	Size
NCTRF PD 01-10	Body Back	CSU15- BODY-BACK	CUT 1	EACH
	Body Front	CSU15-BODY-FRONT	CUT 1	EACH
	Body Bladder Cover IS	CSU15-BODY-BLDR-CVR-IS	CUT 1	EACH
	Body Bladder Cover OS	CSU15-BODY-BLDR-CVR-OS	CUT 1	EACH
	Body Lacer Cover	CSU15-BODY-LACER-CVR	CUT 2	EACH
	Body Bladder Cover Extension	CSU15-B-BLDR-CVR-EXT	CUT 1	EACH
	Body Protective Fly Cover	CSU15-B-PRTC-FLY-CVR	CUT 1	EACH
	Leg Bladder Cover	CSU15-LEG-BLDR-CVR	CUT 1 PAIR	EACH
	Leg Lacer Cover	CSU15-LEG-LACER-CVR	CUT 2	EACH
	Leg Thigh	CSU15-LEG-THIGH	CUT 1 PAIR	EACH
	Leg Protective Fly Cover	CSU15-L-PRTC-FLY-CVR	CUT 1 PAIR	EACH
	Leg Thigh Take Up Fly	CSU15-L-T TAKE-UP-FLY	CUT 1 PAIR	EACH
	Leg Lower Lacer Cover	CSU15-L-LWR-LAC-CVR	CUT 2	EACH
	Pocket	CSU15-POCKET	CUT 1 PAIR	EACH
	Stiffener Cover	CSU15-STIFFENER-COVER	CUT 6	ALL
	Inflation Sleeve Opening Fabric	CSU15-INFLAT-SLV-OPNG-F	CUT 1	ALL

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TABLE VIII. List of pattern parts – Continued.

Material	Pattern Nomenclature	Computer Nomenclature	Cut Parts	Size
MIL-C-83489	Body Bladder	CSU15-BODY-BLADDER	CUT 1 PAIR	EACH
MIL-L-43283 or MIL-DTL-32092	Inflation Sleeve Opening Fabric	CSU15-INFLAT-SVL-OPNG-F	CUT 1	ALL
MIL-T-38328	Leg Loop Tape	CSU15-LEG-LOOP-TAPE	CUT 2	EACH
	Body Loop Tape	CSU15-BODY-LOOP-TAPE	CUT 2	ALL
PIA-C-3953	Body Protective Fly Stiffener	CSU15-B-PRTC-FLY-STFNR	CUT 1	ALL
	Leg Protective Fly Stiffener	CSU15-L-PRTC-FLY-STFNR	CUT 1 PAIR	EACH
	Take Up Fly Stiffener	CSU15-T-UP-FLY-STFNR	CUT 2	EACH
	Inner Stiffener	CSU15-INNER-STIFFENER	CUT 6	ALL

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TABLE IX. Sewing operations.

No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
1	<p><u>Cut Parts (see 3.11.1)</u></p> <p>(a) Cut the parts (including the bladders) of the anti-G garment in accordance with the patterns which show shape, size, directional lines, and marking for the proper assembly of the parts.</p> <p>Note: Trimming of the body lacer covers, the thigh lacer covers, and the calf lacer covers will be permitted as specified in No. 5(b), 6(b), and 6(e).</p> <p>Note: The pattern label “protective fly” is shortened to “fly” in this table.</p> <p>Note: The term “bladder casing” in this table refers to the pattern label “bladder cover” to differentiate between “lacing covers,” “body cover,” and “leg cover.”</p>			
2	<p><u>Shade Mark</u></p> <p>(a) Mark all parts to ensure a uniform shade throughout the anti-G garment.</p>			
3	<p><u>Sear Raw Edges</u></p> <p>(a) Sear the exposed raw edges of all parts made of nylon fiber. Avoid sharp edges.</p>			
4	<p><u>Sew Loops of Lacer Loop Tape</u></p> <p>(a) Sew one row of stitching along each length of the lacer loop tape, through the base of each loop to prevent the loops from slipping.</p>	301	SSa-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
5	<p><u>Make Body Lacer Covers</u></p> <p>Note: No. 5(b) shall be performed before No. 5(c) so that the fastener tape will be sewn to the body lacer covers before the body lacer covers are bound.</p> <p>(a) Select the fastener tapes for the body lacer covers in accordance with table IV.</p> <p>(b) Trim the fastener tape, if necessary, to fit the body lacer covers at the top and the bottom. Turn each body lacer cover under 3/8-inch. Sew the hook fastener tape to each body lacer cover, at the pattern location, with a single row of stitching 1/8 inch from the edge on all four sides.</p> <p>(c) Bind each body lacer cover at each end with bias binding in 3.4.2 (finished dimension 5/16 inch) with a single row of stitching 1/16 inch from the edge. Before completing the stitching of the binding at the top and the bottom of each lacer cover, fold the raw edges of each end of the binding (two ends per lacer cover) 1/2 inch, so no raw edges of binding tape are exposed and complete the stitching of the binding to the fastener tape.</p>	301	LSd-1	8-10
6	<p><u>Make Leg Lacer Covers and Leg Lower Lacer Covers</u></p> <p>Note: No. 6(b) shall be performed before No. 6(c) so that the fastener tape will be sewn to the leg lacer covers before the leg lacer covers are bound.</p> <p>Note: No. 6(e) shall be performed before No. 6(f) so that the fastener tape will be sewn to the leg lower lacer covers before the leg lower lacer covers are bound.</p> <p>(a) Select the fastener tapes for the leg lacer covers in accordance with table IV.</p>	301	BSc-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
6 (cont'd)	<p>(b) Trim the fastener tape, if necessary, to fit the leg lacer covers at the top and the bottom. Turn each leg lacer cover under 3/8 inch. Sew the hook fastener tape to each leg lacer cover, at the pattern location, with a single row of stitching 1/8 inch from the edge on all four sides.</p> <p>(c) Bind each leg lacer cover at each end with bias binding in 3.4.2 (finished dimension 5/16 inch) with a single row of stitching 1/16 inch from the edge. Before completing the stitching of the binding tape at the top and the bottom of each lacer cover, fold the raw edges of each end of the binding (two ends per lacer cover) 1/2 inch, so that no raw edges are exposed, and complete the stitching of the binding to the fastener tape.</p> <p>(d) Select the fastener tapes for the leg lower lacer covers in accordance with table IV.</p> <p>(e) Trim the fastener tape, if necessary, to fit the leg lower lacer covers at the top and the bottom. Turn each leg lower lacer cover under 3/8 inch. Sew the hook fastener tape to each leg lower lacer cover, at the pattern location, with a single row of stitching 1/8 inch from the edge on all four sides.</p> <p>(f) Bind each leg lower lacer cover at each end with bias binding in 3.4.2 (finished dimension 5/16 inch) with a single row of stitching 1/16 inch from the edge. Before completing the stitching of the binding at the top and the bottom of each lacer cover, fold the raw edges of each end of the binding (two ends per lacer cover) 1/2 inch so that no raw edges are exposed, and complete the stitching of the binding to the fastener tape.</p>	301	LSd-1	8-10
		301	BSc-1	10-12
		301	LSd-1	8-10
		301	BSc-1	10-12
7	<p><u>Hem Body Bladder Casing</u> Note: The term "bladder casing" in this table refers to the pattern labeled "bladder cover" to differentiate between "lacing covers," "body cover," and "leg cover."</p>			

MIL-DTL-81905H(AS)

No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
7 (cont'd)	<p>(a) Hem the upper edge of the separate leg extension to the inside, 1/4 inch, with a single row of stitching 1/16 inch from the edge.</p> <p>(b) Fold the leg-end of the inside body bladder casing, to which the separate leg extension is to be attached, to the inside 1/4 inch, and hem with a single row of stitching 1/16 inch from the edge.</p> <p>(c) Lap the hemmed end of the separate leg extension up under the leg-end of the body bladder casing until the lower edge is even with the opposite leg end, and sew at the sides with a single row of stitching 1/8 inch from the edge.</p> <p>NOTE: The terms "back body bladder cover," "front body bladder case," "outside cover," and "forward cover" as indicated in this document and on the pattern drawings of the bladder cover shall be interpreted as that portion of the bladder cover on the outside (away from the body when worn) and has a truncated section cut off. The term "back body cover" or "front body bladder case" shall be interpreted as the cover positioned next to the body and is full size. The pattern names indicate this by IS = inside and OS = outside.</p>	301	EFa-1	10-12
		301	EFa-1	10-12
		301	SSa-1	10-12
8	<p><u>Join Front and Back Bladder Casing</u></p> <p>(a) Join the front and the back body bladder casing, material face to face, with a single row of stitching 1/4 inch from the edge, leaving the legs, the bladder inflation sleeve, and 1 inch at tab locations (top, bottom, and right side) open.</p> <p>(b) Turn and topstitch with a single row of stitching 1/16 inch from the edge.</p>	301	SSe-2(a)	10-12
		301	SSe-2(b)	10-12
9	<p><u>Hem Leg Bladder Casing</u></p> <p>(a) Hem the leg bladder casings to the inside, 1/4 inch, down the sides and around the bottom and the top, with a single row of stitching 1/16 inch from the edge.</p>	301	EFa-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
10	<p><u>Make Thigh Take-Ups</u></p> <p>(a) Select the slide fasteners for the thigh take-ups in accordance with tables II and III. Zigzag stitch the tapes of the slide fasteners together from the bottom stop to the ends of the tapes.</p> <p>(b) Sew the ¾-inch-wide stiffener to the inside of the thigh take-up fly, right and left, on the long center line from end to end with a single row of stitching. Stiffener must have one stitch over each end.</p> <p>(c) With the open end of the slide fastener at the top, center the top and the bottom stops between the top and the bottom of the thigh take-ups. Match the edges of the slide fastener tape with the edges of the thigh take-up's fly. Cut the ends of the slide fastener tapes off even with the cover, and sew all around with a single row of stitching 1/8 inch from the edge.</p> <p>(d) Bind all around the thigh take-ups, catching the ends of the slide fastener tapes in the binding, with 5/16-inch-wide (finished) bias binding 1/16 inch from the edge.</p> <p>(e) Cut two 1-1/4 inch by 6-inch pieces from the basic fabric cut on a 45 degree bias as specified in 3.4.1.1. Fold the edges to center and then in half to form a 5/16 inch wide zipper thong. Sew around the perimeter 1/16 inch from the edge.</p> <p>(f) Thread the 6-inch piece through the pull of each slide fastener. Fold the thong in the center. Fold the raw ends under ½ inch and bar-tack. Sew another bar-tack close to the pull.</p>	<p>304</p> <p>301</p> <p>301</p> <p>301</p> <p>301</p> <p>Bar-tack</p>	<p>SSa-1</p> <p>SSa-1</p> <p>SSa-1</p> <p>BSc-1</p> <p>SSc-1</p>	<p>20-26</p> <p>10-12</p> <p>4-6</p> <p>10-12</p> <p>10-12</p> <p>40-42 stitches per inch</p>
11	<p><u>Prepare Slide Fasteners for Body and Leg Openings</u></p> <p>(a) Select the slide fasteners for the body and the leg openings in accordance with tables II and III.</p> <p>(b) Pre-fold the slide fastener tapes for the leg</p>	<p>301</p> <p>301</p>	<p>EFa-1</p> <p>SSa-1</p>	<p>10-12</p> <p>10-12</p>

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
11 (cont'd)	<p>openings at the open ends with a triangular fold so that the beaded edge of the tape is across the end and the fold is to the inside of the case. Sew with a single row of stitching $3/32 + 1/32, -1/16$ inch from the edge. Pre-fold and sew the slide fastener tape for the body opening in the same manner as for the leg openings, making certain that the fold is placed so that the length of the slide fastener tape will be $8-5/8$ inches.</p> <p>(c) Cut two $1-1/4$ inch by 6 inch pieces from the basic fabric cut on a 45 degree bias as specified in 3.4.1.1. Fold the edges to the center and then in half to form a $5/16$ inch wide zipper thong. Sew around the perimeter $1/16$ inch from the edge.</p> <p>(d) Thread the 6 inch piece through the pull of each slide fastener. Fold the webbing in the center. Fold the raw ends under $1/2$ inch and bar-tack. Sew another bar-tack close to the pull.</p> <p>(e) Cut three $1-1/4$ inch by 7 inch pieces from the basic fabric cut on a 45 degree bias as specified in 3.4.1.1. Fold the edges to center and then in half to form a $5/16$ inch wide strip. Sew around the perimeter $1/16$ inch from the edge. Fold the strip in the center. Fold the raw edges under $1/2$ inch, join, forming a box and "X" with a single row of stitching $1/16$ inch from the edge, to the separating end of the slide fastener opposite the sliders, with the ends of the tape down $5/8$ inch from the end of the slide fastener tape. Sew the tape to the inside of the anti-G garment.</p> <p>(f) Sew the loops of the two tapes on the leg opening slide fasteners closed by sewing both sides of the loops with a single row of stitching $1/16$ inch from the edges.</p>	<p>301</p> <p>Bar-tack</p> <p>301</p> <p>301</p>	<p>SSc-1</p> <p>SSc-1</p> <p>SSc-1</p> <p>SSa-1</p>	<p>10-12</p> <p>40-42 stitches per inch</p> <p>10-12</p> <p>10-12</p>
12	<p><u>Make Body Fly</u></p> <p>Note: The pattern label "protective fly" is shortened to "fly" in this table.</p> <p>(a) Place a 1-inch-square reinforcement of the basic</p>	301	SSa-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
12 (cont'd)	<p>fabric as marked on the pattern so that the center of the reinforcement will be 3/4 inch down from the top of the finished fly and on the inside, and sew with a single row of stitching 1/8 inch from the edge. Place another 1-inch-square reinforcement of the basic fabric so that the center of the reinforcement will be 5-1/2 inches below the center of the upper reinforcement and equally distant from the edge of the body fly cover.</p> <p>(b) Fold the body fly cover lengthwise on the fold line, the material face to face; sew across the bottom and the top with a single row of stitching 3/8 inch from the edge.</p> <p>(c) Turn and insert the stiffener, folding the raw edge to the inside enclosing the stiffener. Sew all around the top, the bottom, and the two sides with a single row of stitching, 1/8 inch from the edge. Sew four additional rows of stitching, evenly spaced end to end.</p> <p>(d) Sew two boxes "X" 3/4 x 3/4-inch, 1/8 inch from the edge of two reinforcements described in 12(a) with single row stitching.</p> <p>(e) Punch a 1/8 inch diameter hole in the center of each box "X" described in operation (d), install Stud NASM27980-7B and eyelet NASM27980-8B through the holes at the center of box "X" stitch, ensuring the stud is on the side matching with the socket of tab assembly.</p> <p>(f) Attach the slide fastener tape (with the slider attached) to the back edge of the body fly, the open end at the top; sew with a single row of stitching 1/8 inch from the edge. The slide fastener will extend below the bottom edge of the body fly by 5/8 inch.</p>			
13	<p><u>Make Leg Fly</u> Note: The pattern label "protective fly" is shortened to "fly" in this table.</p>			

MIL-DTL-81905H(AS)

No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
13 (cont'd)	<p>(a) Position a 1-inch-square reinforcement of the basic fabric as marked on the patterns so that the center of the reinforcement will be 2-5/8 inches down from the top of the leg fly finished edge and on the inside. Sew with a single row of stitching 1/8 inch from the edge.</p> <p>(b) Fold the leg fly cover lengthwise on the fold line, the face sides of the material together; sew across the bottom and the top with a single row of stitching 3/8 inch from the edge.</p> <p>(c) Turn and insert the stiffener, folding the raw edges to the inside enclosing the stiffener; sew all around the top, the bottom, and the two sides with a single row of stitching 1/8 inch from the edge. Sew four additional single rows of stitching, evenly spaced from end to end.</p> <p>(d) Sew one box "X" 3/4 by 3/4 -inch, 1/8 inch from the edge of the reinforcement described in 13 (a) with single row stitching.</p> <p>(e) Punch a 1/8 inch diameter hole in the center of each box "X" described in operation (d), install stud NASM27980-7B and eyelet NASM27980-8B through the holes at the center of box "X" stitch, ensuring the stud is on the side matching with the socket of tab assembly.</p> <p>(f) Attach the slide fastener tape (with the slide attached) to the back edge of the leg fly, the open end at the bottom; sew with a single row of stitching 1/8 inch from the edge.</p>	301	SSa-1	10-12
		301	SSe-2(a)	10-12
		301	SSe-2(b)	10-12
		301	SSa-1	10-12
		301	SSa-1	10-12
14	<p><u>Assemble Pockets</u></p> <p>(a) Select the slide fasteners for the body and the leg openings in accordance with tables II and III.</p> <p>(b) Bind the side edges of the pockets with bias binding specified in 3.4.2 (finished dimension</p>	301	BSc-1	10-12

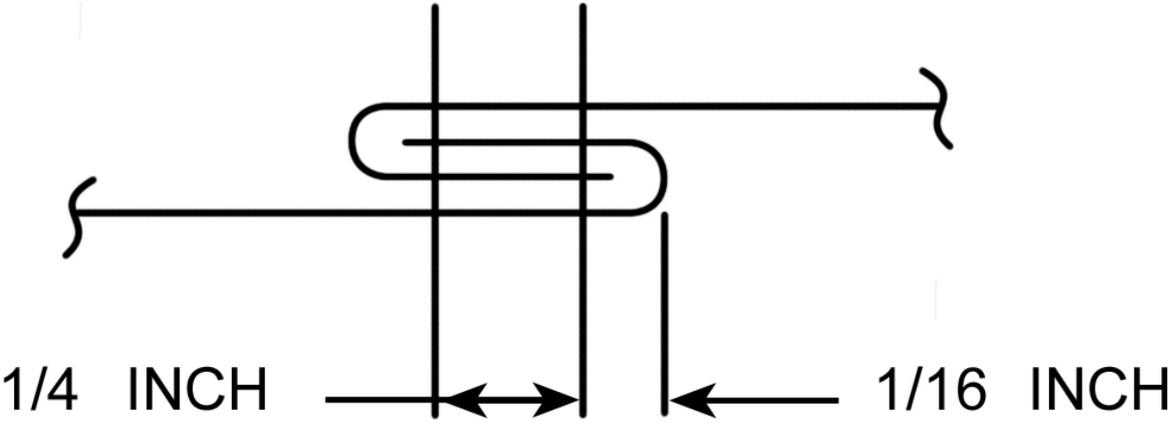
MIL-DTL-81905H(AS)

No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
14 (cont'd)	5/16 inch) with a single row of stitching 1/16 inch from the edge.			
	(c) Place the slide fastener at the marked location on the pocket to the inside; join with a single row of stitching 1/16 inch from the edge all around. (The bridge end shall be at the lowest point on the pocket opening.)	301	SSa-1	10-12
	(d) Slit through the center and diagonally at the ends. Turn the fabric under 1/4 inch; sew with a single row of stitching 1/16 inch from the folded edge.	301	LSd-1	10-12
	(e) Sew the bottom corners, the face sides of the material together, with a single row of stitching 3/8 inch from the edge.	301	SSa-1	10-12
	(f) Topstitch the sides and the bottom edge of the pockets, at the pattern marks, with a single row of stitching 1/16 inch from the folded edge.	301	OSf-1	10-12
	(g) Cut two 1¼ inch by 6 inch pieces from the basic fabric cut on a 45 degree bias as specified in 3.4.1.1. Fold the edges to center and then in half to form a 5/16 inch wide zipper thong. Sew around the perimeter 1/16 inch from the edge.	301	SSc-1	10-12
	(h) Thread a 6-inch piece through the pull of each slide fastener. Fold the strip in the center. Fold the raw ends under ½ inch and bar-tack. Sew another bar-tack close to the pull.	Bar-tack		40-42 stitches per inch
	(i) Cut four, 2-3/4 inch square of the basic fabric to reinforce the slide fasteners. Turn the outside edges of each reinforcement under 1/4 inch on all four sides, and stitch two reinforcements 1/16 inch from the edge, which will be adjacent to each end of the metal portion of the slide fastener (centered from the top and bottom on the inside of the pocket). "X" stitch inside box through all layers.	301	LSa-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
15	<p><u>Make Leg Socket Tab Assembly</u></p> <p>(a) Sear cut two pieces of 1½ inch wide nylon aromatic tape in accordance with the patterns, fold at the center, sew box “X” ¾ x 1-¼ inch, ⅛ inch from the folded edge, punch a ⅛ inch diameter hole through the center of box “X”, install button NASM27980-1B and socket NASM27980-6B through the hole at the center of box “X” stitch. Note: The tape for the leg socket tab may be cut on a straight angle.</p>	301	OSf-1	10-12
16	<p><u>Make Body Socket Tab Assemblies</u></p> <p>(a) Sear cut two pieces of 1-½ inch wide nylon aromatic tape in accordance with the patterns and fold in accordance with the pattern. Sew a box “X” ¾ X 1-¼ inch, ⅛ inch from the folded edge, punch a ⅛ inch diameter hole through the center of box “X” stitch, install button NASM27980-1B and socket NASM27980-6B through the hole at the center of box “X” stitch.</p> <p>(b) Fold the ¾ inch extended end over the short end. Sew around the tab with a single row of stitching 1/16 inch from the edge.</p>	301	OSf-1	10-12
17	<p><u>Construct Bladder</u></p> <p>(a) Construct the bladder as specified in 3.13 .</p>			

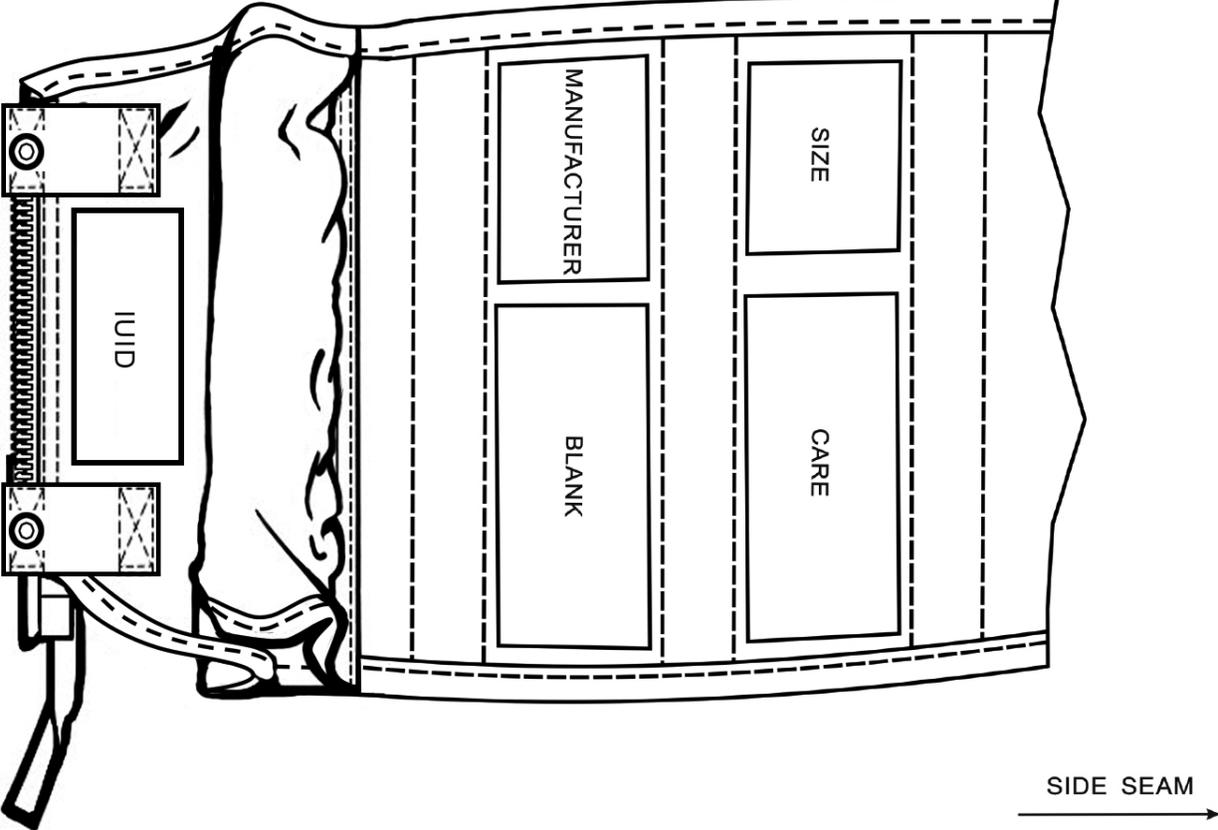
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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
18	<p><u>Make Body Covers</u></p> <p>(a) Join the left side of the body front to the left side of the body back with a double row of stitching, 1/16 inch from the edges, 1/4 inch gage per Detail A.</p>	301	Detail A	8-10
				
Detail A. Construction of body front to body back seam.				
<p>(b) Sew a 1¹/₈ inch wide, folded to a 5/8 inch bias-cut piece of the basic fabric over the center of the body front and body back seam (inside) with a single row of stitching, 1/16 inch from the edge, each side of the binding.</p>		301	LSd-1	10-12
<p>(c) Center the bias-cut pieces of the basic fabric on the stiffeners. Sew three rows of stitching from the end to end with one row in the center and one row on the right and the left sides of the center stitching 1/8 inch.</p>		301	SSa-1	10-12
<p>(d) Place the stiffeners at the pattern marks on the back body and the front body and stitch a single row of stitching, 1/16 inch from the edges, each side of the binding.</p>		301	LSa-1	10-12
<p>(e) Place the four lacer loop tapes on the body back, in accordance with the pattern marks, the ends even with the top and bottom edges of the body back, loops facing loops, and join with a double row of stitching 1/16 inch from the edge 3/16-inch gage.</p>		301	LSa-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
18 (cont'd)	(f) Bar-tack both ends of each lacer loop, across the full width of the lacer loop including the loop material, 3/8-inch from the top and the bar-tack bottom edges.	Bar-tack		40-42 Stitches per inch
	(g) Place the pile fastener tape on the lacer loop tape on the body back, 1/8 inch from the loops, and join with a single row of stitching 1/8 inch from the edge.	301	SSa-1	8-10
	(h) Bind across the top, catching the seam tape and the lacer loop tape in the binding, with bias binding as specified in 3.4.2 (finished dimension 5/16 inch) with a single row of stitching 1/16 from the edge.	301	BSc-1	10-12
	(i) Bind across the bottom of the body front and body back with bias tape specified in 3.4.2 (finished dimension 5/16 inch) with a single row of stitching 1/16 inch from the edge.	301	BSc-1	10-12
	(j) Position the size label, Identification label, care (laundrying) label, blank label and Item unique identification label (IUID) according to figures 1 and 2, centering all labels parallel to the stiffeners and to the bound edges of the back body section.		Fig 1	

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
TOP				
 <p>The diagram shows a top-down view of a bag with a zipper on the left side. The zipper has two pull tabs, each with a circular hole. A rectangular label with the text 'IUID' is positioned on the zipper pull area. The main body of the bag features several rectangular labels: 'MANUFACTURER' and 'BLANK' are on the left side, while 'SIZE' and 'CARE' are on the right side. Dashed lines indicate the layout of these labels. An arrow at the bottom right points to the right, labeled 'SIDE SEAM'.</p>				
FIGURE 1. <u>Closeup of position of labels.</u>				

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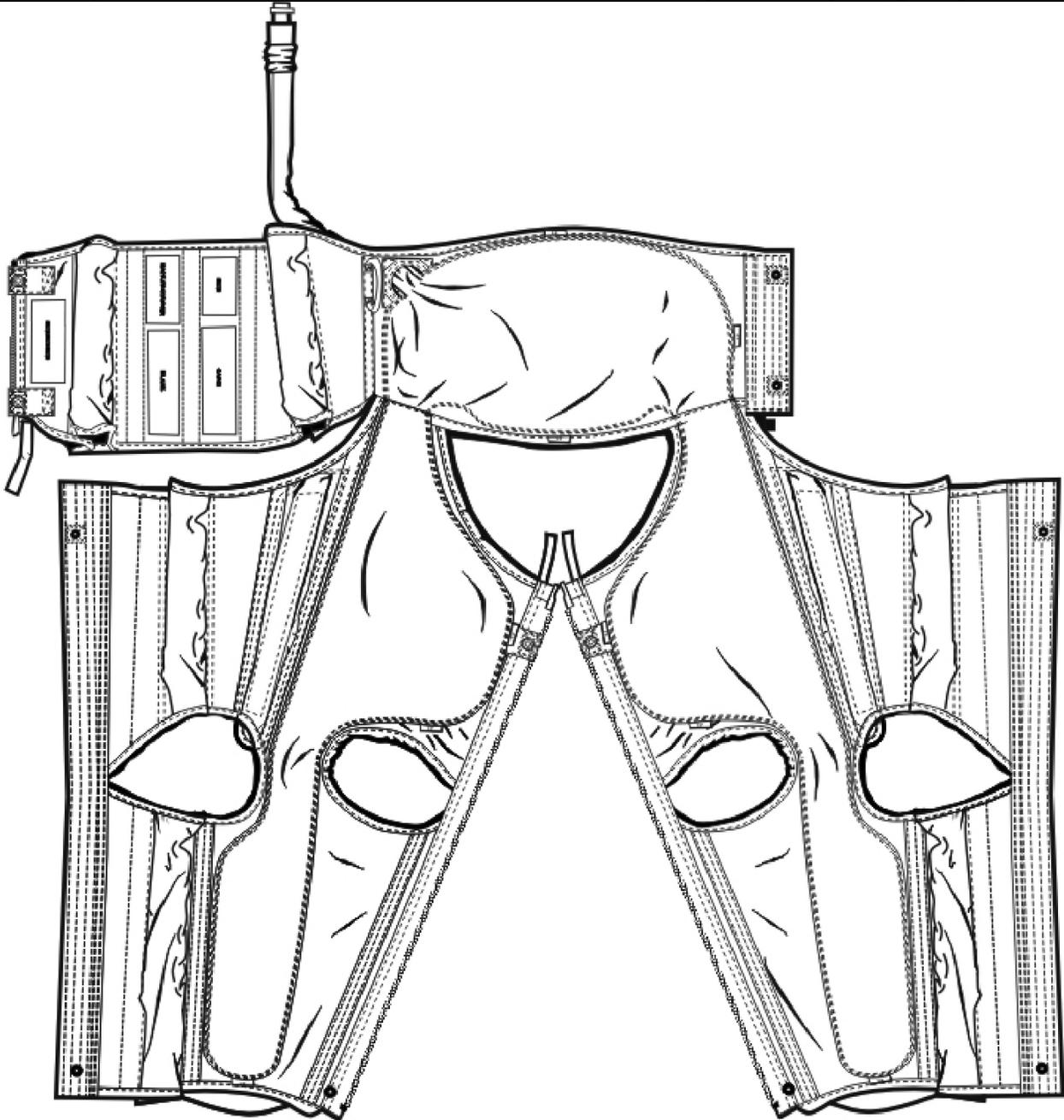
No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
 <p>The drawing shows a flight suit laid flat. On the left side, there is a vertical column of labels. From top to bottom, they are: a small rectangular label, a larger rectangular label with a horizontal line, and another small rectangular label. A cable is attached to the top of the suit. The suit has a high collar, a front zipper, and knee patches. The drawing uses solid lines for the main structure and dashed lines for internal seams and stitching details.</p>				

FIGURE 2. Position of labels.

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
18 (cont'd)	<p>(k) Sew each label to the back body section with a single row of stitching 1/8 inch from the edge on all four sides.</p> <p>(l) Cut a 1¼ by 4¾ inch piece from the basic fabric cut on a 45 degree bias as specified in 3.4.1.1. Fold the edges to center and then in half to form a 5/16 wide hanger loop. Sew around the perimeter 1/16 inch from the edge.</p> <p>(m) Fold the raw end under 3/8 inch and bar-tack one end 3/4 inch down from the top of the edge binding-on-binding strip over the seam joining the body front to the side back. Fold the binding to the inside; bar-tack the other end 1¾ inches from the top edge binding.</p> <p>(n) Turn the body lacer cover under 3/8 inch. Place the finished edge of the body lacer cover on the inner row of lacer loop tape, edge to edge; join with a double row of stitching 1/16 inch from the edge 3/16-inch gage.</p>	301	SSa-1	8-10
		301	SSc-1	10-12
		Bar-tack		40-42 stitches per inch
		301	LSa-2	10-12
19	<p><u>Attach Inflation Tube Opening Reinforcement</u></p> <p>(a) Lay the 3-5/16-inch-square reinforcement piece of the basic fabric at the marked location on the outside of the body front, evenly spaced over the hole position. Sew around the hole marking, 1-1/8-inch diameter, with a single row of stitching.</p> <p>(b) Trim the 1/4 inch inside stitching; and make six small cuts around the edge of the hole but no closer than 1/16 inch from the stitching. Turn the reinforcement piece through the opening; topstitch with a single row of stitching 1/16 inch from the topstitched edge.</p> <p>(c) Turn the outside edge of the reinforcement under 1/2 inch all around; sew to the body front with a single row of stitching 1/16 inch from the folded edge.</p>	301	SSe-2(a)	10-12
		301	SSe-2(b)	10-12
		301	LSd-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
19 (cont'd)	<p>(d) Lay the octagon-shaped leather reinforcement piece evenly spaced over the hole position, on the inside of the body front, and sew around the hole 3/32 inch from the edge on the inside. Sew around the outside edge of the leather patch 3/32 inch from the edge on the inside.</p> <p>(e) Reinforce the inner face of the inflation sleeve external covering (see 3.4.1.1) as indicated by patterns by stitching down a 4-1/2 inch x 1-1/2 inch piece of coated fabric (see 3.4.1.2) 1/8 inch from the edge. On the outer face of the external tube covering, over the reinforcement patch stitch a 1 inch wide x 4 inch long piece of hook fastener tape 1/8 inch from the edge.</p>	301	LSa-2	9-11
		301	LSa-2	9-11
20	<p><u>Attach Body Bladder Casing</u></p> <p>(a) Place the assembled body bladder casing on the body cover to the inside at the marked location with the bladder inflation sleeve on the left side; join with a double row of stitching 1/16 (+1/16 -1/32) inch from the edge 1/16-inch gage. Leave open the end of external inflation sleeve covering, the leg openings, and 1 inch at the tab location, top, bottom and right side.</p>	301	SSa-2	10-12
21	<p><u>Attach Assembled Body Fly</u></p> <p>(a) Turn the edge of the cloth under 3/8 inch on the body front. Sew the slide fastener tape side with the fly attached, with 1/4 inch of the slide fastener tape exposed, with a double row of stitching 1/16 inch from the folded edge 1/4 inch gage. The slide fastener shall be on the inside with the opening on the top and the closed end extending below the body panel by 1 inch. ±1/8 inch.</p> <p>(b) Sew the upper body button/socket tab to the inside of the side-back (front) on the right-hand side of the slide fastener edge as marked on the patterns, forming a box and "X" stitch, 3/8 inch by 1-3/8 inches, 1/16 inch from the edge. The upper button socket tab shall match the stud/eyelet on the body fly. Sew the lower button/socket tab 5½ inches (center</p>	301	LSd-2	10-12
		301	LSd-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
21 (cont'd)	<p>line to center line) below the upper button/socket tab. The lower button/socket tab shall match the lower stud/eyelet on the body fly.</p> <p>(c) Turn the edge of the cloth under 3/8 inch on the body front. Sew the slide fastener tape side without the fly attached, with 1/4 inch of the slide fastener tape exposed with a double row of stitching 1/16 inch from the folded edge, 1/4 inch gage. The slide fastener shall be on the inside with the opening on the top and the closed end extending below the body panel by 1 inch (+/- 1/8).</p>	301	LSd-2	10-12
22	<p><u>Make Leg Covers</u></p> <p>(a) Sew a 5/8-inch-wide, bias-cut piece of the basic fabric on the inside of the legs, at the positions marked at the sides of the pocket piece and at the thigh take-ups, with a single row of stitching 1/16 inch from the edge each side of the binding, right and left.</p> <p>(b) Turn the neck of the pockets inside 1/4 inch; sew across the knees at the marked locations with a double row of stitching 1/16 inch from the edge 1/16-inch gage, leaving 1/2 inch at each edge open, the pocket to the outside, the slide fastener closing to the outside.</p> <p>(c) Sew a 2 1/2-inch wide, 4 1/2-inch long reinforcement made of the bladder material, on the inside of the left leg at the position marked for the pile fastener tape, with a single row of stitching 1/8 inch from the edge.</p> <p>(d) Sew the pile fastener tape on the outside of the left leg, at the marked position, with a single row of stitching 1/8 inch from the edge on all four sides.</p> <p>(e) Place the webbing, with the button/socket assembly NASM27980-1B, -6B attached to the webbing, on the inside of the legs. The top edge of the webbing shall be parallel with, and down from the top, 1-3/4 inches. Sew across the back end of the</p>	301	LSd-1	10-12
		301	LSd-2	10-12
		301	LSa-1	10-12
		301	SSa-1	8-10
		301	LSd-1	10-12

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
22 (cont'd)	webbing, following the contour of the bladder casing locations, with a single row of stitching. The socket of the button/socket tab shall face the body and shall match the stud on the leg fly. <u>Attach Leg Bladder Casing</u>			
23	(a) Place the leg bladder casings on the legs at the marked locations on the patterns. Join at each side, leaving the top and 1 inch at the marked position for the tabs open, with a double row of stitching 1/16 (+1/16 -1/32) inch from the edge 1/16-inch gage. Fold back 1/4 inch at the neck of the pocket left loose so that the pocket is not stitched through in this operation.	301	LSd-2	10-12
24	<u>Attach Pockets</u> (a) Sew the pockets to the lower legs on the center of the basic fabric bias binding, down each side, with a single row of stitching 1/16 inch from the edge of the pocket binding. (b) Join the pockets at the bottom and the upper edges at the knee opening to the legs with a single row of stitching 1/8 inch from the edge.	301	LSd-1	10-12
25	<u>Bind Knee Openings and Bottom of Legs</u> (a) Bind the knee openings (including the pockets) and the bottom of the legs with bias binding (finished dimension 5/16 inch) with a single row of stitching 1/16 inch from the edge.	301	SSa-1	10-12
26	<u>Join Lacer Loop Tapes to Thighs and Calves</u> (a) Place the eight lacer loop tapes the length of each thigh and each calf, in accordance with the marks on the patterns, with the ends even with the top and the bottom edge, with loops facing loops. Join the lacer loop tapes to each thigh and each calf with a double row of stitching 1/16 inch from the edge 3/16-inch gage.	301	SSa-2	9-11

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No.	Description of Operation	Stitch Type	Seam and Stitching Type	Stitches Per Inch
26 cont'd	(b) Bar-tack both ends of the lacer loop, across the full width of the lacer loop including the loop material, 3/8 inch from the top and the bar-tack bottom edges.	Bar-tack		40-42 Stitches per inch
27	<p><u>Join Pile Fastener Tape to Thighs and Calves</u></p> <p>(a) Select the pile fastener tape for the thighs and calves in accordance with table IV.</p> <p>(b) Place the pile fastener tape on the lacer loop tape on each thigh and each calf, 1/8 inch from the loops, and join with a single row of stitching 1/8 (-0, + 1/16) from the edge.</p>	301	SSa-1	8-10
28	<p><u>Attach Assembled Leg (Leg Lacer Covers and Leg lower Lacer Covers.</u></p> <p>(a) Turn the raw edge of each assembled leg lacer cover and leg lower lacer cover under 3/8 inch; place the finished edge of each leg lacer cover on the inner row of the lacer loop tape, edge to edge. Join with a double row of stitching 1/16 inch from the edge 3/16-inch gage.</p>	301	LSa-2	10-12
29	<p><u>Make Elastic Kneeboard Subassembly</u></p> <p>Note: The respective webbing ends of the elastic kneeboard assembly shall be trimmed, if necessary, so that the elastic kneeboard subassembly lays flat across the thigh cover.</p> <p>(a) Sear-cut webbing (type II, class 1 of MIL-DTL-5038) in accordance with table V. Cut elastic (type I, class 1 of MIL-W-5664) in accordance with table V.</p> <p>(b) Sew elastic to the webbing in accordance with figure 3 and detail B. Repeat for remaining end.</p>	301	SSa-1	8-10

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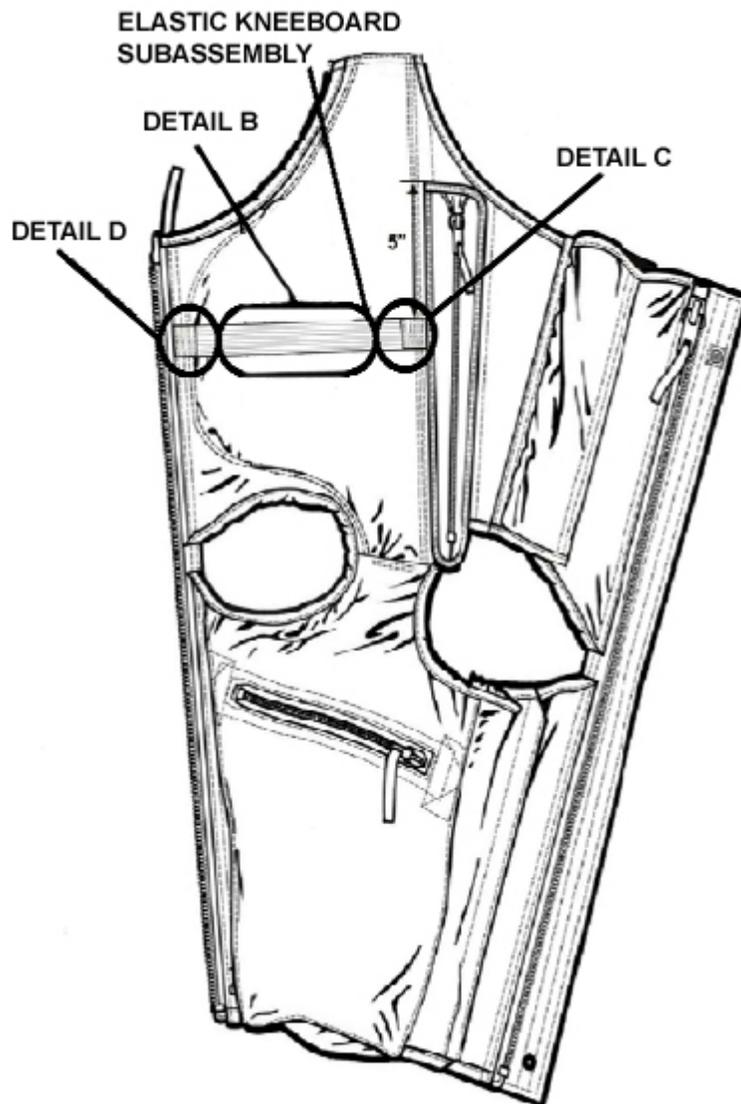
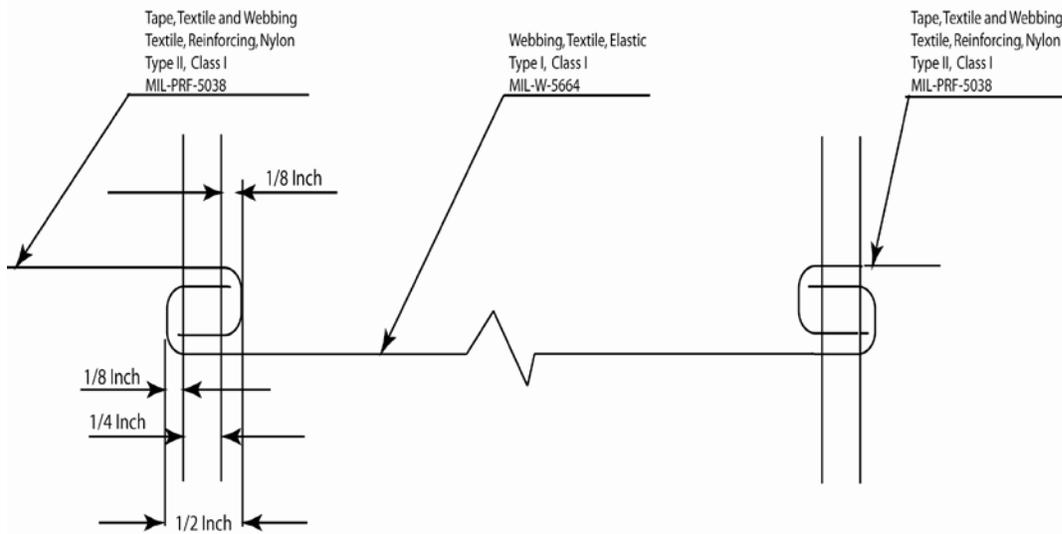


FIGURE 3. Position of elastic kneeboard subassembly.

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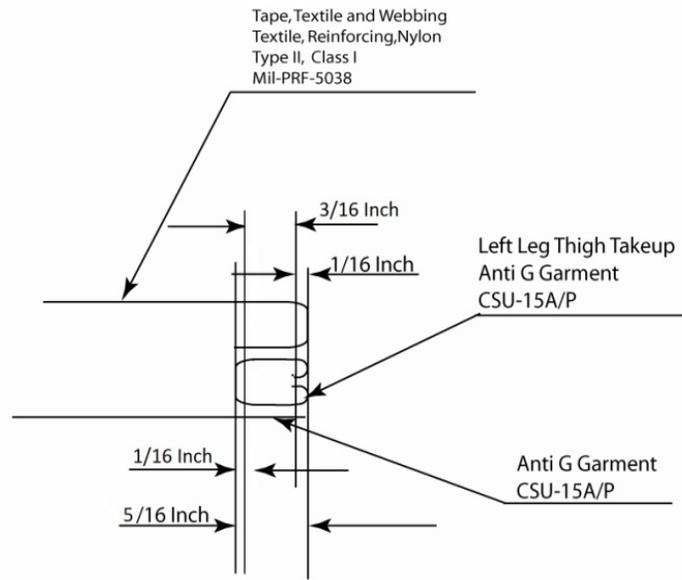


Detail B. Construction of Kneeboard Assembly.

NOTES:

All Dimensions shown in inches.

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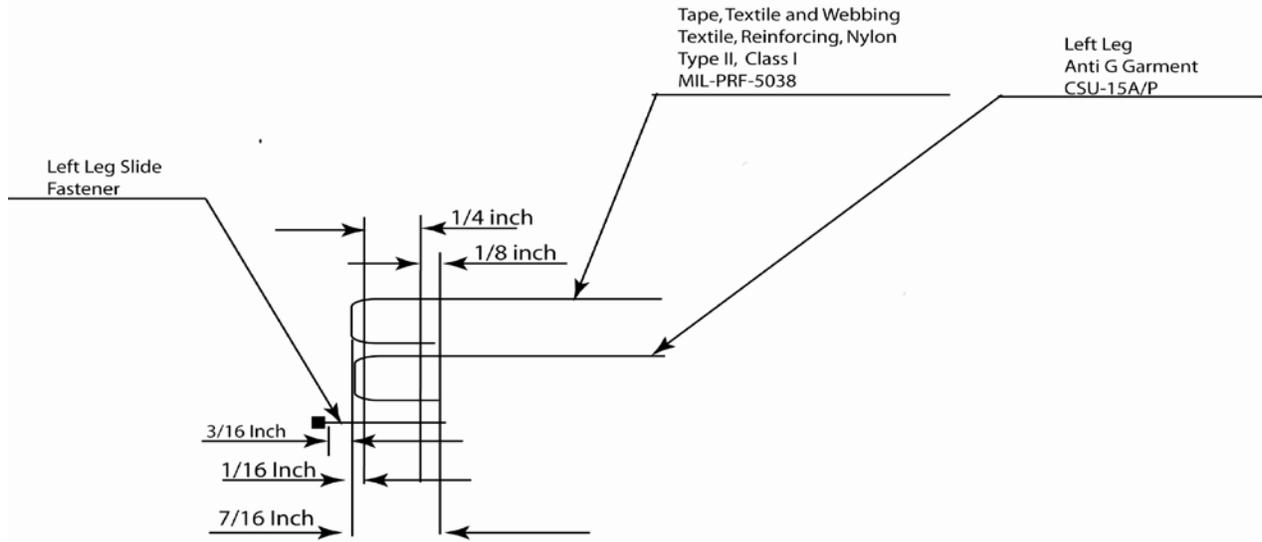


Detail C Attachment of Kneeboard Assembly to Leg Thigh Take-up Side.

NOTES:

All Dimensions shown in inches.

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Detail D. Attachment of Kneeboard Assembly to the Leg Slide Fastener Side .

NOTES:

All dimensions shown in inches.

No.	Description of Operation (Continued)	Stitch Type	Seam and Stitching Type	Stitches Per Inch
29 (cont'd)	<p>(c) Position one end of the kneeboard elastic subassembly (face-up) 5 inches from top of and perpendicular to each respective thigh take-up assembly in accordance with figure 3 and attach to the anti-G garment in accordance with detail C.</p> <p>Position the remaining free end of the kneeboard elastic subassembly (face-up) to the opposite side of the leg section square with the thigh-take up attachment point in accordance with figure 3 and attach to the anti-G garment in accordance with detail D.</p>	301	SSa-1	8-10

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No.	Description of Operation (Continued)	Stitch Type	Seam and Stitching Type	Stitches Per Inch
30	<p><u>Attach Thigh Take-Ups</u></p> <p>(a) Join the assembled right and left take-ups to the outside at the thigh, in accordance with the pattern marks, down the sides and across the top, with a double row of stitching 1/16 inch from the edge 3/16-inch gage. The slide fasteners shall close at the top.</p> <p>Note: Use proper thread tension and fabric tension to keep chain of the slide fastener flat. "Waviness" in the installed zipper is allowed as long as it does not affect the form, fit, or function of the garment.</p>	301	LSa-2	10-12
31	<p><u>Sew Around Reinforcement</u></p> <p>(a) Sew around the perimeter through all materials including the stiffeners of the reinforcement panel inside of the thigh take-ups with a single row of stitching 1/8 inch from the top and sides, 1/4 inch from the bottom.</p>	301	SSa-1	10-12
32	<p><u>Attach Each Assembled Leg Fly</u></p> <p>(a) Position the remaining free end of the kneeboard elastic subassembly (face-up) to the opposite side of the leg section in-line with the thigh-take up attachment point. Turn the edges of the cloth and elastic subassembly under 7/16 inch. Place the respective edges of the cloth down the legs on the slide fastener tapes so that the separating ends of the slide fastener will be at the top, the fly will open to the back, the corners at the knee holes will be spaced 3/4 inch apart on the slide fastener tape will be exposed. Sew each fly through all thicknesses to each slide fastener tape with a double row of stitching 1/16 inch from the edge 1/4 inch gage.</p>	301	LSd-2	10-12
33	<p><u>Install Lower Leg (Ankle) Snap Fasteners</u></p> <p>(a) Punch a 1/8 inch diameter hole on the lower edge of the legs to the side opposite the protective fly, 7/8 from the bottom edge and 5/8 inch from the edge of</p>			

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No.	Description of Operation (Continued)	Stitch Type	Seam and Stitching Type	Stitches Per Inch
33 (cont'd)	<p>the slide fastener teeth edge to the center of the snap fastener. Holes should be in a standardized location on both legs of the same suit.</p> <p>(b) Install the NASM27980-7B stud and the NASM27980-8B eyelet in 3.4.12 to match the button and socket, through the protective flies at the bottom of the legs, approximately 5/8 inch from the edge of the fly and 1 inch up from the bottom edge of the legs to the center of the snap fasteners, with the stud to the outside. The slide fastener must function properly as designed and the snap cannot come unsnapped or cause bulging at any time when the slide fastener is closed.</p>			
34	<p><u>Join Upper Ends of Legs to Body Cover</u></p> <p>(a) Join the upper ends of the legs to the body cover with the face sides of the material together, in accordance with the marks on the patterns, with a single row of stitching 1/4 to 3/8 inch from the edge.</p> <p>(b) Turn and topstitch with a single row of stitching 1/16 inch from the folded edge.</p> <p>(c) Sew an additional row of stitching 5/16 inch from the folded edge.</p>	301	LSq-2(a)	10-12
35	<p><u>Insert Adjustment Laces in Lacer Loops</u></p> <p>(a) Select the adjustment laces in accordance with table I.</p> <p>(b) Insert the adjustment laces into the lacer loops for the body as follows: Start lacing from the bottom similar to lacing shoes. Route the adjustment laces through each lacer loop on each side (loose ends exiting from the top lacer loops). Leave the lacing loose and flat so that adjustment is open to maximum width. Fold the excess lacing into a hank that is 3 inches long. Wrap the hank securely with a rubber band.</p>	301	LSq-2(b)	10-12
		301	SSa-1	10-12

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No.	Description of Operation (Continued)	Stitch Type	Seam and Stitching Type	Stitches Per Inch
35 (cont'd)	<p>(c) Insert the adjustment laces into the lacer loops for the thigh in the same manner as specified for the body in No. 35(b), except that the lacing shall start from the top lacer loops and exit from the bottom lacer loops. Fold the excess lacing into a hank that is 3 inches long. Wrap the hank securely with a rubber band.</p> <p>(d) Insert the adjustment laces into the lacer loops for the calf in the same manner as specified for the body in No. 35(b).</p>			
36	<p><u>Final Assembly</u></p> <p>(a) Install the bladder through the openings at the top of the legs (left open for this purpose) and into the bladder casing. Insert the bladder tabs through the 1 (+1/8 -0) inch wide openings; sew with a double row of stitching 1/16 inch from the edge, 1/16 inch gage.</p>	301	SSa-2	10-12
37	<p><u>Make anti-G Inflation Hose</u></p> <p>(a) Make spacer tube in accordance with Drawing 74204.</p>			

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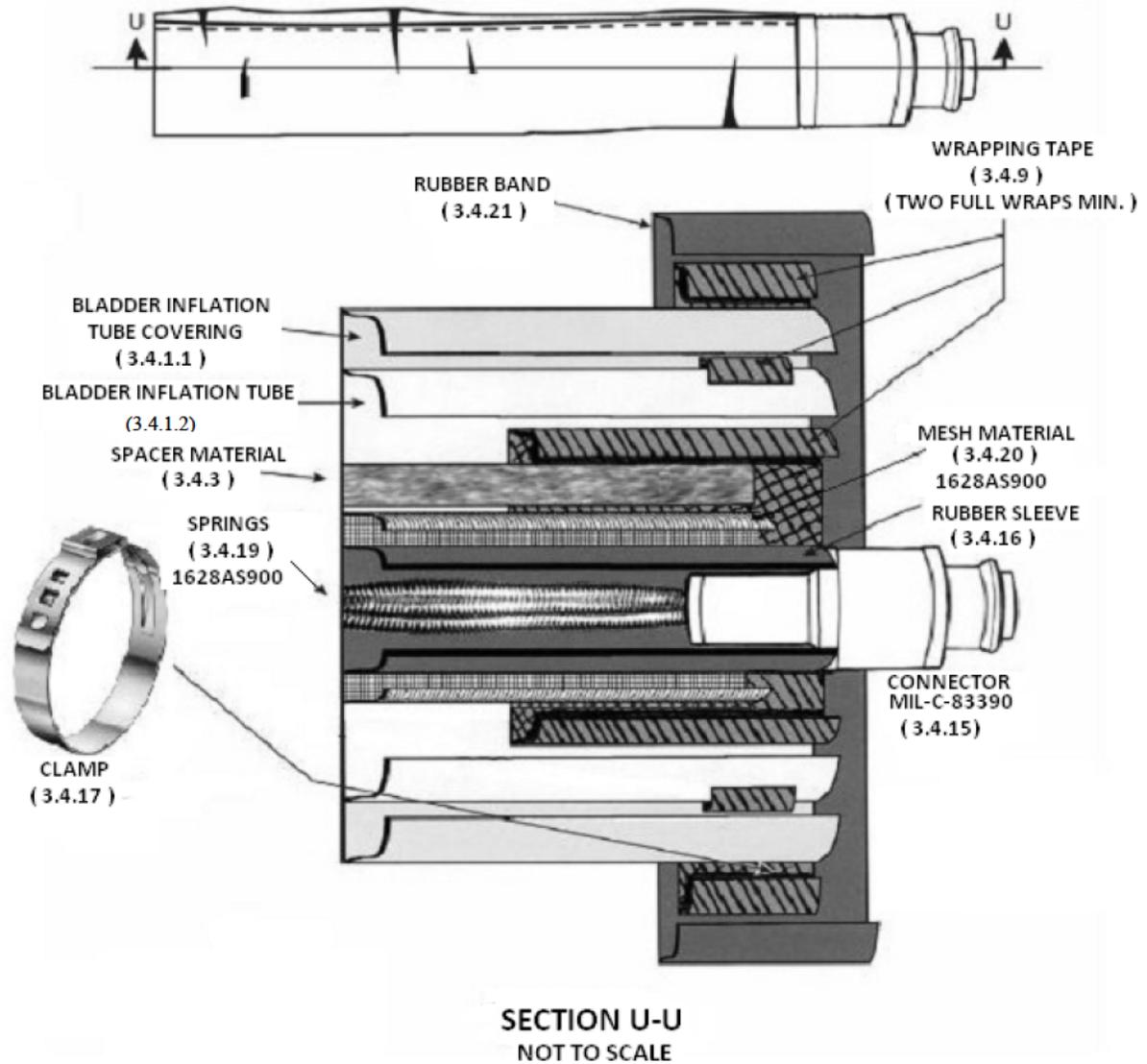


FIGURE 4. Anti-G inflation hose.

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No.	Description of Operation (Continued)	Stitch Type	Seams and Stitching Type	Stitches Per Inch
37 (cont'd)	Note: See section U-U of figure 4 for all steps below.			
	(b) Insert springs into the rubber sleeve so they end up 1/4 inch from the wide labeled part of the connector.			
	(c) Slide spacer tube and spacer material over the connector extension to 1 inch from the wide labeled part of the connector.			
	(d) Add 2 wraps of 1 inch tape to hold spacer tube and spacer material in place.			
	(e) Slide bladder inflation tube up to be even with the wide labeled part of the connector and add 3 wraps of 1 inch tape to secure in place.			
	(f) Pull the bladder inflation tube covering up so that it is even with the wide labeled part of the connector.			
	(g) Position the Oetiker clamp PN: 16700031 so that it is positioned 1/2 inch from the end.			
	(h) Cover the Oetiker with 1½ wraps of 1 inch tape. This tape will assist in sliding the rubber band over the Oetiker clamp ear.			
	(i) Slide the rubber band over the Oetiker clamp so that it is positioned even with the wide labeled part of the connector.			

3.13 Bladder construction.

a. The polyurethane coated nylon taffeta cloth specified for the bladder in 3.4.1.2 shall be cut in accordance with the applicable patterns. Half of the bladder with the coated surface face up shall be laid on a clear flat surface.

b. Four strips of the spacer material specified in 3.4.3 shall be cut in lengths required by the applicable pattern except that the horizontal spacer extending across the inside of the body bladder shall have 2 to 3 inches of slack (the length of spacer between the two patches in the body bladder shall be 2 to 3 inches longer than the distance in the flat between the two patches). The width of the spacer in the bladder extension and the abdominal bladder shall be ¾ inch. The width of the leg space shall be 1 inch.

c. The ends of the legs and abdominal spacer material shall be overlapped and joined to patches that are made of the polyurethane coated nylon cloth specified in 3.4.1.2, and that are 1 inch by 1¾ inches by bartacking as show on figures 5 and 6. Two additional pieces of spacer

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material 1 inch wide by 10 inches long shall be sewn to the upper portion of the leg spacer material (one length per leg).

d. The upper end of the piece of spacer material that is 1 inch by 10 inches shall be placed 1 inch below the patch joining the leg spacer to the abdominal spacer and shall be sewn to the leg spacer with two rows of stitching $\frac{1}{4}$ inch from each edge of the leg spacer with the thread specified in 3.4.11, seam type in accordance with ASTM D6193, LSA-2, 6-8 stitches per inch, and all ends backstitched a minimum of 1 inch. The bladder extension spacer material shall be overlapped on the abdominal spacer material 2-1/2 inches from the joint between the leg and abdominal spacer material and shall be similarly bartacked (no patch).

e. The spacer material (anti-kink system) shall be positioned on the coated side of the bottom half of the bladder as indicated on the applicable pattern and then secured by radio frequency (RF) welding or cementing patches to the bottom of the bladder as shown on figure 5.

f. The top half of the bladder shall be superimposed and aligned on the bottom half of the bladder. The bladder shall be welded together so that the bonded area will be $\frac{1}{8}$ ($\pm\frac{1}{32}$) inch wide, $\frac{1}{16}$ to $\frac{1}{2}$ inch from the edge of the bladder, and $\frac{1}{16}$ inch from each seam. The welded seam shall be straight, continuous, and parallel to the edge of the bladder.

g. No part of the spacer material or of the attachment patches shall be caught in any portion of the welded seam. The completed bladder shall then be inflated to 2 pounds per square inch (psi) air pressure. The seams of the inflated bladder shall be inspected for proper jointing and adhesion. The inflatable area of the completed bladder shall not be greater than $\frac{5}{8}$ inch and not less than $\frac{3}{16}$ inch from the edge of the patterns. The upper tab of the finished bladder shall be stamped with the abbreviated anti-G garment size.

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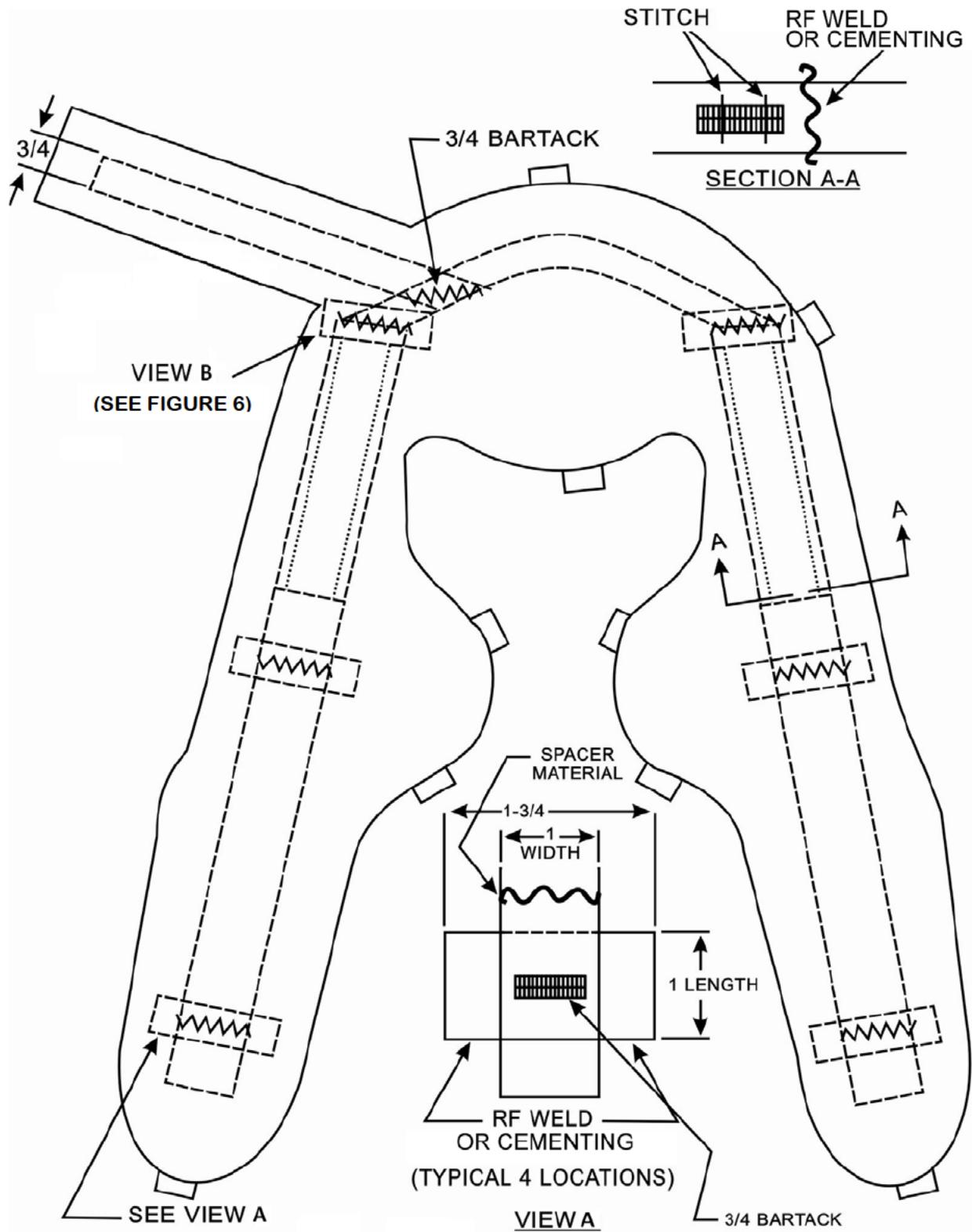


FIGURE 5. Bladder construction View A.

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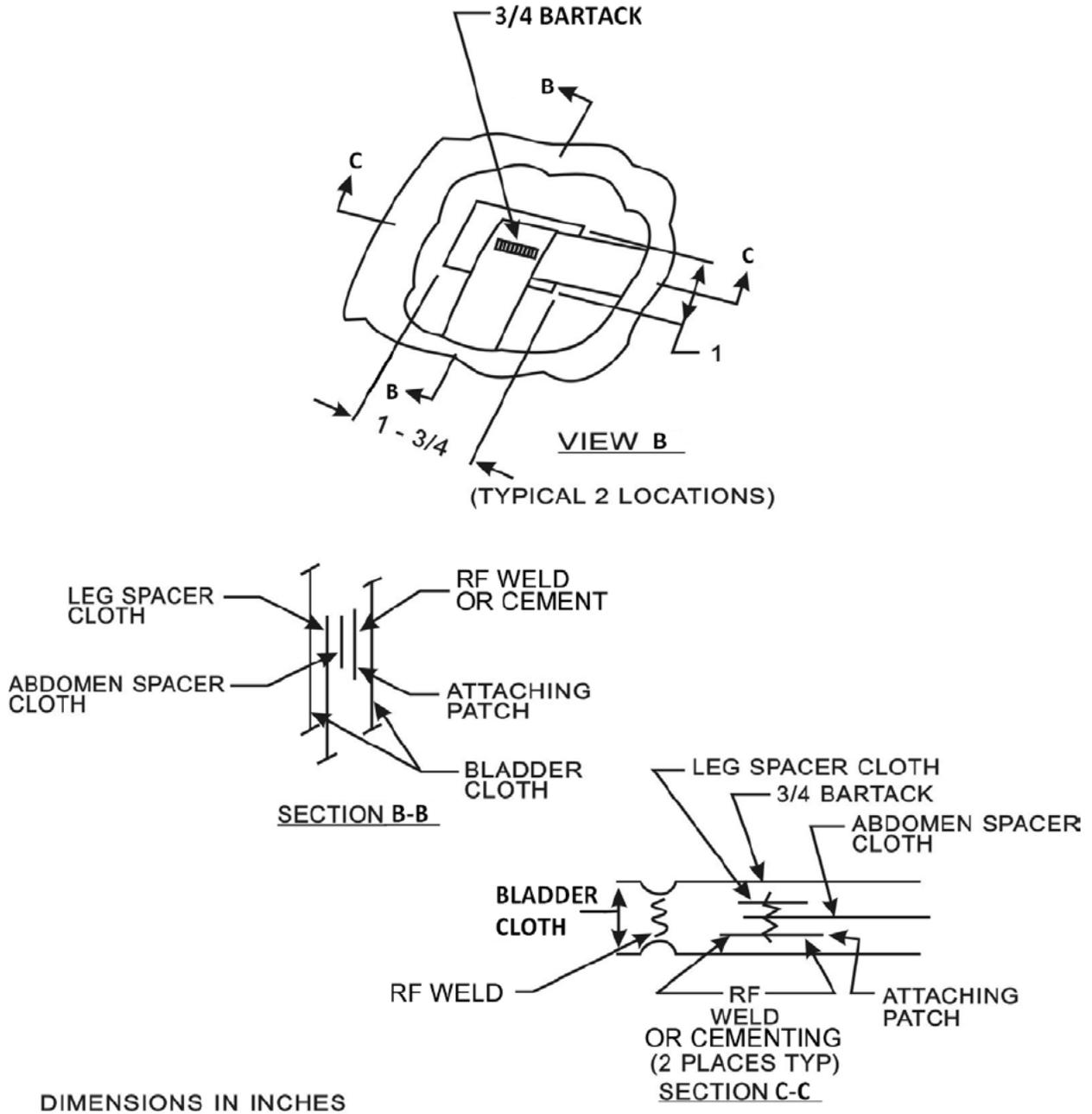


FIGURE 6. Bartack detail View B.

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3.14 Performance.

3.14.1 Leakage. The bladder shall not lose more than 0.5 psig of air pressure in 60 seconds when tested as specified (see 4.9.2).

3.14.2 Endurance. The anti-G garment shall not develop any structural defects when tested as specified (see 4.9.3). Structural defects shall include, but not be limited to, material torn, seam separation, slide fastener slider lock broken, slide fastener chain separated, snap fasteners unsnapped, broken stitches, and clamps loosened or broken. After the anti-G garment has met the requirements of 3.14.2, it shall meet the requirements in 3.14.1.

3.14.2.1 Post endurance bladder inspection. After completion of the endurance test, the garment shall be subjected to an additional leakage test (see 4.9.3) and the bladder post endurance inspection (see 4.9.9).

3.14.3 Inflation time. The anti-G garment shall inflate to a pressure of 8 psig in not more than 3 seconds when tested as specified (see 4.9.4).

3.14.4 Low temperature storage. The anti-G garment shall not be adversely affected by storage at a temperature of -60 °F when tested as specified (see 4.9.5).

3.14.5 High temperature storage. The anti-G garment shall not be adversely affected by storage at a temperature of 160 °F when tested as specified (see 4.9.6).

3.14.6 Low temperature operation. The anti-G garment shall operate when tested at a temperature of -30 °F when tested as specified (see 4.9.7).

3.14.7 Bond strength (bladder). The force required to separate the bonded bladder halves shall be not less than 40 pounds when tested as specified (see 4.9.8).

3.15 Finished measurements. (Refer to table XV and figure 7.) The finished measurements of the anti-G garment shall be as specified in table XV. The minimum finished measurements specified in table XV shall be the measurements of the finished anti-G garment when its adjustment laces are tight and the thigh take up slide fasteners are completely closed. The maximum finished measurements specified in table XV shall be the measurements of the finished anti-G garment when its adjustment laces are loose and the thigh take up slide fasteners are completely open and the fabric is stretched to the limit of the solid fabric with the lacer cover closed.

3.16 Workmanship. Completed garments shall be free of all loose thread, lint, foreign matter, irregularities or defects that could adversely affect performance or durability.

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4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.3).
- b. First article inspection (see 4.4).
- c. Conformance inspection (see 4.5).

4.2 Inspection conditions.

4.2.1 Atmospheric conditions. Unless otherwise specified herein or in specified test methods, all tests except visual and examinations shall be made at an atmospheric pressure of 28 to 32 inches of mercury, at a temperature of 77 ± 10 °F, and at a relative humidity of 80 percent or less. Where tests are made with atmospheric pressure or temperature different from these values, allowance shall be made for the change in instrument reading.

4.2.2 Connector. A connector conforming to MS27755 (see 6.2) shall be used to connect the anti-G garment to the air source for tests that require inflation and deflation cycling of the anti-G garment.

4.2.3 Air. The air used to test the anti-G garment as specified herein shall not contain any oil or moisture.

4.2.4 Air pressure gauge. Air pressure gauges utilized shall be in pounds per square inch (psig), and shall be precise to at least one hundredth of a psig. The gauge shall have a current calibration.

4.3 Qualification inspection. The qualification samples described in 4.3.1 shall be subjected to the qualification inspection. The qualification inspection for the two anti-G garments shall consist of the test methods described in 4.9.1 through 4.9.9 and 4.10. The qualification inspection for the bladder shall consist of the test methods described in 4.9.8 and 4.9.9 (see table X).

4.3.1 Qualification samples. The qualification samples shall consist of one anti-G garment in size medium regular, one anti-G garment in size large long, two complete bladders in size medium regular and one complete bladder in size large long. (Note: Although the qualification samples include three bladders, only one bladder shall be subjected to the qualification inspection.)

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TABLE X. Qualification inspections.

Inspection	Requirement	Test Method
Visual Examination	3.5	4.9.1/table XIII
Leakage	3.14.1	4.9.2
Endurance	3.14.2	4.9.3
Inflation Time	3.14.3	4.9.4
Low Temperature Storage	3.14.4	4.9.5
High Temperature Storage	3.14.5	4.9.6
Low Temperature Operation	3.14.6	4.9.7
Bond Strength (Bladder)	3.14.7	4.9.8
Dimensional/Finished Measurements	3.15/table XV	4.10/figure 7
Bladder Post-Endurance/ Post-Leakage Visual Inspection	3.13/figure 5	4.9.9

4.4 First article inspection. The first article samples specified in 4.4.1.1 shall be subjected to the first article inspection. The first article inspection for the anti-G garment shall consist of the test methods described in 4.9.1, 4.9.2, 4.9.3, 4.9.4, and 4.10. The first article inspection for the bladder shall consist of the test method described in 4.9.8. The first article inspection shall be unacceptable if the requirements are not met.

4.4.1 First article samples. The first article samples shall be manufactured after the award of the contract and before production of the anti-G garment. The first article samples shall consist of the items specified in 4.4.1.1 and shall be representative of the materials, the components, the construction, and the workmanship to be used in the production items.

4.4.1.1 First article sample quantities. The manufacturer of the anti-G garment shall furnish one anti-G garment for every size in the current contract and one bladder assembly for every size in the current contract. First article submittals consisting of four or more sizes shall have four garments selected for endurance testing. For first article submittals of less than four sizes, two garments shall be selected for endurance testing.

TABLE XI. First article inspections.

Inspection	Requirement	Test Method
Visual Examination	3.5	4.9.1/table XIII
Leakage	3.14.1	4.9.2
Endurance	3.14.2	4.9.3
Inflation Time	3.14.3	4.9.4
Bond Strength (Bladder)	3.14.7	4.9.8
Dimensional/Finished Measurement	3.15/table XV	4.10/figure 7

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4.5 Conformance inspection. The conformance inspection shall be performed on the finished anti-G garment and bladder assemblies (see 4.6, 4.7 and 4.8). The conformance inspection for the anti-G garment shall consist of the test methods described in 4.9.1, 4.9.2, 4.9.3, 4.9.4, 4.9.9, and 4.10. Unless otherwise specified within this specification, the verifications shall be performed in accordance with ASQ Z1.4. Each lot shall be inspected for conformance. Each lot inspection shall consist of the examinations and tests specified in table XII.

TABLE XII. Conformance inspections.

Inspection	Requirement	Test Method
Visual Examination	3.5	4.9.1/table XIII
Leakage	3.14.1	4.9.2
Endurance	3.14.2	4.9.3
Inflation Time	3.14.3	4.9.4
Bladder Post-Endurance/Post-Leakage Visual Inspection	3.13/figure 5	4.9.9
Dimensional/Finished Measurement	3.15/table XV	4.10/figure 7

4.6 Sampling inspection. Sampling inspection shall be conducted in accordance with plans A and B for the end items and components (see 4.7).

4.7 Lot formation. Each lot shall consist of anti-G garments that have been manufactured under the same conditions and submitted for inspection at the same time. For Plan A lots consisting of 150 garments or less, only one garment shall be subjected to endurance testing. For Plan B lots consisting of 151 to a maximum of 500 garments, two garments shall be subjected to endurance testing.

4.8 Rejection and retest. When garments selected from the submitted lot fail to meet the specification requirements for pre-endurance leakage, endurance, post-endurance leakage, and inflation time, the lot shall be rejected. Visual defects classification shall be determined in accordance table XII and lot rejection or acceptance shall be determined in accordance with acceptable quality level as written in the contract. If the lot is rejected acceptance of all items in the lot shall be withheld until the extent and cause of the failure have been determined. After correction, all of the sampling tests shall be repeated.

4.9 Test methods.

4.9.1 Examination of product. The anti-G garment and bladders shall be examined to determine compliance with the requirements of this specification with respect to materials, finished measurements, identification marking, and workmanship. Defects found during this examination shall be classified as specified in table XIII.

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TABLE XIII. Classification of defects.

No.	Defect <u>1/</u>	Critical	Major	Minor
1.	Materials a. Materials not conforming to specified requirements unless otherwise classified herein.	1		
2.	Fabric imperfection a. See FED-STD-4 <u>2/</u>		101	
3.	Slide fasteners <u>3/</u> a. Fabric seam on tape catching in slider or slide not operating freely. b. Slide fastener not specified type, style or length. c. Any part of slide fastener assembly omitted, bent, or broken. d. Separation of slide fastener chain. e. Pull tab missing. f. Stiffener missing. g. Pull tab not specified type. h. Stiffener not specified type.	2 3 4 5	102 103 104 105	
4.	Color a. Mismatched/shaded parts. b. Any component color not approximately matching specified color shade.		106 107	
5.	Snap fasteners <u>4/</u> a. Stud not securely clenched, damaged spring, too tight or damaged snap fastener. b. Stud not aligned with the socket causing noticeable bulge or twist when snapped. c. Snap fastener not holding together. d. Assembled bottom and socket rotate when hand force is applied for NASM27983 and NASM27980. e. Snap fastener not specified type. f. Snap fastener not separating under normal pull.	6	108 109 110 111 112	
6.	Assembly a. Incorrectly assembled, that is, reversed seams, not specified type of seam, not specified type of stitch, or misplaced or reversed components, etc. b. Incompletely assembled, that is, any component or required operation omitted.	7 8		

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TABLE XIII. Classification of defects - Continued.

No.	Defect <u>1/</u>	Critical	Major	Minor
7.	Identification of Product a. Any label missing, misplaced, or illegible. b. IUID label will not scan. c. Information on any label incorrect or incomplete.	9 10 11		
8.	Workmanship a. Hole, cut, tear, or needle chew. b. Darn or mend affecting serviceability. c. Darn or mend affecting appearance. d. Stain, oil spot, or dirt over ¼ inch diameter (per instance). e. Stain, oil spot, or dirt up to or equal to ¼ inch in diameter in not more than two places on one suit. f. Stain, oil spot, or dirt up to or equal to ¼ inch in diameter in three or more places on one suit.	12 13	113 114 115	201
9.	Measurements a. Any finished measurement not within specified tolerance. - Waist, thigh, ankle circumference - Leg length at fastener, hose length	14	116	
10.	Hook and loop assembly <u>5/</u> a. Hook and loop assembly not specified type. b. Hook not aligned with loop (tolerance 1/8 inch) - More than 1/8 inch but less than ¼ inch - Equal to or more than ¼ inch - Affecting operation.	15 16	117	202
11.	Stitches and seams a. Stitching missing or incomplete. b. Stitch tension too tight, too loose for 2 or more stitches c. Stitching broken or cut. - On lacer cover, slide fastener pull tape, slide fastener loops - On snap tabs, labels - All other areas d. Skipped stitch. - On lacer cover, slide fastener pull tape, slide fastener loops - On snap tabs, labels - All other areas	15 16 17	118 119 120	203 204

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TABLE XIII. Classification of defects - Continued.

No.	Defect <u>1/</u>	Critical	Major	Minor
11.	e. Run-off. f. Open or separated seam. g. End of stitching not securely backstitched as specified. h. Stitching margins out of tolerance unless otherwise classified herein. <u>6/</u> i. Thread ends not trimmed to ¼ inch maximum.	18 19	121 122	205
12.	Bladder a. Spacer material or the attachment patches caught in any portion of the welded seam. b. The seams of the inflated bladder not proper joining and adhesion. The seams not straight, continuous, and parallel to the edge of the bladder. c. The distance from the outside edge of the weld to the edge of the bladder material shall not be greater than ½ inch or less than 1/16 inch. d. The upper tab of the finished bladder shall be stamped. e. Bladder fin edge (not tab) caught in body bladder cover stitching. f. Puckering of the bladder or material at the bladder tabs.	20 21 22	123 124 125	
13.	Leather a. Hole in leather (needle hole in less than 3 places), other than perimeter stitching. b. Hole in leather (needle hole in 3 or more places), other than perimeter stitching. c. Hole in leather (hole larger than a needle).	23	126	206
<p><u>1/</u> All defects are counted per instance unless otherwise noted.</p> <p><u>2/</u> Fabric imperfections that would affect the function or appearance of the anti-G garment shall be considered major defects.</p> <p><u>3/</u> The slide fastener shall be checked for proper function and attachment by zipping closed and unzipping the slide fastener at least two times.</p> <p><u>4/</u> The snap fastener shall be checked for proper function and attachment by snapping closed and unsnapping the snap fastener at least three times.</p> <p><u>5/</u> The hook assembly shall be checked by attaching the hook to the loop and closing the slide fastener. Alignment of the hook assembly shall not interfere with the slide fastener operation.</p> <p><u>6/</u> This classification of defects for stitching margins shall not apply to any stitching margins for which a tolerance has been specified in table VI. A stitching margin that is not within the tolerance specified in table VI shall be classified as a major defect.</p>				

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4.9.2 Leakage. The bladder in the anti-G garment shall be inflated to a pressure of 12 psig indicated by a gage. The air supply shall be shut off securely. After a minimum of 60 seconds, the pressure in the bladder shall be checked and readjusted, if necessary, to the original pressure of 12 psig. A minimum of 60 seconds after the pressure has been checked and re-adjusted, the pressure in the bladder shall be checked. If the pressure in the bladder is less than 11.5 psig, the anti-G garment shall be rejected. While the anti-G garment is still inflated, it shall be examined for material and constructional failure, separation of seams and components, change in location of slide fastener sliders, separation of slide fastener chains, twisting, distortion and puckering of the anti-G garment. After this examination is completed, the bladder of the anti-G garment shall be completely deflated.

4.9.3 Endurance. The anti-G garment shall be fitted to the inanimate model specified in 4.12. The anti-G garment shall be automatically inflated 1,000 times, in accordance with table XIV, to a pressure of not less than 15 psi and then examined for structural defects. Upon completion of the endurance test, the anti-G garment shall be leakage tested in accordance with 4.9.2.

TABLE XIV. Inflation of anti-G garment.

Minimum Pressure (psi)	Maximum Seconds Permitted to Inflate Garment to Minimum Pressure	Minimum Seconds Permitted to Deflate Garment to Zero psi (Gage Pressure Reading)	Minimum Cycles
15	8	4	5 per minute
12	8	4	5 per minute
6	30	10	10 per hour

4.9.4 Inflation time. The anti-G garment shall be fitted to the inanimate model specified in 4.12. The anti-G garment shall be connected to a source of air with a free flow of 10 cubic feet per minute. The regulator shall be adjusted so that the pressure shall be not greater than 12 psig. The bladder in the anti-G garment shall inflate to a pressure of 8 psi in not greater than 3 seconds when the pressure is applied.

4.9.5 Low temperature storage. The anti-G garment shall be packaged in a corrugated box with maximum dimensions of 13½ by 4½ by 8½ inches. The packaged anti-G garment shall be subjected to a temperature of -60 °F or colder for at least 48 hours. The packaged anti-G garment shall then be kept at room temperature for at least 24 hours. The anti-G garment shall be removed from the box, fitted to the inanimate model specified in 4.11, and inflated 500 times, in accordance with table XIV, to a pressure of not less than 12 psi. At the completion of this test, the anti-G garment shall be examined for failures or defects in the material or workmanship.

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4.9.6 High temperature storage. The anti-G garment shall be packaged in a corrugated box with maximum dimensions of 13½ by 4½ by 8½ inches. The packaged anti-G garment shall be subjected to a temperature of plus 160 °F or warmer for at least 4 hours. The packaged anti-G garment shall then be kept at room temperature for at least 24 hours. The anti-G garment shall be removed from the box, fitted to the inanimate model specified in 4.11, and inflated 500 times, in accordance with table XIV, to a pressure of not less than 12 psi. At the completion of this test, the anti-G garment shall be examined for failures or defects in the material or workmanship.

4.9.7 Low temperature operation. The anti-G garment shall be subjected to a temperature of -30 °F or colder for a period of 4 hours. During the 4-hour period the anti-G garment is subjected to the -30 °F, it shall be inflated at the rate of 10 times per hour to a pressure of not less than 6 psig in accordance with table XIV. At the completion of this test, the anti-G garment shall be examined for failures or defects in the material or workmanship. Structural defects or any other defects are cause for rejection of the anti-G garment.

4.9.8 Bond strength (bladder). Five specimens shall be cut from different locations of the bladder so that the specimens will be representative of the sealing of the entire bladder. The specimens shall be taken from the straight edge of the bladder. Each of the specimens shall be cut across and perpendicular to the seam of the bladder and shall be $1 \pm 1/16$ inch wide and $6 \pm 1/16$ inches long. A suitable inspection apparatus equipped with an autographic recording device (see ASTM D5034) shall be used to conduct the bond strength test. The front clamp of each jaw of the inspection apparatus shall be 1 inch by 3 inches. The rate of separation of the jaws of the inspection apparatus under no load shall be $12 \pm 1/2$ inches per minute. One of the free ends of a specimen (an end that is not bonded) shall be placed in the upper jaw of the inspection apparatus. The other free end of the specimen shall be placed in the lower jaw of the inspection apparatus. The bonded portion (seam of bladder) of the specimen shall be in the center between the two jaws. The jaws shall be separated until either breakage of the cloth or separation of the bond occurs. The highest value required to separate the bonded specimens or to break the cloth shall be recorded as the test result of the individual bonded specimen. This test shall be repeated until the other four specimens have been tested for bond strength. The lowest value obtained from the tests of the five specimens shall be reported as the test result for the bond strength test and shall be not less than 40 pounds.

4.9.9 Bladder post-endurance/post-leakage visual inspection. After the successful completion of endurance testing and successful completion of post-endurance leakage testing, the bladder assembly shall be carefully removed from the casing assembly of the endurance tested anti-G garments. To remove the bladder from the anti-G casing carefully remove the stitching on the (9) bladder tabs. Remove the rubber sleeve and clamps or clamp and tape from the hose ensuring there are two full wraps of tape, separate the connector from the hose, and remove the spring assembly. Make a 5-inch incision in the casing material only on the inside of the abdomen bladder area. NOTE: use extreme caution not to cut the bladder or any stitching. Remove the complete bladder assembly through this incision. The bladder shall be visually inspected in accordance with 3.13 and figures 5 and 6.

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4.10 Finished measurements. The finished measurements (see figure 7) shall be taken with the garment spread flat. All measurements shall be taken utilizing a retractable metal tape measure. The finished measurements shall be in accordance with table XV. The following measurements shall be taken:

- a. Maximum Waist Circumference - With the waist adjustment laces fully loosened, measure the waist circumference straight across the top edge of the waist from the slide fastener end stop to slide fastener end stop.
- b. Minimum Waist Circumference - With the waist adjustment laces fully tightened, measure the waist circumference straight across the top edge of the waist from the slide fastener end stop to slide fastener end stop.
- c. Maximum Thigh Circumference - With the thigh take up slide fasteners fully opened and adjustment laces completely loosened, measure from the slide fastener retainer unit of the rear thigh to slide fastener pin unit of the front thigh.
- d. Minimum Thigh Circumference - With the thigh take up slide fasteners completely closed and adjustment laces fully tightened, measure from the slide fastener retainer unit of the rear thigh to slide fastener pin unit of the front thigh.
- e. Leg Length - Measure at the slide fastener location from the top of the slide fastener retainer to the bottom end stop of the slide fastener of the leg opening.
- f. Maximum Ankle Circumference - With the calf adjustment laces fully loosened, measure straight across the leg below the calf pocket from the rear slide fastener top stop to the front slide fastener top stop.
- g. Minimum Ankle Circumference - With the calf adjustment laces fully tightened, measure straight across the leg below the calf pocket from the rear slide fastener top stop to the front slide fastener top stop.
- h. Sleeve Assembly - Measure the length of the hose assembly from the end of the MIL-C-83390 connector (see figure 4) to the point where the hose sleeve inserts to the hole in the left body front.

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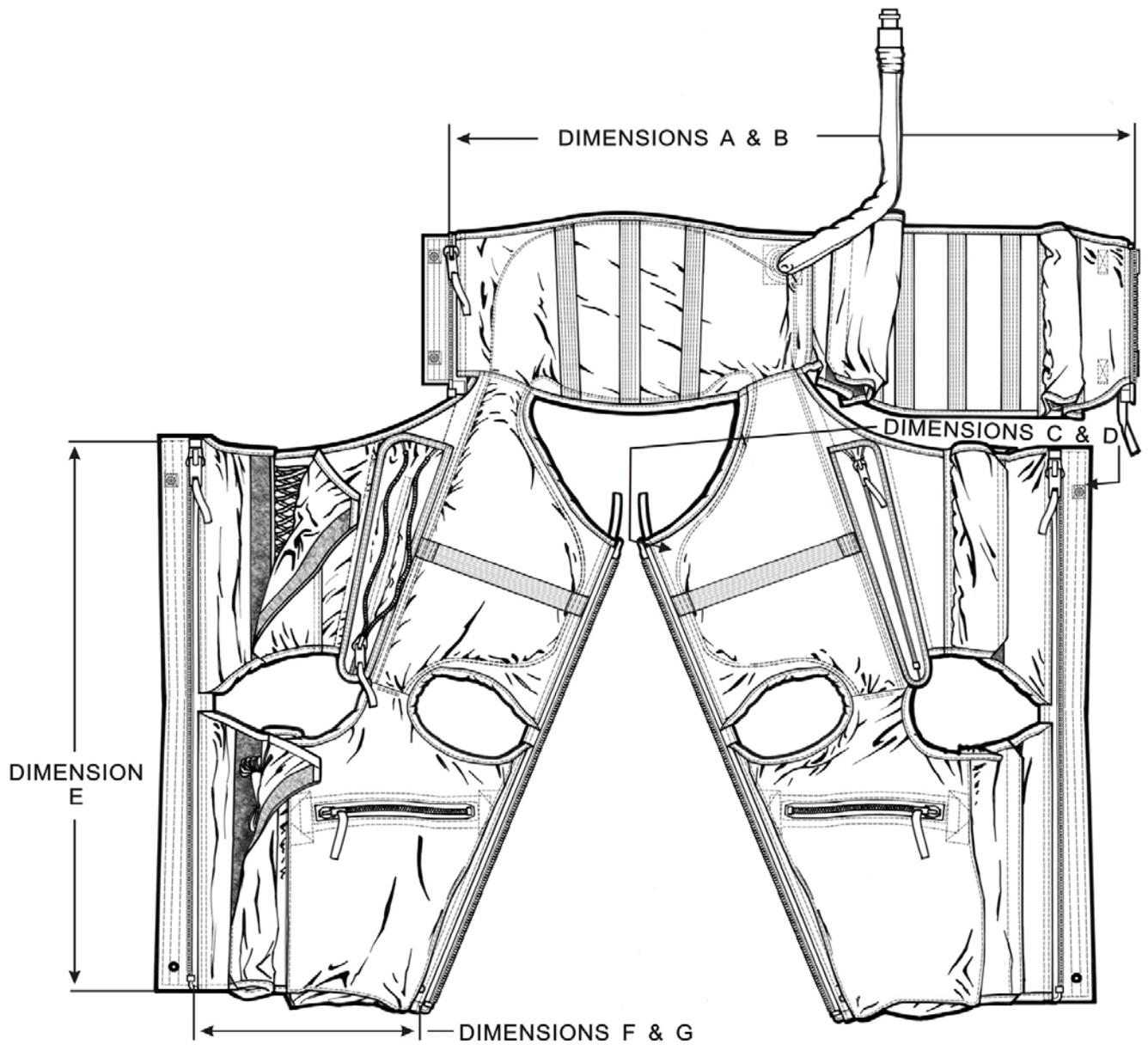


FIGURE 7. Finished measurements.

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TABLE XV. Finished measurements.

Size of Anti-G Garment	Finished Measurements (in inches)							
	Waist Circumference		Thigh Circumference		Leg Length at Fastener Location	Ankle Circumference		Hose Length
	Minimum	Maximum	Minimum	Maximum	Nominal	Minimum	Maximum	
Small Regular	29-1/2	34-1/2	21	26	26	12	15	17
Small Long	29	34-1/4	20-3/4	25-1/2	28	12	15	17
Medium Regular	32-1/4	38-1/4	22-1/4	27-1/4	26-1/2	12	15	17
Medium Long	32	38	22-1/2	27-1/2	28-1/2	12	15	17
Large Regular	35-1/4	41	23-1/2	28-3/4	27	12	15	17
Large Long	35-1/2	41-1/4	24	29	29	12	15	17
Large Extra Long	35-1/2	41-1/4	24	29	33	13-3/4	16-3/4	17
Tolerances	+3/4 inch -1/2 inch	+3/4 inch -1/2 inch	+1/2 inch -3/8 inch	+1/2 inch -3/8 inch	+1/2 inch -1/2 inch	+ 0 inch -1/2 inch	+1/4 inch -1/4 inch	+1/4 inch -1/4 inch

4.11 Inanimate models. Two inanimate models, each consisting of two legs and one torso, shall be required. The anti-G garments in sizes small regular and small long shall be fitted to the small model. The anti-G garments in sizes medium regular, medium long, large regular, large long, and large extra long shall be fitted to the large model. The inanimate models shall conform to table XVI and figure 8. The inspecting activity will inspect the model for surface smoothness prior to any test.

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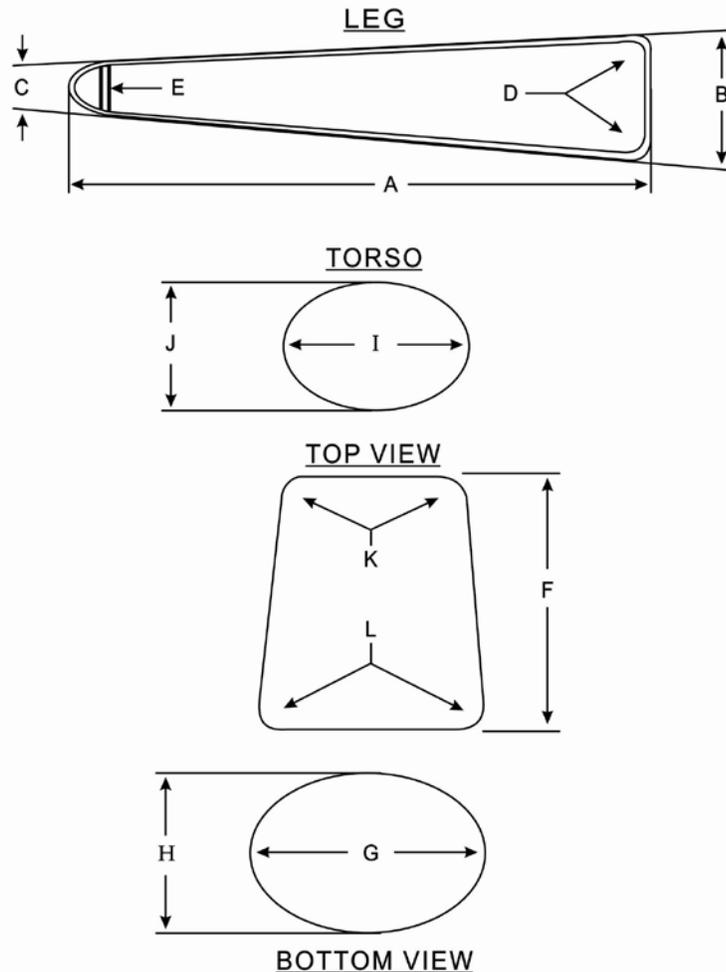
TABLE XVI. Models.

Models	Leg Dimensions in inches <u>1/</u>				
	A	B (dia.)	C (dia.)	D	E
Small	33	6 3/4	2 11/16	1 1/4	1 1/4
Large	33	7 3/16	3 1/16	1 1/4	1 1/2

Models	Torso Dimensions in inches <u>1/</u>						
	F	G	H	I	J	K	L
Small	14	12 3/4	8 1/16	10 1/8	6 13/16	1 1/4	1 1/4
Large	14	13 3/4	9 1/8	11 3/8	7 15/16	1 1/4	1 1/2

1/ Tolerances on all dimensions, except F shall be $\pm 1/16$ inch; dimension F tolerance shall be $\pm 1/4$ inch. See figure 8.

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DIMENSIONS B AND C ARE DIAMETERS

FIGURE 8. Inanimate models (see table XVI).

4.12 Fitting anti-G garment to models. Fitting of the anti-G garment for all tests that require the use of the inanimate models shall be accomplished as follows: Wooden or plastic spacers shall be inserted between the anti-G garment and the model. The spacer for the torso section shall be 4 inches wide by 12 to 14 inches long by 3/4 inch thick and shall be inserted lengthwise so that the 4-inch width will face the model. The spacer for each leg shall be 2 inches wide by 12 to 14 inches long by 3/4 inch thick and shall be inserted lengthwise so that the 2-inch width will face the model. The adjustment laces of the anti-G garment shall then be taken up and tied so that the anti-G garment will fit snugly, but not tightly, around the abdomen and thighs. All slide fasteners shall be in the fully closed position. The model shall be placed in a sitting position similar to that of a pilot seated in the cockpit of an aircraft with the seat back angle of 15 degrees. If a snug fit cannot be obtained at the waist of the sizes large long and large extra long anti-G garments, shims shall be affixed to the model on both sides. All spacers shall be removed prior to commencement of the tests.

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain contractor packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's systems commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended Use. The anti-G garment covered by this specification is intended to be worn by high performance aircraft aircrew to counteract G (gravity) forces.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification, including any amendments.
- b. Size required (see 1.2).
- c. Government furnished patterns (see 3.11).
- d. Waiver or requirements for first article inspection, including first article test reports and shipping instruction (see 3.2 and 4.4 through 4.4.1).
- e. Government loaned connector (see 3.12. and 4.2.2).
- f. Standard color sample (see 3.4.1.1).
- g. Packaging requirements (see 5.1).
- h. Destination of tested anti-G garments (see 6.5).

6.3 Information requests. For access to information such as patterns, drawings, standard shade samples of cloth etc., go to Defense Supply Center Philadelphia's Web site for their Specification/Pattern/Drawing Request form, <http://www.troopsupport.dla.mil/Portal/Authenticated/Home.aspx>. Complete the request form and then submit. Requests to use equivalent materials and/or components or to make changes to the pattern should be sent to the contracting officer for approval by the military services.

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6.4 Test samples. The test methods described in 4.9.3 for endurance and in 4.9.8 for bond strength (bladder), which are required for the sampling inspection specified (see 4.7), are destructive tests. Since these tests are destructive, the anti-G garments and the bladders selected and tested in accordance with 4.6 should not be included in the quantities of serviceable finished end items required. The anti-G garments selected as samples and subjected to the endurance test should be delivered to the procuring activity. The bladders selected as samples and subjected to the bond strength (bladder) test should not be delivered.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in the applicable Qualified Products List QPL-81905 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Air Systems Command, Code 4.6.7.4, 48110 Shaw Road, Patuxent River, MD 20670. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <http://quicksearch.dla.mil>.

6.6 Sources of supply.

- a. Spacer material. Trilok style no. 6001-1-1 (manufactured by Newcastle Fabrics Corp.) has been found to meet the requirements of 3.4.3.
- b. Adhesive. UR-1092. Clifton Adhesive Part number 7531037 – Clifton Adhesive, 282 Burgess Place, Wayne, NJ 07474-0282 (see 3.4.14).

6.7 Shade. U.S. Navy shade green 3456 is equal to U.S.A.F shade sage green 1659. U.S. Navy shade khaki 3729 is equivalent to U.S.A.F shade tan 1657.

6.8 Subject term (key word) listing.

Aircrew
Bladder
High performance aircraft
Pilot

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify change with respect to the previous issue due to the extent of the changes.

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CONCLUDING MATERIAL

Custodian:
Navy-AS

Preparing activity:
Navy-AS

(Project 8475-2015-003)

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