

CHAPTER 4

ANTI-g GARMENTS

Section 4-1. Description

4-1. GENERAL.

4-2. The Anti-g Garments discussed in this chapter are designed to provide protection against the effects of high g-forces experienced by aircrew personnel assigned to high performance aircraft.

4-3. CONFIGURATION.

4-4. Anti-g garments consist of a bladder system encased in fire-resistant cloth outer shell. As g-forces increase, the bladders inflate automatically to pressures predetermined by an automatic valve system installed in the aircraft. The bladders, when inflated,

apply pressure on the body to restrict the flow of blood downward to the aircrewmember's waist and feet to lessen the effects of blackout. Individual garments to be discussed in the following sections are the CSU-15/P, CSU-13B/P, and CSU-20/P which fit from the waist down and are worn over the standard flight suit. The CSU-21/P Counter Pressure Vest, also discussed in this chapter, is worn on the upper torso over the standard flight suit.

4-5. APPLICATION.

4-6. Anti-g garments are used by aircrewmembers assigned to high performance aircraft.

Section 4-2. CSU-15/P and CSU-13B/P Anti-g Garments

4-7. GENERAL.

4-8. The CSU-15/P anti-g garment (MIL-A-81905) (figures 4-1 and 4-3) and the CSU-13B/P anti-g garment (MIL-A-83406B) (figures 4-2 and 4-4) provide protection against the effect of g-forces experienced in high performance aircraft.

NOTE

CSU-13B/P garments will replace the CSU-15/P garments on an attrition basis.

4-9. CONFIGURATION.

4-10. The anti-g garments (figures 4-3 and 4-4) consist of a fire-resistant aramid cloth outershell which

houses a bladder. They are cut away at the buttocks, groin, and knees. The outershell has waist and leg entrance slide fasteners, adjustment lacing areas with lacing covers, and leg pockets with slide fastener closures. The CSU-13B/P also has a knife pocket on the front left thigh, and thigh take-ups with slide fasteners. The bladder system is constructed of polyurethane coated nylon cloth and covers the abdomen, thighs, and calves. The bladder system is fitted with a hose for connecting directly to the aircraft anti-g system. Refer to tables 4-1 and 4-2 for sizing.

4-11. APPLICATION.

4-12. CSU-15/P and CSU-13B/P anti-g garments are issued to individual aircrewmembers and are used in conjunction with standard Navy personal equipment.

WARNING

Items that are carried or stored in the g-suit pockets must not be heavy, bulky, or sharp as injury could occur on ejection.

4-13. FITTING.

CAUTION

With bladder deflated, lace adjustments shall be tightened to provide a snug (not tight) comfortable fit, especially at the waist. The thigh take-up slide fasteners shall be closed during fitting.

Table 4-1. Deleted

Table 4-2. Sizing CSU-13B/P Anti-g Garment

Garment Size	Height (In.)	Weight (Lbs)	NIIN
Small regular	63.0 - 67.9	131 - 160	00-545-8197
Small long	68.0 - 72.9	131 - 160	00-545-8204
Medium regular	64.5 - 69.4	161 - 190	00-545-8211
Medium long	69.5 - 74.4	161 - 190	00-550-7394
Large regular	67.0 - 71.24	191 - 220	00-545-8221
Large long	71.25 - 75.4	191 - 220	00-545-8227
Large extra long	75.5 - 79.0	191 - 230	00-545-8248

Note: For borderline cases (e.g. height 5'8", (68") weight 167 lbs.) it may be necessary to drop down one size from medium regular to small regular.

4-13A. OPTIONAL LEG RESTRAINT PASS-THROUGH OPENINGS IN THE LEG POCKETS OF THE CSU-13B/P ANTI-G GARMENT FOR AV-8B SERIES AIRCRAFT.

Materials Required List

Quantity	Description	Reference Number
As Required	Thread, Nylon, High Temperature, Sage Green or Olive Drab	MIL-T-83193 NIIN 00-130-6245 NIIN 00-405-2252
	-or-	
As Required	Thread, Nylon Type II, Size E, Sage Green	V-T-295 NIIN 00-204-3884
	-or-	
As Required	Thread, Size E	MIL-T-43636 NIIN 00-512-1103 NIIN 00-496-9901
1	Chalk, Marking	SS-C-266 NIIN 00-164-8893 or Equivalent
1	Razor, Surgical	MIL-R-36540 NIIN 00-924-2089 NIIN 01-363-1212 or Equivalent

NOTE

All stitching shall be ASTM-D-6193, Type 301 lockstitch 7 to 10 stitches per inch, with a 1-inch overstitch or backstitch minimum.

1. Unfold garment and unzip the waist and leg slide fasteners.
2. Lay out garment on a workbench with the outside of the garment facing up (Anti-g Hose to the technician's right).
3. Locate back of the pocket seams (pleats at the top just below the knee opening areas).
4. Measure down 2 1/2 ± 1/8 inches from the binding tape edge of the knee openings at the top of the pockets and make a mark.
5. Measure down 2 ± 1/2 inches from the mark made in step 4 and make a mark.
6. Carefully remove single row of stitches holding the back of the pocket to the garment between the two marks.

7. Remove thread fragments from the cut out area.

8. Restitch the cut ends of the stitches above and below the marks by using a 1/4 x 1 inch cross box-stitch over the double row of stitched fabric on the garment, or 3 rows of stitches 1 inch long at the seam ends (sew 1 inch, backstitch 1 inch, backstitch 1 inch) There shall be enough open space behind the pocket to install a leg restraint through openings.

9. Perform a Place-In-Service inspection in accordance with paragraph 4-24.

10. Document in accordance with OPNAVINST 4790.2 Series.

4-14. ANTI-g GARMENT. The anti-g garment is fitted and adjusted to the aircrewmember on a best fit basis. Use Tables 4-1 and 4-2 as a guide for selection. The cords shall be laced in the same direction as the applicable lacing cover slide fastener closure. Whenever possible, the anti-g garment should be fitted over the summer flyer's coverall, such that the lace adjustments are almost completely tightened. This will assure that the size coverall selected can be refitted to accommodate larger anti-exposure assemblies.

NOTE

During fitting and flight, the thigh take-up slide fasteners shall be closed. The thigh take-up slide fasteners may be left open for comfort during pre/post flight.

1. To fit proceed as follows:

a. Pull firmly on the cut ends of the lacing cords until a proper fit is achieved.

b. Tie the ends in a double half-hitch knot. See Figure 4-3 and 4-4.

NOTE

Do not cut off excess laces.

c. Fake excess lacing cord, secure with a light-weight rubber band and stow behind tightened laces. With a proper fit, cutout areas of anti-g garment should expose the knees, groin and buttocks without binding or hindering movement. The garment should fit snugly, but not tight, with the bladder deflated.

The inflated bladder should compress the waist, thighs and calves firmly and evenly. If a snug fit cannot be achieved, refer to paragraph 4-15 for custom fitting.

NOTE

It is recommended that after donning the suit, the wrinkles be manually worked out of the bladder's seams to reduce discomfort.



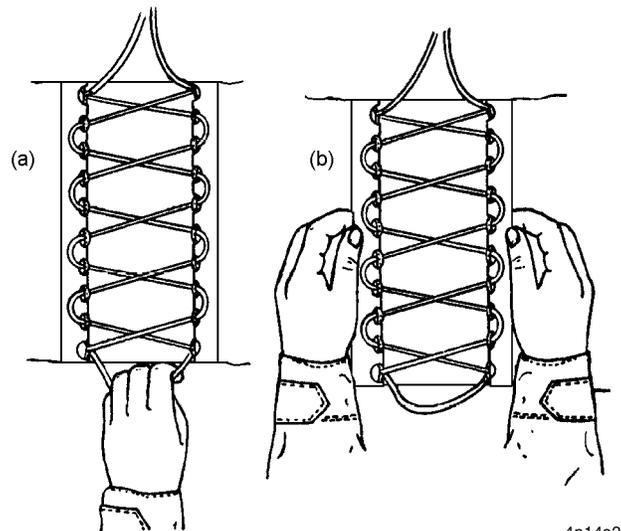
When doffing garment do not use quick release feature of leg slide fastener as this may limit service life of the garment (CSU-15/P only).

2. To loosen laces for refitting over anti-exposure assemblies, proceed as follows:

a. Untie the securing knot, grasp the bottom loop of the lacing cord and pull down firmly forming a loop.

b. Work sides to loosen laces and extend garment fitting area.

c. Refer as in step 1 above.



Step 2 - Para 4-14

4p14s2

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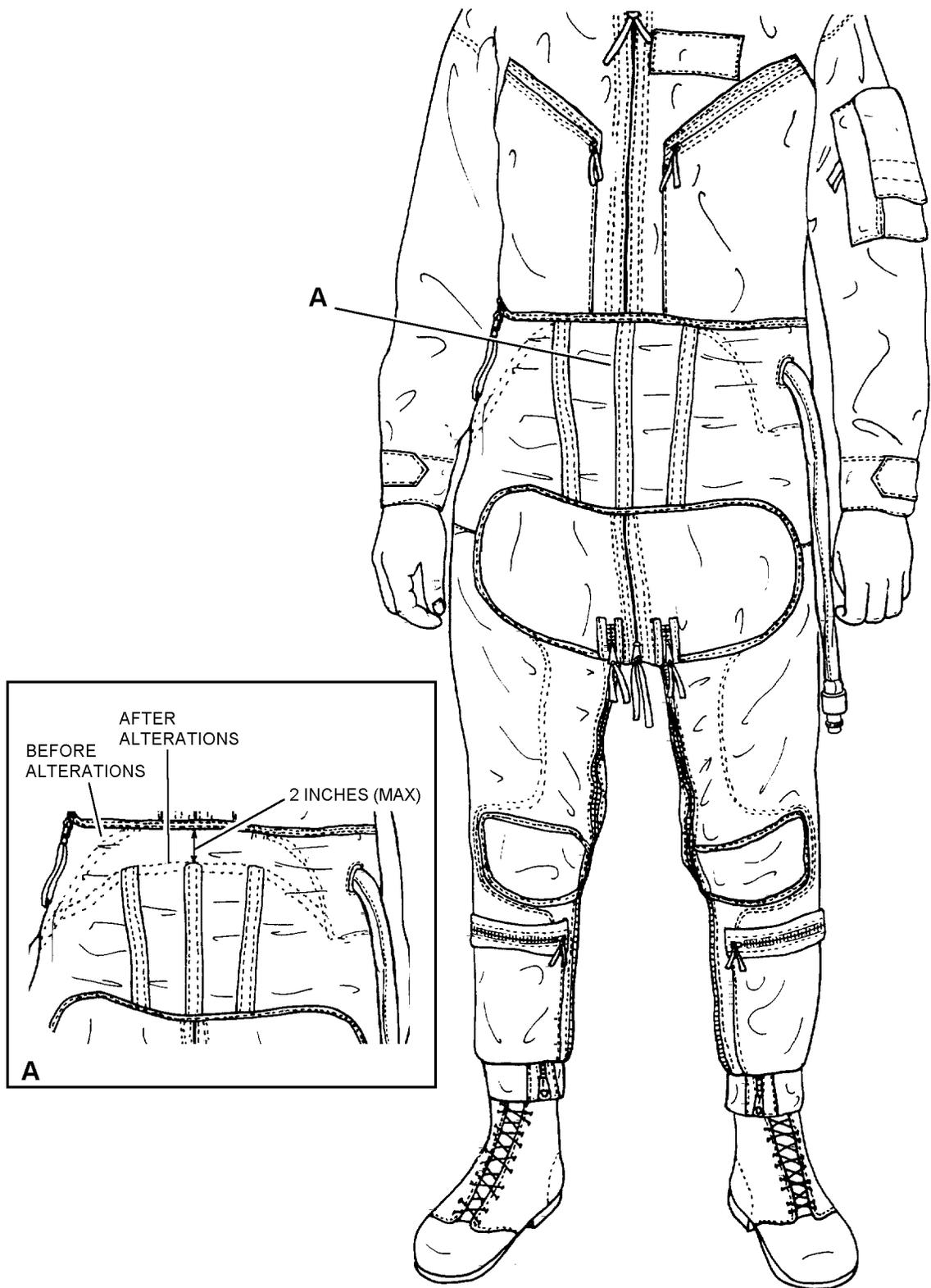


Figure 4-1. CSU-15/P Anti-g Garment

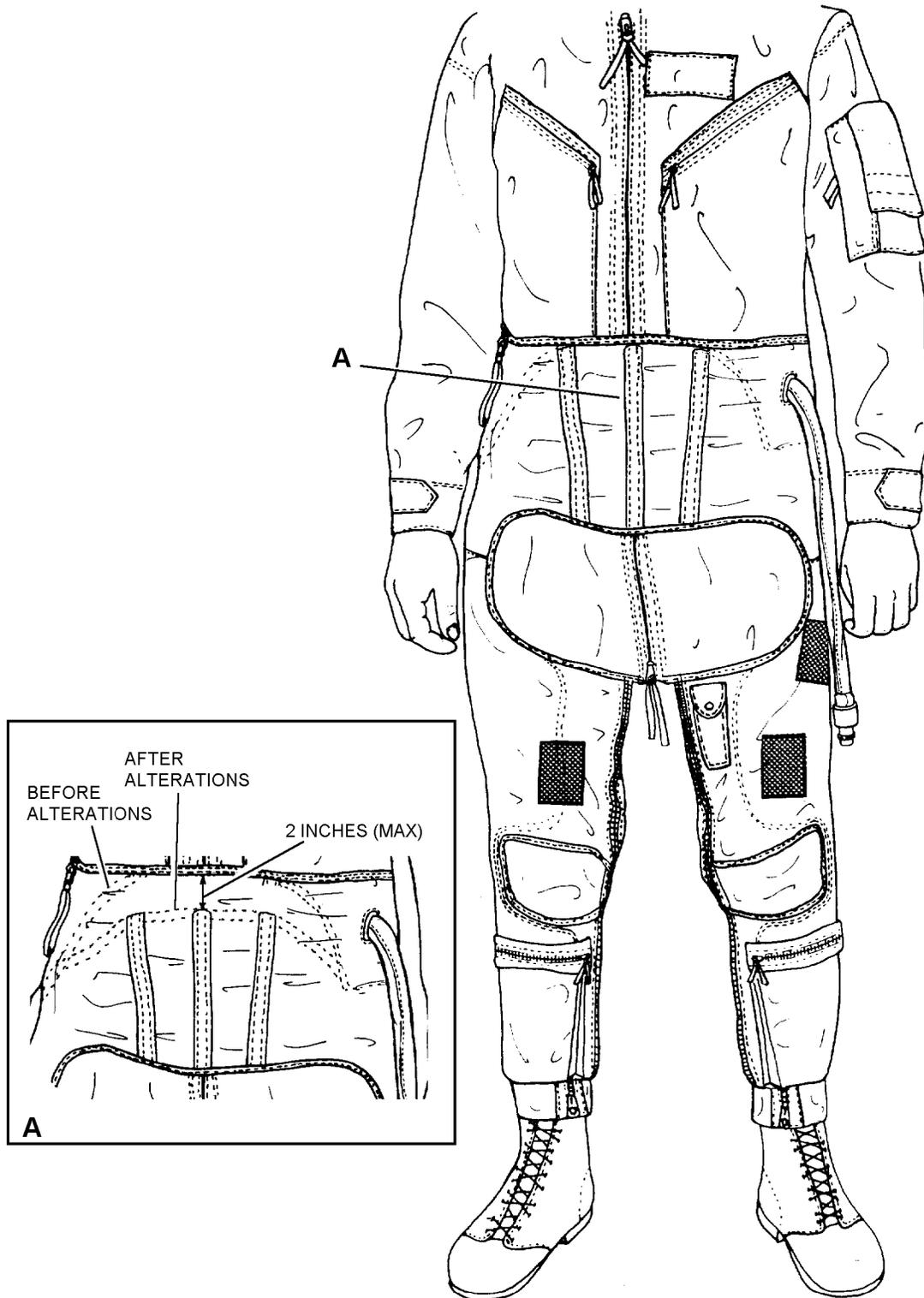


Figure 4-2. CSU-13B/P Anti-g Garment

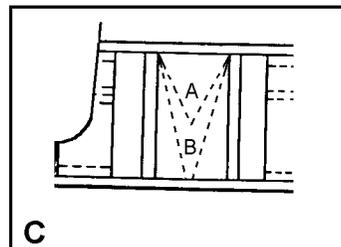
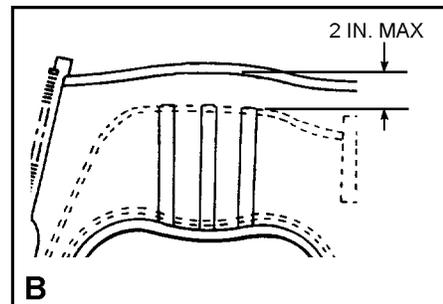
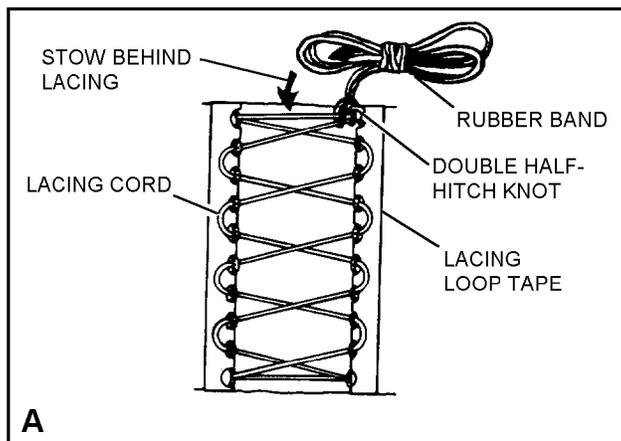
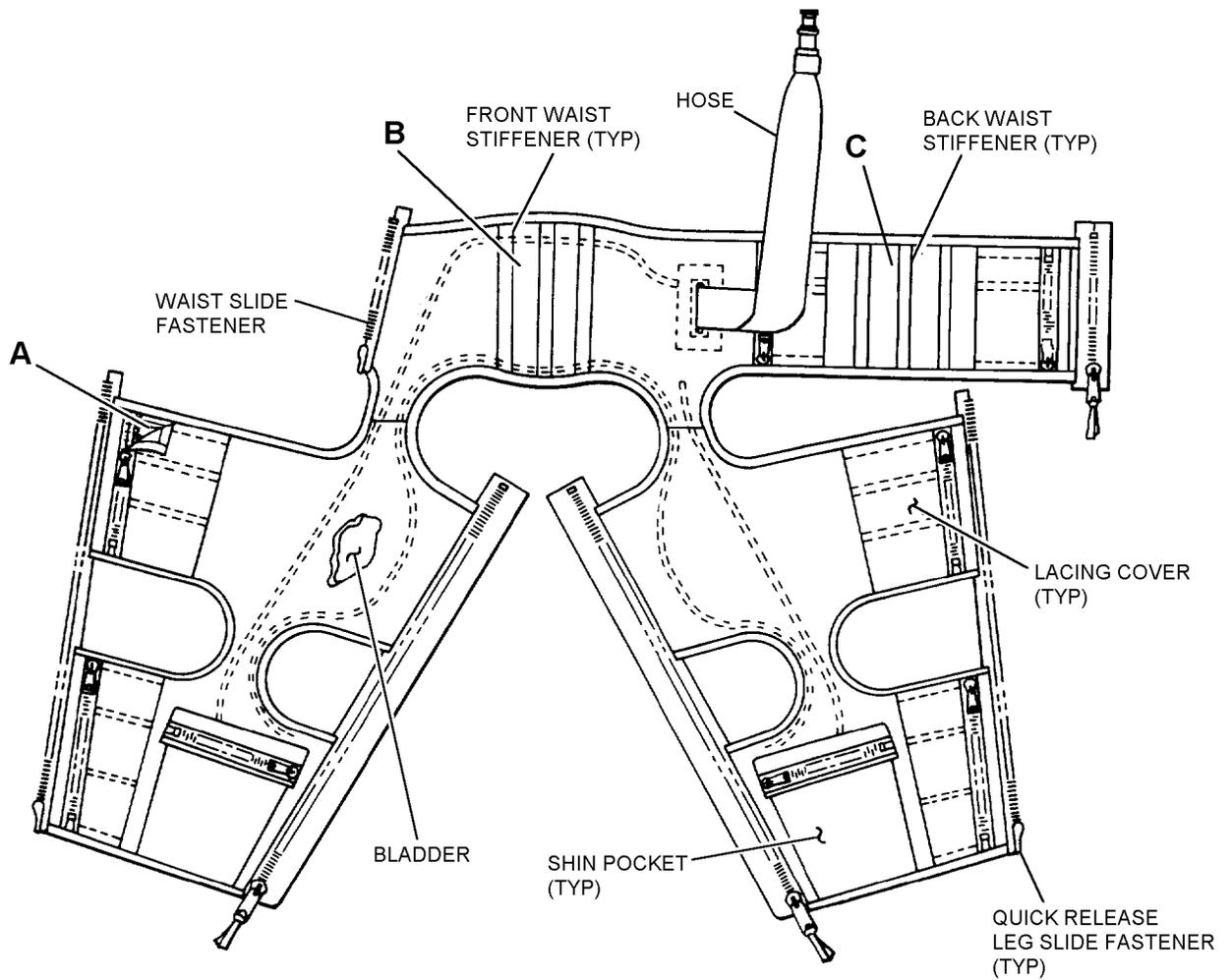


Figure 4-3. CSU-15/P Parts Nomenclature

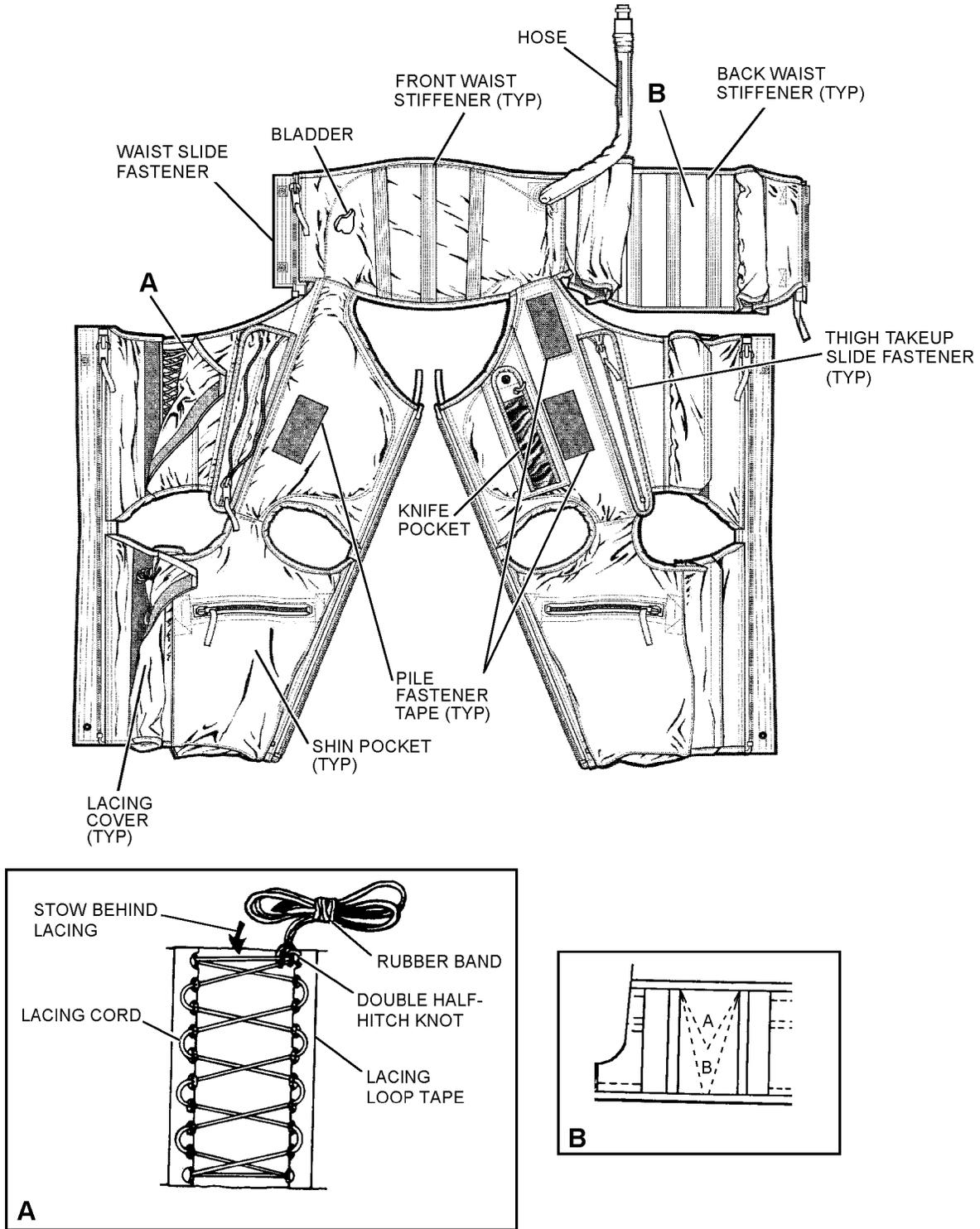


Figure 4-4. CSU-13B/P Parts Nomenclature

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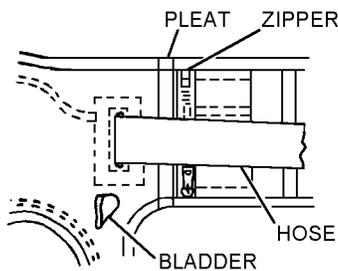
4-15. CUSTOM FITTING TO MAKE GARMENT SMALLER. If the garment does not fit after full lace adjustment but is the correct size based on body positioning, the following procedure may be used to modify those parts of the garment which are too large.

1. While aircrewmember is wearing anti-g garment, let out lace adjustment fully.

WARNING

Ensure that pleat does not interfere with waist bladder function.

2. Form a pleat in the waist between the hose and the zipper of the adjustment lace cover. The size of the pleat should allow the waist to fit slightly loose while in the proper body position.

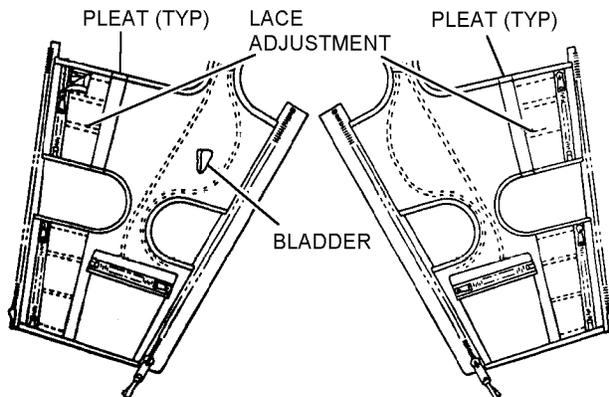


Step 2 - Para 4-15

4p15s2

3. Mark the position of the pleat with chalk.

4. Repeat the procedure for the thigh by forming a pleat between the lace adjustment cover stitching and the bladder. The pleat should be as close to the lace adjustment as stitching will permit.



Step 4 - Para 4-15

4p15s4

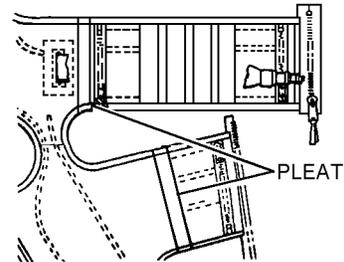
5. Mark the position of the pleat with chalk.

6. Have aircrewmember remove the garment.

7. Lay the garment out flat and refold the pleats as marked.

NOTE

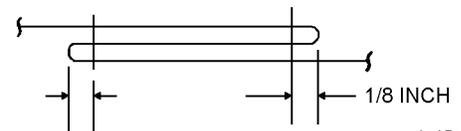
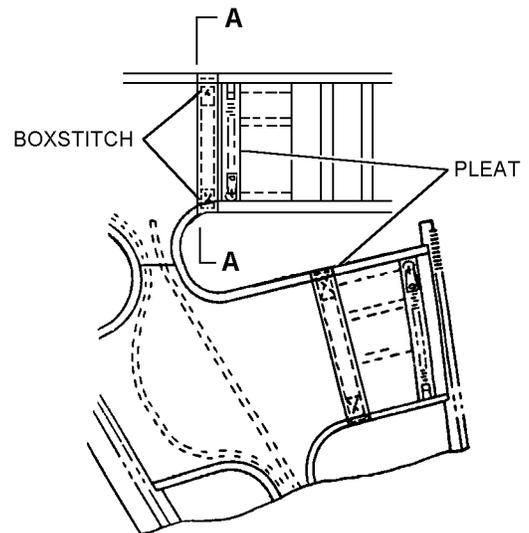
All stitching shall be in accordance with ASTM-D-6193, Type 301 lockstitch, 7 to 10 stitches per inch with minimum 1/2-inch backstitch. Refer to paragraph 4-16 for materials required.



Step 7 - Para 4-15

4p15s7

8. Stitch the pleats. Secure at each end using a boxstitch 1/8-inch from the edge of each side of the pleat. Backstitch 1/2-inch on all stitching.



Step 8 - Para 4-15

4p15s8

9. Reducing the calf size does not usually require the aircrewmember to don the anti-g garment, as there is very little excess material to work with. Procedure with steps 10 through 12 if it has been determined that reducing the size of the calf is needed.

NOTE

Modifying the calf is only authorized on the medium and large anti-g garments as the smaller sizes do not have enough excess material to perform the procedure. Even modifying the medium and larger sizes will not make a significant difference in the fit of the anti-g garment, thus this procedure for modifying the calf has very limited benefit to very few aircrewmembers.

WARNING

Ensure that pleat does not interfere with calf bladder function.

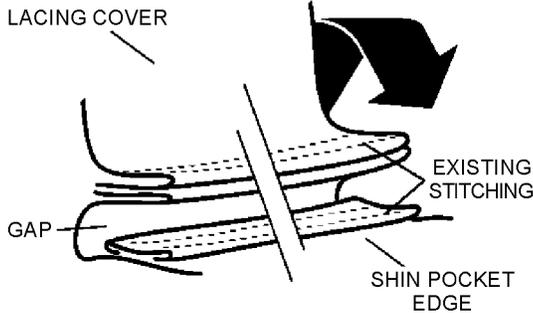
11. Stitch the pleat in place with two rows of stitches, side by side, down the entire length of the overlapping lacing adjustment cover edge and the shin pocket edge. Reinforce using minimum of 1-inch backstitching.



Step 9 - Para 4-15

4p15s9

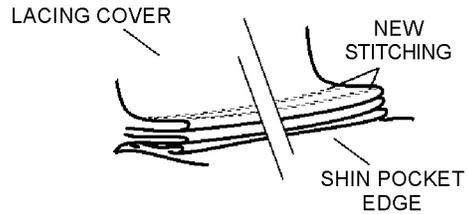
10. Form a pleat between the lace adjustment cover stitching and the shin pocket by placing the existing row of stitching of the lacing adjustment cover edge on top of the existing row of stitching of the shin pocket edge.



SHIN POCKET

Step 10 - Para 4-15

4p15s10



Step 11 - Para 4-15

4p15s11

12. Have aircrewmember don garment. Refit in accordance with [paragraph 4-14](#).

13. Inspect anti-g garment in accordance with [paragraph 4-24](#).

4-16. CUSTOM FITTING TO MAKE GARMENT LARGER. If the garment is not large enough to fit around the leg after the lacing adjustment has been let out fully, the following procedure may be used to modify those parts of the garment which are too small.

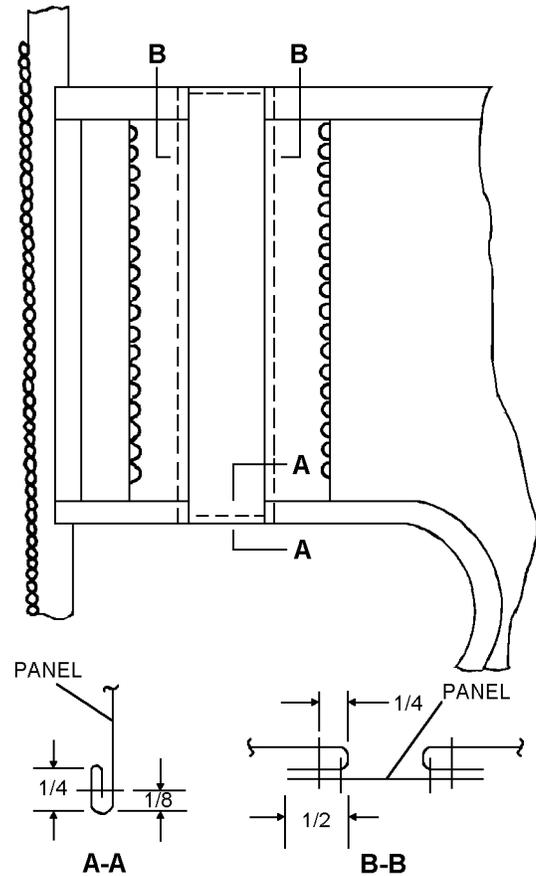
Materials Required

Quantity	Description	Reference Number
As Required	Thread, Aramid, Size E, Sage Green	MIL-T-43636 NIIN 00-496-9901
	-or-	
	Thread, Nylon, Type II, Class A, Size E, Sage Green	V-T-295 NIIN 00-204-3884 or equivalent
As Required	Cloth, Twill, Aramid High Temperature Resistant, Sage Green (CSU-15/P only)	MIL-T-81814 NIIN 01-031-9403
	-or-	
	Cloth, Twill, Type II (CSU-13B/P only)	MIL-C-83429 NIIN 01-147-2064

1. Have aircrewmember don anti-g garment with lacing adjustment let out fully.
2. If leg sections are too tight, or there is insufficient fabric to go around leg, determine additional amount of fabric necessary to provide proper fit.
3. Have aircrewmember doff garment.
4. Remove lacings from adjustment panel.
5. Cut fabric strip 2 inches wider than measurement determined in step 2, and 1 inch longer than length of lacing panel.

6. Hem ends of strip.

7. Stitch strip to lacing panel using seam type LSq, stitching shall be in accordance with ASTM-D-6193, Type 301 lockstitch, 7 to 10 stitches per inch with minimum 1/2-inch backstitch.



8. Replace lacings in adjustment panel.

9. Have aircrewmember don garment. Refit in accordance with paragraph 4-14.

10. Inspect anti-g garment in accordance with paragraph 4-24.

NAVAIR 13-1-6.7-2

4-16A. CUSTOM FIT KNEE HOLE PANEL. (For instructor/student pilots flying in T-45 Aircraft only). This custom fit procedure is an alteration to the anti-g garment to reinforce the fabric in the knee area to eliminate the fabric from bowing out when the aircrewmember's knee is bent. This alteration is intended to prevent binding between control stick in the aircraft and the pilots anti-g garment that may occur during dynamic maneuvers. This alteration may be done at the option of the individual instructor/student. To reinforce the knee hole of the anti-g garment, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Cloth, Plain Weave, Aramid	MIL-C-83429 NIIN 01-147-2064
As Required	Webbing, Type VIII C 2 1/4 inch or equivalent	MIL-W-4088 NIIN 01-015-9434
As Required	Thread, Nylon High Temperature, Sage Green or Olive Drab	MIL-T-83193 NIIN 00-130-6245 NIIN 00-405-2252
	-or-	
	Thread, Nylon Type II, Size E, Sage Green	A-A-50195 NIIN 00-204-3884
	-or-	
	Thread, Size E	MIL-T-43636 NIIN 00-512-1103

1. Fabrication of Fabric Knee Panel.

NOTE

Final fabricated panel is a rectangle sleeve of fabric encasing a piece of webbing. The webbing is used to add strength and help keep the shape of the panel. The panel is stitched closed on all four sides and is used to partially cover the back of the kneehole on the left and right legs of the anti-g suit.

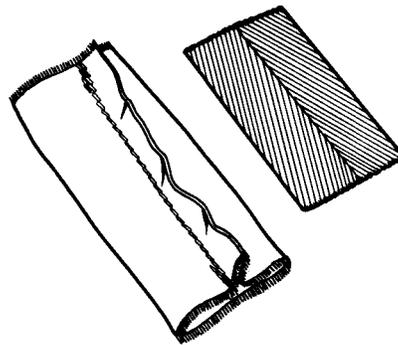
All directions are for the application of panel onto the right leg of the anti-g suit. Application of the panel to the left leg is accomplished in the same manner if aircrewmember desires.

All stitching to be made using 301 Lock-stitch, 8 to 10 stitches per inch with size "E" thread. Backstitch a minimum of 1/2 inch on all stitching.

a. Measure and cut a piece of aramid cloth 5 1/2 inches by 6 inches. Orient fabric so that 6 inch edges are at the top and bottom.

b. Fold the fabric in half so that the 5 1/2-inch edges meet creating a 3-inch wide by 5 1/2-inch tall piece of fabric.

c. Stitch raw ends of 5 1/2-inch edges together with a single row of stitches 3/8 inch from the edge.



Step 1c - Para 4-16A

4p16as1c

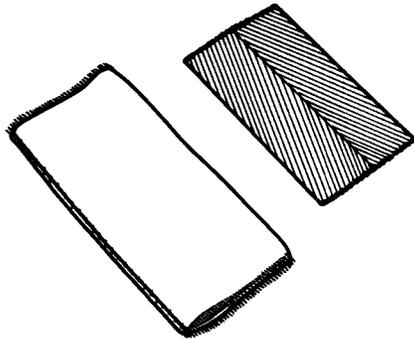
d. Turn inside out (seams inside).



Step 1d - Para 4-16A

4p16as1d

e. Orient the panel so the folded edge is on the right.

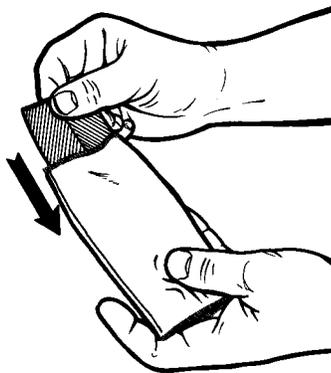


Step 1e - Para 4-16A

4p16as1e

f. Cut 3 1/2 inch length of Type VIIC (2 1/4 inches wide) webbing and sear edges.

g. Insert webbing into the sleeve with raw edges at the top and bottom.

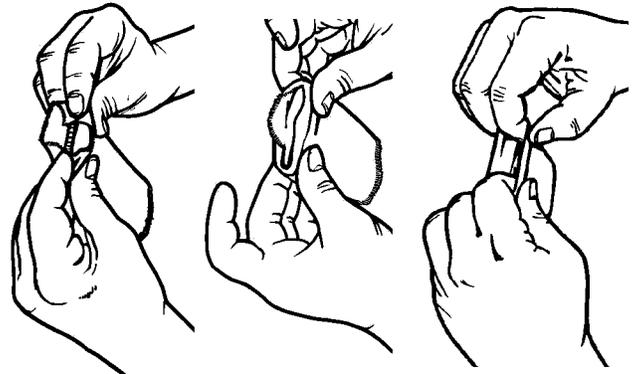


Step 1g - Para 4-16A

4p16as1g

h. Tuck the top and bottom raw edges evenly inside the sleeve creating a panel of fabric encasing

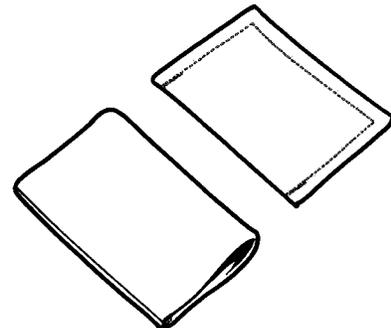
the piece of webbing with clean finished edges and a finished dimension of 2 1/2 inches wide by 3 3/4 inches tall.



Step 1h - Para 4-16A

4p16as1h

i. Stitch top, right and bottom edges of panel closed with one row of stitches 1/4 inch from the edge. Ensure that the webbing inside the panel is stitched in place during this step.



Step 1i - Para 4-16A

4p16as1i

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2. Stitching Fabric Panel to Anti-G Suit.

a. Lay out garment and unzip the waist and leg slide fasteners (anti-g hose to the technician's right).

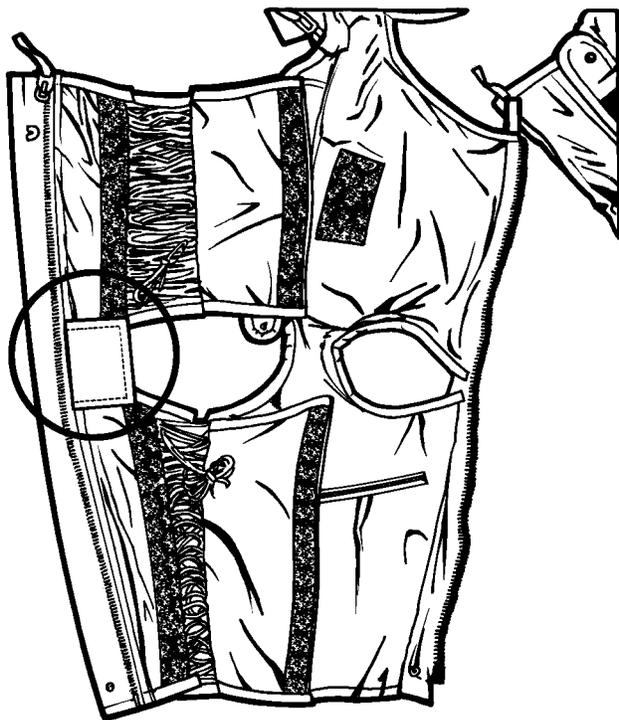
b. On the right leg, locate the opening for the back of the knee between the thigh and the calf lacing cover. Position panel with its folded edge flush against the edge of the anti-g suit fabric sewn to the slider tape and centered over the back of the knee opening. When centered correctly, the top of the panel will be aligned directly below the edge of the thigh lacing cover pile tape and the bottom of the panel will be aligned directly above the calf lacing cover pile tape (figure 4-4A).

c. Stitch panel to the anti-g suit starting at the upper right edge of panel stitching towards the edge located against the slider tape, down the left edge and across the bottom with one row of stitching 3/8-inch from the edge.

d. Have aircrewmember don garment and sit with knees bent to ensure proper custom fit.

e. Inspect anti-g garment in accordance with paragraph 4-24.

f. Record alteration on the aircrew personal equipment record OPNAV 4790/159 card and document in accordance with OPNAVINST 4790.2 Series.



004004a
Figure 4-4A. Proper Alignment of the Custom Fit Knee Hole Panel

4-17. HOSE (CSU-15/P ONLY). The anti-g hose must be fitted after correct garment size has been determined. To fit the anti-g hose, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Tape, Insulation, Electrical, Pressure Sensitive, 3/4-Inch Wide	MIL-I-24391 NIIN 00-419-4291 or equivalent
As Required	Insulation Sleeve, Heat Shrinkable, Polyolefin, Flexible (Class 1 or 3) (Not [redacted])	MIL-I-23053/5A NIIN 00-990-9911
1	Heat Gun	P/N 6966C(78976) NIIN 01-037-7268

Notes: 1. Use of heat shrinkable tubing to cover clamp is optional.

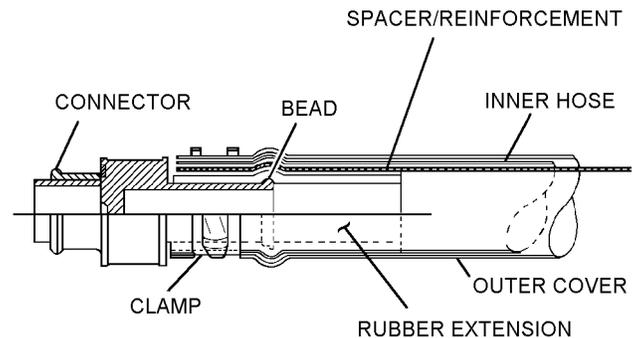
1. Have aircrewmember don anti-g garment and sit in aircraft. Attach quick disconnect on hose to aircraft supply system. If hose is too long, measure and mark distance to be shortened.

2. Lay hose out flat. In a single operation, cut outer covering, inner hose, and spacer/reinforcement at mark made in step 1. Seal completely around end of outer cover to prevent fraying.

3. Remove tape, clamp, and severed portion of hose from quick disconnect connector.

4. Position spacer/reinforcement on rubber extension of connector (figure 4-5). Butt end against raised portion of connector, and cover with three turns of tape (MIL-I-24391).

5. Slide inner hose (bladder material) over connector and butt against raised portion of connector. Ensure that spacer/reinforcement is not twisted. Secure with three turns of tape (MIL-I-24391).



004005
Figure 4-5. Assembly of Hose and Quick Disconnect Fitting

NOTE

In some instances it may be necessary to build up outside diameter of hose area under clamp with three to six turns of electrical insulation tape (MIL-I-24391) to attain sufficient tightening of clamp.

6. Slide outer cover of hose over inner hose and butt against raised portion of connector. Install clamp as shown in Figure 4-5. Cover clamp with three turns of tape (MIL-I-24391) or slide heat shrinkable insulation sleeve over clamp and apply heat with heat gun until sleeve shrinks tightly over clamp.

7. Ensure that fitting is properly inserted in hose and clamp properly positioned between raised bead and body. Ensure that clamp is tightened sufficiently by grasping hose and jerking sharply on fitting.

4-18. MODIFICATIONS.

4-19. The CSU-13B/P and CSU-15/P anti-g garments should be updated by comparing the configuration of the garment with the directives listed in table 4-3. Repairs, fabrications and installations to maintain serviceability are listed in table 4-4.

4-20. ALTERATION OF CSU-13B/P AND CSU-15/P ANTI-g SUITS. To ensure proper fit of small stature aircrewmembers, alteration of the CSU-13B/P and CSU-15/P anti-g suits shall be accomplished by performing the following steps:

Materials Required (Cont)

Quantity	Description	Reference Number
As Required	Tape, Nylon Type III, 1-Inch	MIL-T-5038 NIIN 00-176-8085 -or- NIIN 00-753-6144
1	Razor, Surgical Preparation	MIL-R-36540 NIIN 01-363-1212
As Required	Thread, Size E	V-T-295 NIIN 00-204-3884 or equivalent

1. Perform a leak test in accordance with paragraph 4-25. If anti-g suit passes the leak test proceed to step 2. If anti-g suit fails leak test it shall be removed from service.

2. Fit the anti-g suit to the aircrewmember in accordance with paragraph 4-93.

3. Ensure the waist panel lacing loops, in rear of anti-g suit, have 1 inch separation from top to bottom on both the right and left side.

4. With the aircrewmember standing, check for excess slack in the anti-g suit by finding the top center of the rear panel and pulling straight out away from the aircrewmember's back.

5. With the top panel pulled out, pinch the panel together and mark the right and left panel where they meet, with chalk.

NOTE

Chalk shall be non-permanent type tailors chalk or regular chalk.

6. Repeat this procedure on the bottom panel.

Materials Required

Quantity	Description	Reference Number
As Required	Thread, Size E	MIL-T-43636 NIIN 00-512-1103 -or- NIIN 00-496-9901
As Required	Chalk, Marking	SS-C-266 NIIN 00-164-8893

Table 4-3. Anti-g Garment Directives

Description of Modification	Application	Modification Code
None		

Table 4-4. Repairs/Fabrications/Installations

Description of Repairs/ Fabrications/Installations	Application	Paragraph Number
Shortening of Hose and/or Clamp Replacement	All Anti-g Garments	4-17
Replacement of Loose or Broken Stitching	All Anti-g Garments	Not in 4-28
Replacement of Lacing Cord	All Anti-g Garments	4-31
Replacement of Lacing Cover Slide Fasteners with Hook and Pile Tape	All CSU-15/P Anti-g Garments	4-32
Replacement of Sliders and Top Stops on Closure Slide Fasteners	All CSU-15/P Anti-g Garments	4-33
Repairs of Small Holes, Tears, Snags	All CSU-13B/P Anti-g Garments	Not in 4-28
Replacement of Slide Fasteners	All Anti-g Garments	4-29
Replacement of Damaged Hook and Pile Tape	All CSU-13B/P Anti-g Garments	4-30
Replacement of Broken/Damaged/Missing Metal Hook and Bar Fasteners	All CSU-13B/P Anti-g Garments	4-33A

Notes: 1. Stitching repairs near the bladder area of the garment shall not be accomplished. It is preferable to use aramid thread conforming to MIL-T-43636, Size E, Sage Green for repairs. If unavailable, use V-T-295, Size E, Sage Green.

NOTE

The distance between the top chalk marks and the bottom chalk marks may not be the same.

7. Have the aircrewmember sit in a straight back chair and locate their lowest rib. If the top of the abdominal bladder extends over the lower ribs or if the inflation of the bladder causes discomfort to the lower rib cage, the height of the abdominal bladder can be reduced by using the following steps:

8. Mark the outside of the anti-g suit just below the rib on the right, left and center with chalk.

9. Have aircrewmember remove anti-g suit.

10. Find the 4 chalk marks made in steps 5 and 6. Ensure the chalk marks are on the panel and not the binding tape.

11. Carefully remove the stitching from the top and bottom of the back panel binding tape.

12. Remove the stiffeners on the back panel as required (figure 4-3 or 4-4). Normally only the middle stiffener is removed.

13. Pull the center of the back panel to the inside of the anti-g suit and fold the anti-g suit back on itself.

NOTE

All stitching shall be in accordance with ASTM-D-6193, Type 301 lockstitch, 7 to 10 stitches per inch with minimum 3/4-inch backstitch.

14. With the top chalk marks aligned together and the bottom chalk marks aligned together make a seam in the anti-g suit from top to bottom.

NOTE

If there is no excess material at the bottom of the back panel, a vertical dart stitch will terminate at the center of the back panel.

15. With the back panel seam sewn in, fold the excess material flat to the right or left side and sew a row of top stitches on the outside of the folded material.

16. With the back panel top stitched secure the fold made in step 14 to the back inside panel with one row of stitches approximately 1/8 inch from the folded edge.

NOTE

If only a dart was sewn from the center to the top, the dart shall be folded and top stitched and the loose dart shall be sewn to the back inside panel with 1 row of stitches.

17. If there is allowable surface area without overlapping of stiffener, reinstall the stiffeners removed in step 12 as follows:

a. If there is not enough back panel area for all 3 stiffeners to be reinstalled or only 1 stiffener was removed and there is not area for the stiffener to be reinstalled it can be discarded.

b. Using the lacing cover seam edge as the reference point, find the center top and bottom of back panel.

c. Center a stiffener over the center of the back panel and sew the stiffener with a row of stitches around the outside edge approximately 1/16 inch.

d. Center the remaining stiffeners between the lacing cover seam edge and the center stiffener and sew one on the right and one on the left in the same manner as step c.

18. Fold the excess top binding tape back on itself and sew to the back panel.

19. Fold the excess bottom binding tape back on itself and sew to the back panel.

20. Carefully remove the stitches from the hose side of the waist bladder cover on the front of the anti-g suit working to approximately 4 inches above where the bladder goes into the right leg.

NOTE

The minimum distance for this alteration is 1 inch, and the maximum is 2 inches. If the markings are less than 1 inch below the original stitch line that joined the abdominal bladder casing to the front abdominal panel, draw a second set of markings that is at least 1 inch below the original stitch line. If the markings are more than 2 inches below the original stitch line that joined the abdominal casing to the front abdominal panel, draw a second set of markings that is no more than 2 inches below the original stitch line.

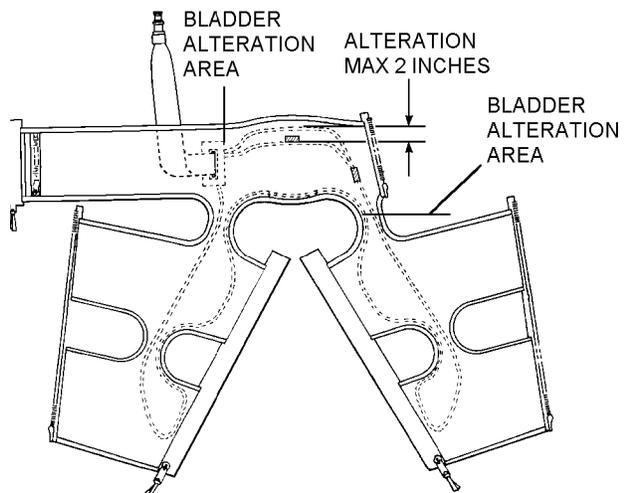
21. Transfer the chalk mark positions made in step 8 to the inside of the anti-g suit.

22. The bladder tab can be sewn to the bladder cover with 1 row of stitches to hold it in place.

23. You may want to chalk in the seam line from the 3 points you transferred from the front.

24. Push the bladder down toward the bottom of the anti-g suit and ensure that the bladder system cannot be damaged and align the bladder seam to chalk mark.

25. Sew 2 rows of stitches from the right to the left to approximately 1 inch distance from the inlet hose exit point. Rows of stitches shall be no greater than 1/4 inch apart. Be careful not to pierce the bladder.



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Steps 20 thru 25 - Para 4-20

26. Cut 3, 9-inch lengths of nylon tape, MIL-T-5038 (NIIN 00-176-8085 or 00-753-6144).

NOTE

The cut length of the strap shall be 9 inches for the 1 to 2 inches of adjustment made to the abdominal bladder.

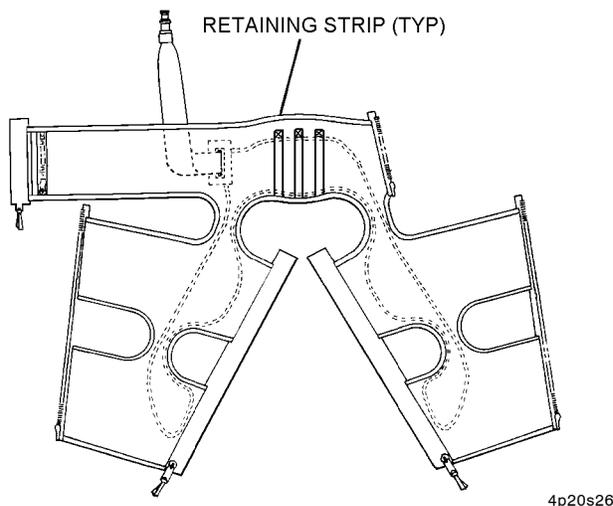
27. These 3 restraining straps will be added to prevent upward movement of the bladder during inflation.

28. Align the straps on the inside of the front abdominal panel so that they are placed in line with and over the webbing stiffeners on the outside of the front abdominal panel.

29. Turn straps under 3/4 inch at both ends and secure onto the inside of the front abdominal panel using a 3/4-inch crossbox stitch.

30. The 3/4-inch fold in the strap will be placed with the seared edge at the top of the back bladder casing, prior to making the top crossbox stitch.

31. The folded edge of the 3/4-inch fold in the strap will be horizontally aligned with the bottom edge of the back bladder casing, prior to making the bottom crossbox stitch.



Steps 26 thru 31 - Para 4-20

4p20s26

32. Aircrewmember shall have a fit check completed with their anti-g suit prior to step 33.

33. The suit must pass a leak test in accordance with [paragraph 4-25](#), prior to being placed back into service.

4-21. MAINTENANCE.

4-22. The aircrewmember's responsibility for maintenance of the anti-g garment is limited to Pre/Postflight Inspection only. Repairs and maintenance actions required shall be performed by organizational level maintenance or above. Defects in the bladder system shall be considered cause for replacing entire garment. All maintenance actions and inspections shall be recorded in accordance with OPNAVINST 4790.2 series.

4-23. PRE/POSTFLIGHT INSPECTION. The Pre/Postflight Inspection shall be performed by the aircrewmember prior to each flight. To perform the Pre/Postflight Inspection, examine the following:

1. Slide fasteners for secure attachment, ease of operation, and corrosion.
2. All seams for loose or broken stitching.
3. Outershell and hose covering for holes, tears, and abrasion.
4. Quick disconnect connector for nicks, corrosion, and proper operation.
5. Laces and lacer loops for secure attachment and wear.
6. (CSU-13B/P only) Hook and pile tapes for damage and secure attachment. Hooks and snaps for secure attachment and wear.
7. If discrepancies are noted, forward garment to Aviator's Equipment Branch for inspection/corrective maintenance.

4-24. SPECIAL INSPECTION. The Special Inspection shall be performed by an Aircrew Survival Equipmentman upon issue prior to placing the anti-g garment in service and every 180 days thereafter. The Special Inspection shall also be performed whenever a discrepancy is discovered during Pre/Postflight Inspection. The inspection consists of the Pre/Postflight Inspection and the following additional tasks:

1. Perform leak test in accordance with [paragraph 4-25](#).
2. Repair any discrepancies after completion of leakage test.
 - 2A. Upon completion of any repair, perform a leak test in accordance with [paragraph 4-25](#).
3. Document inspection in accordance with OPNAVINST 4790.2 Series.

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4-25. LEAK TEST. To test a CSU-15/P or CSU-13B/P anti-g garment for leakage using the recommended leak test fixture (figure 4-6), proceed as follows:

NOTE

Section 4-3 provides information on a recommended test fixture.

1. Close leak test fixture valve and attach quick disconnect fitting on garment hose to female fitting on leak test fixture.

2. Rotate three-way valve to air source and inflate bladder to 5 psig. Rotate valve to measuring device to check pressure.

3. The bladder pressure shall not drop more than 1.0 psig in the first 30 seconds. A pressure drop greater than 1.0 psig in the first 30 seconds constitutes a failure.

NOTE

When the leak test fixture is removed from the garment, the bladders may deflate. This is normal. The quick disconnect fitting on the garment hose is equipped with an emergency pressure relief valve. This allows for deflation of the bladders to 1.5 psi within 4 seconds upon disconnection from the air source. The garment will maintain an internal pressure of at least 0.3 psi for a 4-hour period. For use as a secondary flotation, the bladders may be orally inflated using the garment hose.

4. Remove leak test fixture and deflate the garment. Garments that fail the leak test shall be placed.

4-26. SERVICE LIFE. The CSU-15/P and CSU-13B/P anti-g garments shall remain in service until they fail the leakage test.

4-27. REPAIRS. Repairs shall be performed by the lowest maintenance level possible. Damage which cannot be corrected by the repairs described in 4-4 shall be considered cause for rejection. Rejected garments shall be scrapped in accordance with local supply procedures.

4-28. REPAIR OF SMALL HOLES, TEARS, SNAGS AND MISSING OR BROKEN STITCHING IN BASIC FABRIC (CSU-13B/P ONLY). Repairs of small holes, tears, snags and missing or broken stitching in basic fabric shall be accomplished as follows:

NOTE

All stitching shall be in accordance with ASTM-D-6193, Type 301 lockstitch, 7 to 10 stitches per inch with minimum 3/4-inch backstitch.

1. Open seams or broken stitching shall be re sewn.

2. Small holes, tears or snags, up to 7/8 inch shall be darned with a reinforcing patch on the underside. Reinforcement shall be of basic cloth, Specification MIL-C-83429. Use a circular darn for holes or snags and up-and-down or zigzag darn for straight tears.

3. Holes or tears in excess of 7/8 inch and not exceeding three inches shall be patched. With all edges of patch turned to inside 1/4 inch, patch will extend 3/4 inch beyond damaged area all around on the underside of the garment. Stitch in place to garment with a row of stitching 1/8 inch from edge of patch. On the outside of garment turn under damaged edges approximately 1/4 inch all around and stitch 1/8 inch from edge. Patching material is listed in step 2.

NOTE

Care shall be taken in opening seams to reach damaged area so as not to damage the bladder system. All seams shall be restitched in original position.

4. Repairs of tears or worn areas in basic fabric covering bladders/knife pockets not in excess of 3 inches shall be made by stitching a patch to the outside of the cover/knife pocket.

a. Cut patch similar to that in paragraph 3, except that the material for the knife pocket patch shall conform to MIL-C-7219, Type III, Class 3. Cut patch for covering worn knife pockets 3-1/4 X 4-1/4 inches.

b. Mark location of tabs and interior bladder cover.



Do not puncture bladder.

c. Rip stitching on interior bladder cover sufficient to permit subsequent sewing of patch/knife pocket cover.

d. Sew a 12-inch length of 1/2-inch wide tape (any type) to bladder tab(s) for later use to pull bladder tabs through tab holes in bladder cover.

e. Pin bladder and interior bladder cover out of the way using bladder tabs with safety pins.

f. Hem all sides of patch/knife pocket cover by turning under 1/4 inch and stitching as indicated in paragraph 3 above.

g. Pin patch/knife pocket cover to exterior of bladder cover/knife pocket.

h. Stitch patch material/knife pocket cover to garment as indicated in paragraph 3. Stitch knife pocket cover across bottom and along both sides.

i. Remove safety pin(s) installed in step 4e. Pin interior bladder cover in place with approximately 10 to 12 straight pins. Stitch bladder cover with two rows of stitching. The first row of stitching to be 1/16 inch from the edge and second row 1/16 inch gage.

j. Pull bladder tabs through holes in bladder cover using the tape sewn on tab(s) in step 4d. Cut the tapes and stitch bladder tabs with two rows of stitching as outlined in step 4i.

k. After repair, leak test garment in accordance with paragraph 4-25.

5. Suit damage in metal stay area shall be repaired/reinforced.

NOTE

Prior to sustaining damage, garment may be reinforced in metal stay areas as a preventative maintenance measure.

4-29. REPLACEMENT OF SLIDE FASTENERS. Broken or inoperative slide fasteners shall be replaced in the same manner as originally installed. Refer to table 4-5.

4-30. REPLACEMENT OF DAMAGED HOOK AND PILE TAPE (CSU-13B/P ONLY). Damaged hook and pile tapes shall be replaced. The hook fastener tape shall conform to Type I, Class 2 of MIL-F-21840. Pile fastener tape shall conform to Class 2, MIL-F-21840. Color shall approximate the color of the base fabric. Refer to table 4-6 for dimensions of fastener tape.

4-31. REPLACEMENT OF LACING CORD. To replace the lacing cord, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Cord, Polyamide, High Temperature-Resistant	MIL-C-81104 NIIN 01-218-8409
	-or-	
As Required	Cord, Type I	MIL-C-83242 NIIN 01-013-4086
As Required	Beeswax	NIIN 00-253-1171
As Required	Paraffin	NIIN 00-285-2041

NOTE

The color of the lacing cord shall approximately match the color of the outershell clutch.

1. Unlace damaged or defective cord and discard.

2. Cut a new length of lacing cord. The lacing cord shall be cut in accordance with the following lengths:

- a. Abdomen 88 inches.
- b. Thigh 128 inches.
- c. Calf 120 inches.
- d. Bladder 16 inches.

2A. Dip each cut end into an approximately 50/50 beeswax/paraffin mixture to a depth of 1 inch to prevent fraying.

3. Relace using new cord and refit in accordance with paragraph 4-13.

Table 4-5. Slide Fasteners (A-A-55634)

Suit Size	Location	NIIN No.	Type	Style	Size	Length (Inches)
All sizes	Waist closure	5325-00-170-2999	IV	7	MHS	8 1/2
All sizes	Pockets	5325-00-164-9752	I	7	MS	8
Small regular	Waist comfort slide fasteners cannot be replaced due to the close distance to the bladder.					
	L/H Leg opening	5325-00-935-5977	IV	7A	MHS	26
	R/H Leg opening	5325-00-186-6237	IV	8A	MHS	26
Small long	L/H Leg opening	5325-00-164-0814	IV	7A	MHS	27 1/2
	R/H Leg opening	5325-00-164-9984	IV	8A	MHS	27 1/2
Medium regular	L/H Leg opening	5325-00-935-5978	IV	7A	MHS	27 1/2
	R/H Leg opening	5325-00-164-9971	IV	8A	MHS	27 1/2
Medium long	L/H Leg opening	5325-00-935-5981	IV	7A	MHS	29
	R/H Leg opening	5325-00-164-9984	IV	8A	MHS	29
Large regular	L/H Leg opening	5325-00-935-5979	IV	7A	MHS	29
	R/H Leg opening	5325-00-164-0826	IV	8A	MHS	29
Large long	L/H Leg opening	5325-00-164-9913	IV	7A	MHS	30 1/2
	R/H Leg opening	5325-00-164-9772	IV	8A	MHS	30 1/2
Large X-long	L/H Leg opening	5325-01-471-3280	IV	7A	MHS	32
	R/H Leg opening	5325-01-471-3282	IV	8A	MHS	32
SL/ML/LL/LXL	Comfort Zipper	5325-00-164-0827	I	3	MS	12 1/2
MR/LR	Comfort Zipper	5325-00-164-0827	I	3	MS	12

- Notes:
- Activities having problems ordering fasteners via the supply system can open purchase the zippers directly from the manufacturer (YKK, an approved government source) by calling Diversified Marketing Group at (610) 667-5589. They will ask you for the NIIN and build an approved fastener based on the specifications belonging to that NIIN.
 - This table reflects Federal Specifications V-F-106F (e.g. Type and Style) even though the standard was superseded by Commercial Item Description (CID) A-A-55634 in March of 1998. Below you will find the basic specifications for the fasteners needed in the G-Suit so as to make future purchases easier. Please note that both the V-F-106F and the A-A-55634 standards are listed (Notes 4 and 5).
 - All slide fasteners are Size Medium Heavy Special (MHS) or Medium Special (MS) and slide in an upward direction.
 - Specs for the V-F-106 Standard Waist and Leg Opening Fasteners are as follows: The R/H Fastener is a Type IV, Style 7, Separating, Non-reversable fastener with an automatic lock, open top stop, closed bottom stop, right hand separating unit, single slider arrangement. The L/H Fastener is identical to the R/H Fastener except that the Style is 8 on the L/H Fastener. The Waist Fasteners are identical to the R/H Fastener.
 - Specs for the A-A-55634 Waist and Leg Opening Fasteners are as follows: The R/H Fastener is a Type III, Style 7A, Separating, Non-reversable fastener with an automatic lock, open top stop, closed bottom stop, right hand separating unit, single slider arrangement. The L/H Fastener is identical to the R/H Fastener except the Style is 8A on the L/H Fastener. Waist Fasteners are identical to the R/H Fastener.

Table 4-6. Dimensions of Fastener Tape

Size of Anti-g Garment	Body Lacer Covers (Not E1)	Leg Lacer Covers (Not E1)	Hose Retainer (Not E2)	(Inches) Check List Retainer (Note 3)
Small regular	1 by 9-1/2	1 by 10 5/8	4	2 by 4
Small long	1 by 9-1/2	1 by 11 1/2	4	2 by 4
Medium regular	1 by 10	1 by 10 7/8	4	2 by 4
Medium long	1 by 10	1 by 11 3/8	4	2 by 4
Large regular	1 by 10	1 by 10 7/8	4	2 by 4
Large long	1 by 10	1 by 11 1/4	4	2 by 4
Large X-long	1 by 10	1 by 11 1/4	4	2 by 4

Notes: 1. Two shall be required for each anti-g garment.
 2. One shall be required per anti-g garment. The width shall be 1 inch hook fastener tape and 2 inches for the pile fastener tape.
 3. Two of the pile fastener tape shall be required.

4-32. REPLACEMENT OF LACING COVER SLIDE FASTENERS WITH HOOK AND PILE TAPE (CSU-15/P ONLY). To replace the lacing cover slide fasteners with hook and pile tape, proceed as follows:

1. Carefully remove damaged slide fastener from lacing cover and garment, by removing attachment stitching, and discard.

2. Cut one piece of hook fastener tape the length of the lacing cover. Cut one piece of pile tape the length of the lacing cover and trim to 1 1/2-inch width, searing the cut edge.

NOTE

When attaching fastener tapes to the garment, be careful not to catch lacing loops or lacing cords in the stitching.

3. Place hook tape, hook side up, along edge of lacing loop tape. Sew to garment using a single row of stitching, 1/8-inch from the fastener tape edge on all four sides. Overstitch at least 1/2-inch.

Materials Required

Quantity	Description	Reference Number
As Required	Thread, Aramid, Size E, Sage Green	MIL-T-43636 NIIN 00-496-9901 or equivalent
	-or-	
	Thread, Nylon, Size E, Sage Green	V-T-295 NIIN 00-204-3884 or equivalent
As Required	Fastener Tape, Hook, Type II, Class I, 1-Inch Wide	MIL-F-21840 NIIN 00-935-6761 (Black) NIIN 00-104-5973 (Olive Green)
As Required	Fastener Tape, Pile, Class I, 2-Inches Wide	MIL-F-21840 NIIN 00-924-4930 (Black) NIIN 00-498-6631 (Olive Green) NIIN 00-405-2265 (Sage Green)

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4. Lap pile tape 3/8-inch under the edge of the lacing cover, with back side of pile tape next to the inside of the lacing cover and the seared edge under the lacing cover. Sew to garment, using a double row of stitching 1/8-inch from the fastener tape edge and 1/8-inch apart. Overstitch at least 1/2-inch.

Materials Required

Quantity	Description	Reference Number
As Required	Stop, Top	P10000K (03961) NIIN 01-201-3524
As Required	Slider and Pull Interlocking	NIIN 00-276-4940 (See note)

NOTE

Not all sliders are compatible with all slide fasteners. To assure compatibility, defective sliders should be replaced with sliders manufactured by the same manufacturer.

1. Using end cutters or snippers, remove the top stop from retainer side of slide fastener to allow for slider removal.

2. Pull the slider slightly past area where top stop was removed and without removing stitching, ease slider over cord or bead of tape (to which teeth are attached) and remove slider.

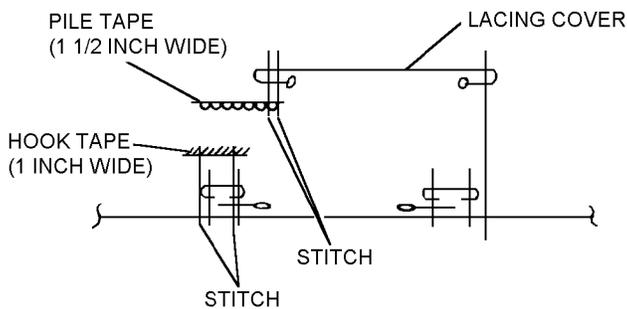
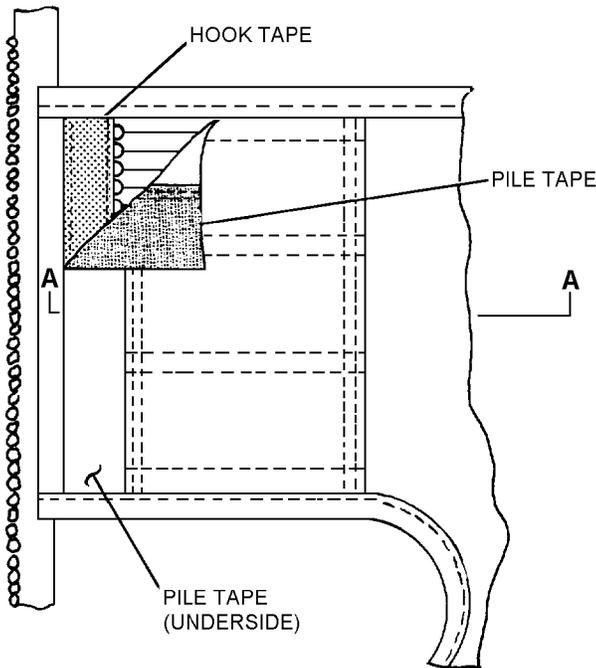
3. Place the replacement slider in approximately the same position as that of the slider just removed and back new slider over cord or bead of tape. Join both sides of slide fastener to check for proper closing.

4. Install new top stop as close to top tooth as possible and crimp tight to cord. Check for security.

4-33A. REPLACEMENT OF THE METAL HOOK OR BAR FASTENER (CSU-13B/P ONLY).

Materials Required

Quantity	Description	Reference Number
As Required	Thread, Aramid	MIL-T-43636 NIIN 00-512-1103 or NIIN 00-496-9901
	-or-	
As Required	Thread, Nylon, Size E	V-T-295 NIIN 00-204-3884 or NIIN 00-616-0079 or Equivalent



SECTION A-A

Steps 3 and 4 - Para 4-32

4p32s3

4-33. REPLACEMENT OF SLIDERS AND TOP STOPS ON CLOSURE SLIDE FASTENERS (CSU-15/P ONLY). To replace sliders and top stops on closure slide fasteners, proceed as follows:

Materials Required (Cont)

Quantity	Description	Reference Number
As Required	Tape, Nylon, Type III, 1 Inch	MIL-T-5038 NIIN 00-176-8085 -or- NIIN 00-753-6144
As Required	Cap, Snap Fastener	MS27980-1B NIIN 00-359-6844
As Required	Socket, Snap Fastener	MS27980-6B NIIN 00-285-6250
As Required	Stud, Snap Fastener	MS27983-3 NIIN 00-276-4908
As Required	Post, Snap Fastener	MS27983-4 NIIN 00-276-4978



Do not damage the anti-g garment when removing hook and bar fasteners.

NOTE

Replacement of the metal hook or bar fastener is required when it is damaged or has broken from the garment. Metal hook or bar fasteners in good condition shall remain in service.

All stitching shall be in accordance with ASTM-D-6193, Type 301 lockstitch, 7 to 10 stitches per inch over stitching with a minimum of 3/4-inches.

1. If the hook fastener is not missing, remove it by placing a screwdriver under the hook fastener and prying up away from the garment. Remove the metal hook fastener back plate from the garment by cutting a small hole in the fabric over and above the metal hook fastener back plate. Discard the metal hook fastener back plate.

2. If the metal bar fastener is not missing, remove by placing a screwdriver under the bar fastener and prying up away from the garment. Discard bar fastener.

er. Remove and discard the metal bar back plate of the bar fastener by cutting the sewn seam threads away from the top of the fastener webbing (as worn by the wearer).

3. Sear cut a 1-inch by 1-inch piece of nylon tape.

4. Sew the tape over the hole and area of the removed metal hook fastener.

5. Punch a hole through the center of the tape (installed in [step 4](#)) and anti-g garment fabric for the snap to fit through. Install the stud and post to the former metal hook fastener area.

6. Punch a hole through the center of the webbing of the metal bar fastener removed in [step 2](#). Install the cap and socket through the webbing so they mate with the stud and post installed in [step 5](#).

7. Ensure the snap is installed correctly and properly snaps together.

8. Document replacement/repairs/maintenance in accordance with OPNAVINST 4790.2 series.

4-34. CLEANING. Cleaning shall be performed at the lowest maintenance level possible. To clean the anti-g garment, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Detergent, Laundry	Commercial



Do not allow water to enter bladder. Do not dry-clean anti-g coveralls. Do not use bleaches or other additives. Do not use commercial laundry facilities. Do not wash garment in hot water.

1. Seal quick-disconnect fitting. Close all slide fasteners and hook and pile tape.

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CAUTION

Securely pad quick-disconnect fitting with rag or suitable material to prevent damage to fitting or washer/dryer. Do not wash coveralls in hot water.

2. Hand launder or use an automatic washer that has a delicate cycle. Ensure water used is cold. Follow detergent manufacturer's recommendation for amount of detergent to be used. Wash cycle shall not exceed 3 minutes.

CAUTION

Do not wring garment; do not damage bladder or hose.

3. Rinse in cool, fresh water. Drain water. Repeat rinse until all traces of detergent have disappeared from rinse water.

CAUTION

Do not spin or tumble dry the CSU-13B/P.

Do not iron or press the CSU-13B/P or CSU-15/P.

The CSU-15/P may be dried in a clothes drier using fluff cycle, no heat, for 20 minutes.

4. Hang garment on wooden hanger in a dry, well-ventilated area until dry, or machine fluff dry.

5. If slide fasteners do not function properly after laundering, a dressing such as paraffin or candle wax may be applied to the chain. Do not use oil or grease.

Section 4-3. Leak Test Fixture

4-35. GENERAL.

4-36. Leak test fixtures are not stocked in the supply system. They must be assembled locally. Most items should be readily available through supply. Items not available through normal supply channels shall be purchased locally, or fabricated at the organizational maintenance level or above.

4-37. CONFIGURATION.

4-38. Leak test fixtures are comprised of various connectors and couplings with attendant shutoff valves necessary to introduce and regulate a source of pressure into a bladder or cell. A measuring device must be provided to measure initial pressure and leakage (pressure drop).

NOTE

Leak test fixture configurations other than that shown in [figure 4-8](#) are allowed if they are able to obtain required readings.

4-39. The test fixture shown in [figure 4-8](#) is a basic fixture that can be adapted to most items of equip-

ment and test requirements by substituting if required, manometer or gage. To operate the leak test fixture, proceed as follows:

NOTE

If needed, a multiplace liferaft pump Type I or III (MIL-P-8258) can be used with adaptable fittings as the air source.

1. Attach the device to a source of low pressure air.

2. Ensure connector is clamped on hose, and is leak-tight.

CAUTION

Inflate test item slowly, making frequent stops to check pressure. Refer to applicable section for correct leak test procedures.

3. Attach connector to test item. Rotate 3-way valve to air source and inflate test item. Rotate valve to gage, and read pressure. Repeat as necessary until proper pressure is attained.

Section 4-4. CSU-21/P22P-16 Counter Pressure Vest

4-40. GENERAL.

4-41. The CSU-21/P22P-16 Counter Pressure Vest (figure 4-10) is worn on the upper torso, over the standard flight suit. The vest provides Chest Counter Pressure Breathing +Gz. Regulated oxygen, at a pre-determined schedule, is supplied to the vest via the regulator for inflation of the vest under +Gz conditions.

4-42. CONFIGURATION.

4-43. The CSU-21/P22P-16 Counter Pressure Vest consists of a flame resistant cloth outershell which houses a pneumatic bladder. A front slide fastener closure provides easy donning and doffing and laces allow sufficient adjustment for correct fit. The vest valve is a fill/dump valve located in the end of the vest hose. It maintains the pressure differential between the vest and the mask at less than four inches of water at inspiratory pause.

4-44. APPLICATION.

4-45. The CSU-21/P22P-16 Counter Pressure Vest is a component of the Navy Combat Edge (NCE) A/P22P-16 Aircrew Protective Assembly. The NCE A/P22P-16 assembly is designed for use by aircrew personnel assigned to high performance aircraft that have the proper automatic g-valve installed.

4-46. MODIFICATIONS.

4-47. Currently there are no modifications authorized to the CSU-21/P22P-16 Counter Pressure Vest assembly (table 4-7).

4-48. SERVICE LIFE.

4-49. The CSU-21/P22P-16 Counter Pressure Vest shall remain in-service until it fails leakage test and/or it can no longer be economically repaired.

4-50. FITTING.

4-51. Determine correct vest size by taking chest measurement while aircrew member is wearing under-shirt and flight suit. Compare the values shown in table 4-8 and select the correct size of vest. Proceed as follows:

1. Don the underwear and standard flight suit.
2. Open the front slide fastener on the vest and loosen all laces to full extension.
3. Don the vest by inserting arms and folding the left side of the vest over the right side.
4. Position the hook and pile tabs at the left shoulder.
5. Fasten the securing tab hook and close the front diagonal slide fastener. Close the side slide fasteners.
6. While the crewmember is standing, tighten both side laces evenly until the vest is comfortably snug (should not prevent full expansion of the chest).
7. Knot the laces close to the vest using a double half-hitch knot.
8. Instruct the crewmember to sit down and then readjust the lacings for comfort. Adjustments should be made so that the flat of the hand can be slid between vest and the flight suit at the shoulders without difficulty. Secure the excess lacings behind the lacing covers.

NOTE

The lacing may have to be readjusted after the crewmember wears the vest during flights.

9. Tie ends in an overhand knot when completed.

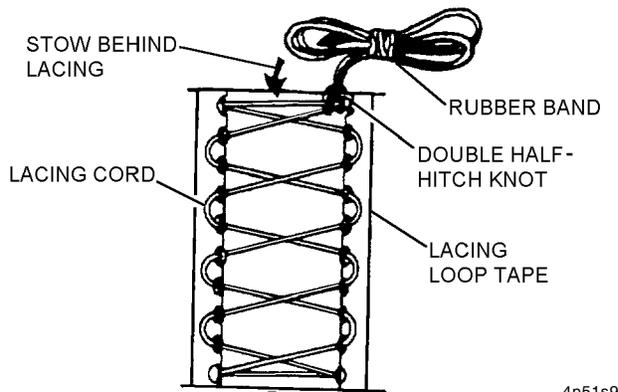
Table 4-7. CSU-21/P22P-16 Counter Pressure Vest Directives

Description of Modification	Application	Modification Code
None		

NOTE

Do not cut off extra laces.

10. Fake excess lacing cord, secure with a light-weight rubber band and stow behind tightened laces and lacing cover.



Steps 9 and 10 - Para 4-51

Table 4-8. Vest Sizes

Chest (Inches)	Vest Size	P/N
31.25 - 35.25	Small (S)	3473AS500-1 93D8517-1 (Gentex)
35.25 - 39.25	Medium (M)	3473AS500-2 93D8517-2 (Gentex)
39.25 - 43.25	Large (L)	3473AS500-3 93D8517-3 (Gentex)
	Extra Large (XL)	3473AS500-4 93D8517-4 (Gentex)

4-52. MAINTENANCE.

4-53. Aircrewmember responsibility for maintenance of the CSU-21/P22P-16 Counter Pressure Vest is limited to Preflight and Postflight Inspections. Required repairs and maintenance actions shall be performed by qualified Aircrew Survival Equipment personnel. Repairs, fabrications, and replacements required to maintain serviceability are listed in [table 4-9](#). The CSU-21/P22P-16 Counter Pressure Vest shall be updated by comparing configuration with directives listed in [table 4-7](#). All maintenance actions shall be documented in accordance with OPNAVINST 4790.2 Series.

4-54. INSPECTION.

4-55. Inspection requirements of the CSU-21/P22P-16 Counter Pressure Vest shall consist of Place-In-Service Inspection, Preflight/Postflight Inspection, and Special Inspections (90 and 360-Day). Any discrepancies noted shall be reported to the Aviation Equipment Branch for maintenance action. Inspections shall be documented in accordance with OPNAVINST 4790.2 Series.

4-56. PLACE-IN-SERVICE INSPECTION. Prior to being placed into service the counter pressure vest shall receive a Visual Inspection in accordance with [paragraph 4-58](#) and a leak check in accordance with [paragraph 4-60](#).

4-57. PREFLIGHT/POSTFLIGHT INSPECTION. The Preflight/Postflight Inspection shall be performed prior to and after each flight by the aircrew member to whom the anti-g garment is assigned. The Preflight/Postflight Inspection shall be a Visual Inspection in accordance with [paragraph 4-58](#).

4-58. VISUAL INSPECTION. The Visual Inspection of the CSU-21/P22P-16 Counter Pressure Vest shall consist of the following:

1. Inspect garment for tears, holes, rips, damaged or missing parts, worn or frayed lacing, and worn or separated seams.

Table 4-9. CSU-21/P22P-16 Counter Pressure Vest Repairs, Fabrications, and Replacements

Description	Paragraph
Vest Fabric Repair (Not Over Bladder Area)	4-70
Vest Fabric Repair (Over Bladder Area)	4-71
Slide Fastener Replacement	4-72
Lacing Repair	4-73
Garment Binding Tape Replacement	4-74
Hook/Pile Fastener Replacement	4-75
Stowage Loop Replacement/Fabrication	4-76
Vest Supply Hose Replacement	4-77
Replacement of Vest Valve Assembly	4-80

2. Inspect outer shell and hose for holes, tears, and abrasions.

3. Inspect slide fasteners, hose, and cable connectors for corrosion and proper operation.

4. If required, clean assembly components in accordance with [paragraph 4-83](#).

4-59. SPECIAL INSPECTION (90-DAY). A Special Inspection shall be performed by an Aircrew Survival Equipmentman every 90 days and whenever a discrepancy is noted during a Preflight/Postflight Inspection. The 90-Day Special Inspection shall consist of the following:

1. Perform Visual Inspection in accordance with [paragraph 4-58](#).

2. If repairs/discrepancies have been corrected, a leak test shall be conducted in accordance with [paragraph 4-60](#).

3. Deleted

4. Document inspection in accordance with OP-NAVINST 4790.2 Series.

4-59A. SPECIAL INSPECTION (360-DAY). The 360-Day Special Inspection shall consist of the following:

1. Perform all steps in accordance with [paragraph 4-59](#).

2. Perform a leak test in accordance with [paragraph 4-60](#).

3. Document inspection in accordance with OP-NAVINST 4790.2 Series.

4-60. CSU-21/P22P-16 VEST BLADDER LEAK TEST.

4-61. A leak test shall be performed on the CSU-21/P22P-16 counter pressure vest assembly whenever leakage is suspected, prior to issue, and every 360 days thereafter in conjunction with Special Inspection requirements. Leak checks shall be performed by a qualified Aircrew Survival Equipmentman. All maintenance actions shall be documented in accordance with OPNAVINST 4790.2 Series. Refer to [figure 4-6](#) and proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Oxygen, Aviator's Breathing, Type I	MIL-O-27210

Support Equipment Required

Quantity	Description	Reference Number
1	Leakage Tester, TTU-551/E	3549AS100
1	Stop Watch or Timing Device	—
1	Tensioning Tool	MS90387-1

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, fuel, hydraulic fluid, or/and combustible material. Fire or explosion can result when even slight traces of combustible materials come in contact with oxygen under pressure.

CAUTION

Ensure hoses are not kinked when performing leakage test.

NOTE

Do not attempt to perform any maintenance without becoming thoroughly familiar with the TTU-551/E Leakage Tester.

Prior to performing leakage test, ensure that a pretest check has been performed on the TTU-551/E Leakage Tester in accordance with [Section 4-6](#) of this manual or NAVAIR 17-15GB-505.

For index letters referred to in this paragraph, refer to [figure 4-6](#) unless otherwise noted.

4-62. TEST SET-UP.

1. Ensure test set inlet pressure valve (F) is in the OFF position and oxygen supply cylinder valve is fully closed.
2. Connect regulator (A) to the oxygen supply cylinder. Ensure regulator (A) is not loaded by turning pressure adjusting handle counterclockwise until spring tension is released.
3. Ensure oxygen flow control valve (B) attached to regulator (A) is closed.
4. Slowly fully open the oxygen supply cylinder. Relieve any pressure indicated on regulator gage (I) by opening and closing the oxygen flow control valve (B).
5. Connect oxygen hose (C) to fitting (B1) of regulator (A) and connect the other end of oxygen hose (C) to the test set oxygen INLET (D).

6. Fully open oxygen flow control valve (B).

7. Adjust regulator (A) until 1.0 psig is indicated on regulator outlet pressure gage (I).

4-63. TEST PROCEDURE.**4-64. Vest Assembly.**

1. Connect vest assembly fill/dump valve (M) to vest adapter (K) of hose assembly (J). Connect other end of hose assembly (J) to test set oxygen OUTLET (H).

CAUTION

Inflating the bladder to pressures that exceed 2.5 psig will damage the bladder. Any vest bladder subjected to pressure in excess of 2.5 psig must be removed from service.

NOTE

No adjustment of regulator (A) should be necessary during the filling process. Approximate fill time is 45 to 60 seconds.

2. Turn inlet pressure valve (F) to the ON position. Observe low pressure gage (G). Gage reading should be approximately 0.0 psig during filling, and slowly approach 1.0 psig as the vest becomes fully inflated.

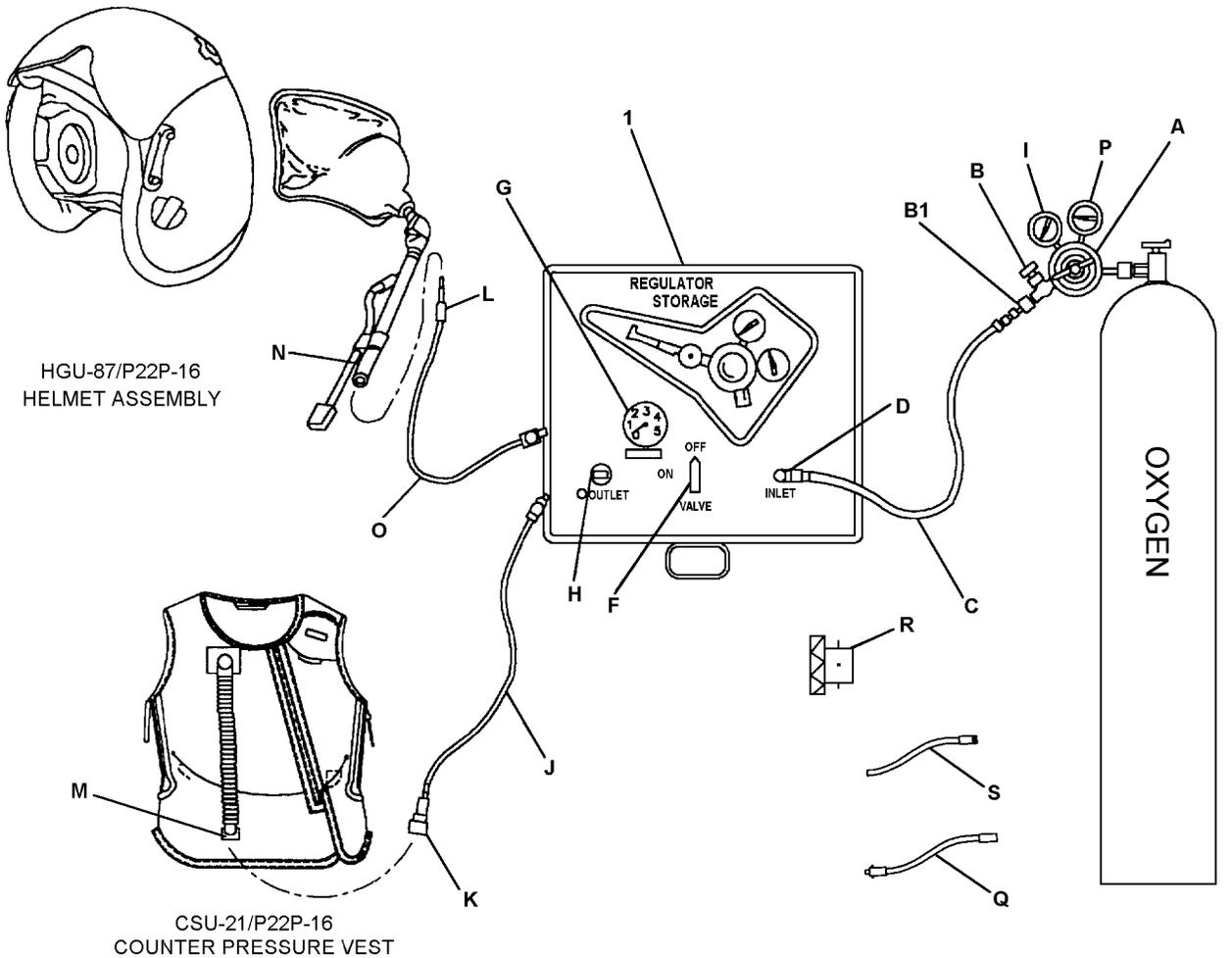
3. Allow the pressure reading on low pressure gage (G) to stabilize. Pressure in the vest should indicate 1.0 ± 0.1 psig. Adjust pressure reading on low pressure gage (G) by turning pressure adjusting handle on regulator (A) as necessary to achieve 1.0 ± 0.1 psig.

NOTE

When test set inlet pressure valve (F) is turned to OFF position, a continuous pressure drop may occur. If leakage does occur, proceed to [step 5](#). If leakage is not indicated, proceed to [step 6](#).

4. Turn test set inlet pressure valve (F) to the OFF position.

5. If leakage is indicated on low pressure gage (G) after inlet pressure valve (F) is turned to OFF; perform Fill/Dump Valve Functional Check in accordance with [paragraph 4-65](#). If fill/dump valve (M) passes functional check, proceed to [paragraph 4-66](#) and perform Test Vest Bladder Only procedures.



- | | | | |
|----|---------------------------------|---|--|
| 1 | LEAKAGE TESTER TEST SET | J | HOSE ASSEMBLY (VEST) |
| A | REGULATOR | K | VEST ADAPTER (FITTING) |
| B | VALVE (OXYGEN FLOW CONTROL) | L | HELMET/VEST BLADDER ADAPTER (FITTING) |
| B1 | QUICK DISCONNECT (FITTING) | M | VEST ASSEMBLY FILL/DUMP VALVE |
| C | HOSE, OXYGEN | N | HELMET BLADDER HOSE |
| D | OXYGEN INLET (QUICK DISCONNECT) | O | HOSE ASSEMBLY (HELMET BLADDER/VEST) |
| E | RELIEF VALVE (NOT SHOWN) | P | REGULATOR INLET GAGE |
| F | INLET PRESSURE VALVE | Q | ADAPTER CAP ASSEMBLY |
| G | LOWER PRESSURE (0 - 5 PSIG) | R | VEST ADAPTER CAP |
| H | OXYGEN OUTLET (QUICK CONNECT) | S | HOSE ASSEMBLY (HELMET BLADDER, INTERMEDIATE) |
| I | REGULATOR OUTLET GAGE | | |

Figure 4-6. Leakage Tester, TTU-551/E

6. If leakage is not apparent on gage (G), perform a time test of the test set low pressure gage (G) readings to determine leakage rate. Allowable leakage shall not exceed 0.1 psig in 30 seconds. If vest leakage does not exceed 0.1 psig, perform Fill/Dump Valve Functional Check in accordance with paragraph 4-65. If leakage exceeds 0.1 psig in 30 seconds, perform [step 5](#).

4-65. Fill/Dump Valve Functional Check.

1. Ensure the pressure reading on gage (G) is approximately 1 psig. Turn test set inlet pressure valve (F) to the ON position and then to the OFF position if necessary to achieve this pressure.

NOTE

A properly operating fill/dump valve (M) will initially vent vest pressure in 3 to 5 seconds when vest adapter (K) is disconnected from fill/dump valve (M).

2. Disconnect vest adapter (K) from fill/dump valve (M).

NOTE

If fill/dump valve (M) does not vent vest in 3 to 5 seconds or is slow to vent, replace fill/dump valve (M) in accordance with [paragraph 4-80](#) and retest in accordance with [paragraphs 4-65](#) and [4-66](#).

3. Slightly press down on vest and remove approximately 1/2 of remaining oxygen from vest bladder.



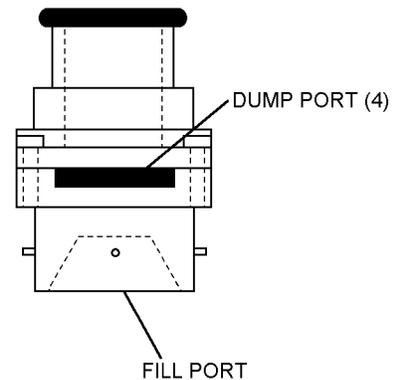
It is essential that individuals be able to attain a proper seal of the fill port prior to performing [steps 4](#) and [5](#).

NOTE

When performing [steps 4](#) and [5](#), individuals with small thumbs may use the palm of their hand to seal the inlet port.

4. Place thumb over fill port (see illustration after [step 5](#)). Press down on vest. Vest should not deflate at this time. If vest deflates, repeat [steps 1 through 4](#) until proper seal can be achieved and vest does not deflate.

5. With thumb still over fill port, continue pressing on vest. Quickly remove and replace thumb over fill port. The vest should continue to deflate through the dump ports. If vest does not continue to deflate after thumb is replaced, then the fill/dump valve (M) has malfunctioned and should be replaced in accordance with [paragraph 4-80](#) and retested in accordance with [paragraphs 4-64](#) and [4-65](#).



Steps 4 and 5 - Para 4-65

4p65s4

6. Provided there will be no more tests conducted on equipment requiring the TTU-551/E, the test stand will be secured in accordance with [paragraph 4-67](#). Otherwise, return to [paragraph 4-64](#) to perform additional vest tests.

4-66. Test Vest Bladder Only.

1. Disconnect vest fill/dump valve (M) from vest adapter (K).

2. Disconnect hose assembly (J) from oxygen OUTLET (H).



Cut through head of cable tie using diagonal cut pliers. Do not attempt to cut strap underneath head.

3. Carefully cut nylon cable tie securing vest fill/dump valve (M) and remove the fill/dump valve (M).

4. Insert helmet/vest bladder adapter fitting (L) into vest bladder hose (O). Connect other end of hose assembly (O) to test set oxygen OUTLET (H).



Inflating the bladder to pressures that exceed 2.5 psig will damage the bladder. Any vest bladder subjected to pressure in excess of 2.5 psig must be removed from service.

NOTE

No adjustment of regulator (A) should be necessary during the filling process.

5. Turn test set inlet pressure valve (F) to ON position. Observe low pressure gage (G). Gage reading should be approximately 0.0 psig during filling, and slowly approach 1.0 psig as the vest becomes fully inflated.

6. Allow the pressure reading on low pressure gage (G) to stabilize. Pressure in the vest should indicate 1.0 ±0.1 psig. Adjust pressure reading on low pressure gage (G) by turning pressure adjusting handle on regulator (A) as necessary to achieve 1.0 ±0.1 psig.

7. Turn test set inlet pressure valve (F) to the OFF position.

8. Time low pressure gage (G) reading for 30 seconds. Leakage shall not exceed 0.1 psig in 30 seconds. If vest bladder leakage exceeds allowable limits, install a new vest hose in accordance with paragraph 4-77 and repeat steps 5 thru 8. If leakage is within limits, proceed to step 9. If leakage exceeds allowable limits with new vest hose, the new hose shall be removed and the vest disposed of in accordance with the SM&R code.

9. Disconnect vest hose from helmet/vest adapter (L). Disconnect hose assembly (O) from oxygen OUTLET (H).

10. Re-install the original fill/dump valve (M) on the vest hose with a new cable tie with tension set to 3.

11. Provided there will be no more tests conducted on equipment requiring the TTU-551/E, the test stand will be secured in accordance with paragraph 4-67. Otherwise, connect hose assembly (J) to oxygen

OUTLET (H) and return to paragraph 4-64 to perform additional vest tests.

4-67. SECURING TTU-551/E TEST SET.

1. Disconnect vest hose assembly (J) from test set oxygen OUTLET (H).

2. Close oxygen supply cylinder.

3. Turn test set inlet pressure valve (F) to the ON position, to bleed pressure from test set.

4. Turn regulator (A) counter-clockwise until spring tension is released.

5. Close oxygen flow control valve (B) and turn inlet pressure valve (F) to the OFF position.

6. Disconnect all hoses from test set and regulator (A) and stow in lid of test set.

7. Disconnect regulator (A) from oxygen supply cylinder and stow in space provided in test set.

8. Stow all hoses and adapter fittings/caps in space provided in test set.

4-68. REPAIR/REPLACEMENT.

4-69. Only the fabric portions of the CSU-21/P22P-16 Counter Pressure Vest shall be repaired. Repair of the bladder is not authorized. Garments having leaking or otherwise defective bladders shall be condemned. Procedures for repair or replacement of components of the CSU-21/P22P-16 Counter Pressure Vest are as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Thread, Aramid Type II, Size E	MIL-T-43636 NIIN 00-512-1103
	-or-	-or-
	Type I, Size E Sage Green	NIIN 00-494-9901
As Required	Cloth, Duck Type III, Class 3	MIL-C-7219 NIIN 01-173-4436

Materials Required (Cont)

Quantity	Description	Reference Number
As Required	Slide Fastener Type IV, Style 8	A-A-55634
As Required	Fastener Tape, Hook, Type I, Class 1, 1 Inch US Army 106	MIL-F-21840 NIIN 00-151-6480
As Required	Fastener Tape, Pile, Class 2, 1 Inch US Army 106	MIL-F-21840 NIIN 00-151-6484
As Required	Cord, Polyamide High Temp. Resistant (Sage Green)	MIL-C-83242 NIIN 01-218-8409
As Required	Cord, Type I	MIL-C-81104 NIIN 01-013-4086
As Required	Stop, Top	P100000K NIIN 01-201-3524
As Required	Hose, Non-Metallic, Vest Assembly	F148-1231-1 G002-1101-01 NIIN 01-317-4439
As Required	Beeswax	NIIN 00-253-1171
As Required	Paraffin	NIIN 00-285-2041

4-70. REPAIR OF FABRIC NOT OVER BLADDER AREA. Repair of holes, tears, snags, worn areas, and missing or broken stitching in basic fabric, not over the bladder, shall be repaired as follows:

NOTE

All seams shall be restitched in original position minimum.

1. Open seams or broken stitching shall be sewn using non-melting thread. Stitches shall be Type 301, 8 to 10 stitches per inch. Backstitch or overstretch 3/4 inch.

2. Small holes/worn areas, tears or snags up to 7/8 inch shall be darned with reinforcing patch on underside. Use a circular darn for holes or snags and up-and-down or zigzag darn for straight tears, 14 to 16 stitches per inch. Backstitch or overstretch 1/2 inch.

3. Holes, worn areas, tears, or snags greater than 7/8 inch but less than 3 inches shall be patched. Patches shall not exceed three per garment.

a. With all edges of the patch turned under 1/4 inch, patch shall extend 3/4 inch beyond perimeter of damaged area on underside of garment.

b. Stitch patch to garment with a row of stitches 1/8 inch from edge of patch.

c. On outside of garment, turn under damaged edges of garment approximately 1/4 inch and stitch to patch 1/8 inch from edge of fold. Use 10 to 12 stitches per inch with 1/2 inch backstitch or over-stitch.

WARNING

Repair of material or stitching directly over the bladder is not authorized.

4-71. REPAIR OF FABRIC/STITCHING OVER BLADDER AREA. There shall be no repair of the bladder. Garments that have leaks or defective bladders shall be condemned.

4-72. REPAIR OF SLIDE FASTENER. Repair is limited to replacement of slide fastener stops and slider assembly.

4-73. LACING REPAIR. Frayed or otherwise worn or weakened lacing shall be replaced. Ends of adjustment lacing shall be seared or dipped in hot solution of 50 percent bees wax and 50 percent paraffin to prevent fraying. Lacing loops shall be repaired as follows:

NOTE

Each lacing loop tape shall be restricted to a one-time only repair of the original upper and lower end loops. Garment shall be condemned upon subsequent failure of end loops.

1. Trim frayed end of broken or separated end lacing loop.

2. Stitch or bar tack loop cord where loop cord and tape join between the defective and adjacent loop.

3. Stitch with minimum of 6 rows of stitching, 10 to 12 stitches per inch.

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4-74. REPLACEMENT OF GARMENT BINDING TAPE. Loose or frayed binding tape on garments shall be replaced as follows:

1. Edge binding shall be 45 degrees bias cut 1 1/4-inches to 1 3/8-inches wide and center folded.

2. Stitching shall be Type 301, 8 to 10 stitches per inch. Backstitch or overstretch 3/4 inch.

4-75. REPLACEMENT OF DAMAGED HOOK AND PILE FASTENERS. Cut new fastener tape same dimension as damaged tape removed and box stitch in place in original position.

4-76. REPLACEMENT OF STOWAGE LOOP. Refer to figure 4-7 and proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Tape, Nylon Type VI, No. 1565 Sage Green	MIL-T-5038 NIIN 00-753-5952

CAUTION

Exercise care to prevent damage to bladder when opening stitching in vest seams.

1. Open inner neck seam at two points where stowage loop is installed and remove stowage loop.

2. Fabricate and install replacement stowage loop as follows:

a. Cut a 5 1/4-inch length of nylon tape and seal ends by searing or dipping in hot paraffin wax.

b. Make 90 degree fold at ends of tape to form 5/8-inch attachment tab.

c. Stitch each folded end with two rows of straight stitching, 18 stitches per inch, and backstitch over stitching.

d. Insert ends of loop tabs into seam openings.

CAUTION

Exercise care to prevent damage to bladder when stitching seams to secure stowage loop.

e. Secure tabs by stitching openings in seams closed. Use three rows of straight stitches, 8 to 10 stitches per inch.

4-77. REPLACEMENT OF VEST SUPPLY HOSE ASSEMBLY. Replace vest supply hose as follows:

4-78. Removal.

CAUTION

Use diagonal cut pliers to cut through top of tiedown strap head. Do not cut under strap head.

1. Using diagonal cut pliers remove tiedown strap securing vest supply hose to elbow adapter and remove hose from adapter.

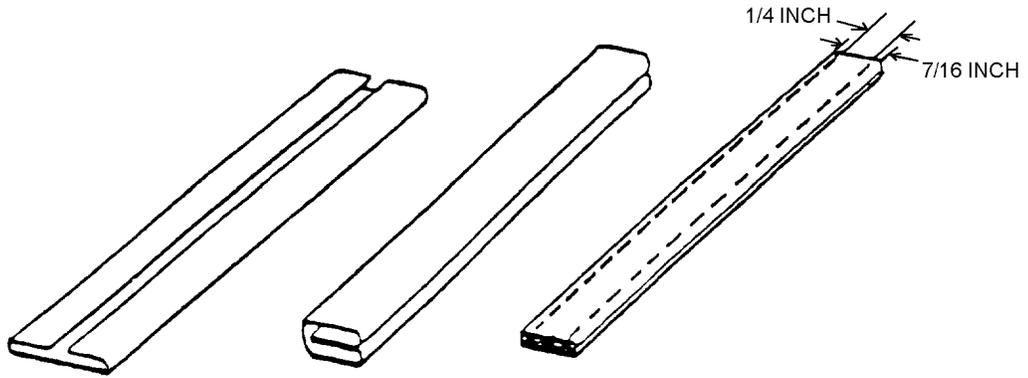
2. Remove tiedown strap securing vest supply hose to vest valve using diagonal cut pliers in same manner.

4-79. Installation.

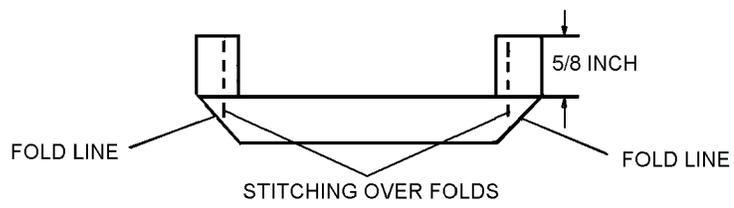
1. Install vest valve assembly on vest supply hose using tiedown strap using tensioning tool set at 8.

2. Slip vest supply hose on to elbow adapter and secure with tiedown strap using tensioning tool set at 8.

3. Perform leak test in accordance with paragraph 4-60.



FABRICATING STOWAGE LOOP



FOLDING/STITCHING STOWAGE LOOP

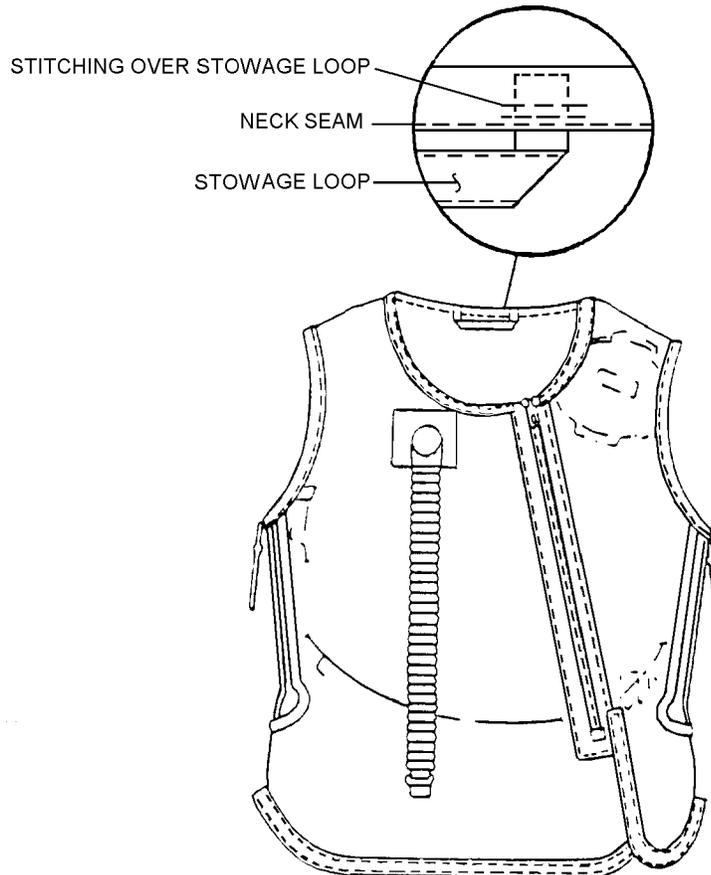


Figure 4-7. Fabrication/Installation of Stowage Loop

NAVAIR 13-1-6.7-2

4-80. REPLACEMENT OF VEST VALVE ASSEMBLY.



4-81. Removal.



Use diagonal cut pliers to cut through top of tiedown strap head. Do not cut under strap head.

1. Remove tiedown strap securing vest supply hose vest valve assembly using diagonal cut pliers and remove hose from valve.

4-82. Installation.

1. Install vest supply hose on vest valve assembly with tiedown strap using tensioning tool set at 8.

2. Perform leak test in accordance with paragraph 4-60.

4-83. CLEANING.

4-84. Cleaning garment shall be performed at lowest level of maintenance possible as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Detergent, Laundry	Commercial



Do not allow water to enter bladder.

Do not dry clean counter pressure vest.

Do not use bleaches or other additives.

Do not use commercial laundry facilities.

Do not wash garment in hot water.

1. Seal vest valve assembly. Close all slide fasteners and hook and pile tape.



Securely pad vest valve assembly with rag or suitable material to prevent damage to fittings or washer/dryer.

Do not wash vest in hot water.

2. Hand launder or use automatic washer with delicate cycle. Ensure cold water is used. Follow detergent manufacturers recommendation for amount of detergent to use. Wash cycle shall not exceed 3 minutes.



Do not wring garment. Do not damage bladder or hose.

3. Rinse in cool, fresh water. Drain water and repeat rinse until all trace of detergent has disappeared from rinse water.



Do not iron or press.

NOTE

Garment may be dried in a clothes dryer using fluff cycle, no heat, for 20 minutes.

4. Hang garment on wooden hanger in a dry, well ventilated area until thoroughly dry, or machine fluff dry.

5. If slide fasteners do not function properly after laundering, a dressing such as paraffin or candle wax may be applied to fastener chain. Do not use oil or grease.

Section 4-5. CSU-20/P22P-16 Anti-g Garment

4-85. GENERAL.

4-86. The CSU-20/P22P-16 Anti-g Garment (figure 4-9) is a component of the Navy Combat Edge (NCE) A/P22P-16 Aircrew Protective Assembly. The CSU-20/P22P-16 anti-g garment provides 40% greater bladder coverage to restrict the flow of blood to the lower portion of the body than either the CSU-13B/P or CSU-15/P anti-g garments.

4-87. CONFIGURATION.

4-88. The CSU-20/P22P-16 has a flame resistant cloth outer shell which houses a bladder. It is cut away at the groin and knees. The outer shell has waist and inner-leg slide fasteners, adjustment lacing with covers, and leg pockets with slide fastener closures. The lower garment bladder inflates automatically to a pressure determined by the automatic anti-g suit pressure regulating valve installed aboard the aircraft. A g-sensing line located between the oxygen regulator and the male portion of the g-suit hose quick connect provides the pneumatic signal to the regulator that enables the NCE system to operate. The bladder, when inflated, restricts the downward flow of blood to the waist and feet, thereby lessening the effect of blood pooling.

4-89. APPLICATION.

4-90. The CSU-20/P22P-16 Anti-g Garment is a component of the Navy Combat Edge (NCE) System and is designed to be used only by aircrew personnel assigned to high performance aircraft with the proper automatic anti-g suit valve installed.

4-91. MODIFICATIONS.

4-92. There are currently no modifications authorized for the CSU-20/P22P-16 Anti-g Garment. See table 4-10.

4-93. FITTING.

4-94. The CSU-20/P22P-16 Anti-g Garment is fitted and adjusted to aircrew personnel on a best fit basis. Use table 4-11 as a guide for selection of initial fit. The anti-g garment should be fitted over the summer flyer's coverall. Some readjustment in size selection may be required to accommodate bulkier anti-exposure assemblies. The overall fit should be snug, not tight, due to the large volume of inflated bladders. The anti-g garment is fitted as follows:

1. Loosen all laces on garment but do not remove laces from eyelets. Open all thigh comfort slide fasteners.

2. Have aircrewmember don CSU-21/P22P-16 Counter Pressure Vest fitted in accordance with paragraph 4-50.

3. Have aircrewmember don CSU-20/P22P-16 Anti-g Garment and close waist slide fastener. The top edge of the anti-g garment should be just below bottom of wearer's rib cage. The hem of the counter pressure vest must overlap the top (waist line) of anti-g garment.

4. After donning anti-g garment, manually work out wrinkles of the flight suit to reduce discomfort.



Failure to evenly distribute the tightness among the four waist lacing assemblies can lead to premature failure of the garment.

NOTE

Laces are threaded beginning in the middle and lacing toward the top and bottom of the lacing eyelets.

5. Beginning with the top portion of each waist lacing assembly, tighten lacing cords, ensuring they are securely and equally tightened.

6. Continue with lower portion of each waist lacing assembly adjusting side and back lacings as necessary to obtain snug, but comfortable fit. Do not lace so tight as to restrict normal breathing or compress aircrew members abdomen. When properly adjusted, one should be able to slip the open hand between the waist section and the aircrewmember's abdomen.

NOTE

Distribute tightness approximately equally among the four waist lacing assemblies. Lacing may need to be looser at the ends to achieve comfortable fit across the hips.

7. When lacing adjustment is completed tie ends of lacing in a double half-hitch knot.

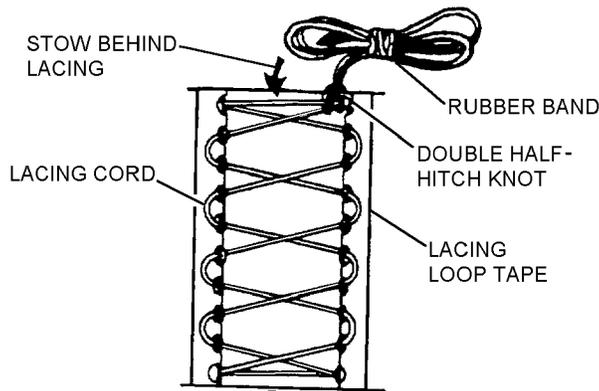
Table 4-10. CSU-20/P22P-16 Anti-g Garment Directives

Description of Modification	Application	Modification Code
None	None	None

NOTE

Do not cut off unused (excess) lacing.

8. Fake excess lacing, secure with lightweight rubber band and stow behind tightened laces.



Step 7 - Para 4-94

4p94s7

9. Position the knee hole openings so wearer's kneecaps are centered. Have aircrew member close leg slide fasteners. Close thigh slide fasteners. Close slide fastener covers.

NOTE

The thigh comfort slide fasteners shall be closed during fitting and when in the aircraft. However, they may be left open for comfort during pre/post flight.

10. Tighten thigh and calf laces, ensuring that knees stay centered in knee holes and garment extends down to boot tops.

11. Have aircrewmember sit in normal sitting position, then check to ensure top of waist bladder does not extend above the lowest rib. If it does, and cannot be corrected by readjustment of the waist, a smaller size garment may be required.

NOTE

Table 4-11. CSU-20/P22P-16 Anti-g Garment Sizing Chart

Garment Size	Height (inches)	Weight (pounds)	P/N
Small Regular	64 - 68	129 - 156	MSF8403
Small Long	68 - 73	129 - 156	MSF8402
Medium Regular	64 - 70	157 - 184	MSF8403
Medium Long	70 - 74	157 - 184	MSF8404
Large Regular	66 - 71	185 - 209.5	MSF8405
Large Long	71 - 76	185 - 209.5	MSF8406
Large Extra Long	75 - 79	191 - 230	MSF8407

Fitting g-suit on small stature aircrewmember requires careful attention to position of abdominal and calf bladders. The abdominal bladder must be below the rib cage. The top of the calf bladder must be positioned at the knee crease on the back of the leg. Alterations of the CSU-20/P22P-16 is authorized. See paragraph 4-20.

12. Have aircrewmember stand and lift leg onto a platform (arm of a chair or something of similar height - approximately 25 inches) and check mobility. If the garment is too tight to permit this movement, adjust the lacings, or try a larger garment size.

13. Tie lacing ends in double half-hitch knot when completed (as in step 7 above).

NOTE

Do not cut off unused (excess) lacing.

14. Fake excess lacing, secure with lightweight rubber band and stow behind tightened laces.

NOTE

The fit of the new anti-g suit should be checked after each of the first few sorties. Some lacing may require readjustment due to initial fabric and lacing stretch.

If an acceptable fit cannot be achieved, or if any concerns regarding fitting arise, notify your Failsafe Tiger Team Representative.

4-95. CSU-20/P22P-16 ANTI-g HOSE. No modification to shorten or lengthen hose is authorized.

4-96. MAINTENANCE.

4-97. Aircrewmember responsibility for maintenance of the anti-g garment is limited to Preflight/Postflight

Inspections. Defects in a bladder system shall be considered cause for replacing entire garment. Required maintenance actions shall be performed by qualified Aircrew Survival Equipment personnel. Authorized repairs are listed in [table 4-12](#). All maintenance actions shall be documented in accordance with OPNAVINST 4790.2 Series.

4-98. INSPECTION.

4-99. Inspection requirements of the CSU-20/P22P-16 Anti-g Garment shall consist of Place-In-Service Inspection, Preflight/Postflight Inspection, and Special Inspection (90 and 360-Day). Any discrepancies noted shall be reported to the Aviation Equipment Branch for maintenance action. Inspections shall be recorded as required by OPNAVINST 4790.2 Series.

4-100. PLACE-IN-SERVICE INSPECTION. Prior to being placed into service the anti-g garment shall receive a Visual Inspection in accordance with [paragraph 4-103](#) and a leak check in accordance with [paragraph 4-104](#).

Table 4-12. Repairs/Fabrications/Replacements

Description	Paragraph
Fitting Anti-g Hose and/or Clamp Replacement	4-95
Repair Small Holes, Tears, Snags in Basic Fabric	4-109
Bladder Cover Repair	4-111
Slide Fastener Replacement	4-113
Hook and Pile Fastener Replacement	4-112
Lacing Cord Replacement	4-114
Lacing Covers Replacement	4-115
Sliders, Top Stops on Slide Fastener Replacement	4-116
Anti-g Hose Connector Replacement	4-117
g-Sense Line	4-120

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4-101. PREFLIGHT/POSTFLIGHT INSPECTION.

The Preflight/Postflight Inspection shall be performed prior to and after each flight by the aircrew member to whom the anti-g garment is assigned. The Preflight/Postflight Inspection shall be a Visual Inspection in accordance with [paragraph 4-103](#).

4-102. SPECIAL INSPECTION (90-DAY). A Special Inspection shall be performed by an Aircrew Survival Equipmentman every 90 days and whenever a discrepancy is noted during a Preflight/Postflight Inspection. The 90-Day Special Inspection shall consist of the following:

1. Perform Visual Inspection in accordance with [paragraph 4-103](#).

2. If discrepancies have been corrected, a leak test shall be conducted in accordance with [paragraph 4-104](#).

3. Deleted

4. Document inspection in accordance with OP-NAVINST 4790.2 Series.

4-102A. SPECIAL INSPECTION (360-DAY). The 360-Day Special Inspection shall consist of the following:

1. Perform all steps in accordance with [paragraph 4-102](#).

2. Perform a leak test in accordance with [paragraph 4-104](#).

3. Document inspection in accordance with OP-NAVINST 4790.2 Series.

4-103. VISUAL INSPECTION. The Visual Inspection of the anti-g garment shall satisfy the following:

1. Secure attachment and locking, unimpeded operation, and absence of corrosion on all slide fasteners.

2. No loose or broken stitching.

3. Hook/bar fasteners for wear, security and corrosion.

4. No holes, tears, abrasions or otherwise weak areas of inner or outer fabric located directly over bladders, including hose bladder.

5. No nicks, corrosion or impeded operation of quick disconnect connectors.

5A. If required, clean assembly components in accordance with [paragraph 4-123](#).

6. If discrepancies are noted, inform Aircrew Survival Equipmentman for action.

4-104. LEAK TEST OF CSU-20/P22P-16 ANTI-g GARMENT. The leak test shall be performed using test fixture described in [Section 4-3](#). Leak test is performed as follows:

1. Close leak test fixture valve and attach quick disconnect fitting on garment hose to female fitting on leak test fixture.

2. Rotate three-way valve to air source and inflate bladder to 3 psig. Rotate to measuring device to check pressure.

3. The bladder pressure shall not drop more than 1.0 psig in the first 60 seconds. A pressure drop greater than 1.0 psig in 60 seconds constitutes test failure.

NOTE

When the leak test fixture is removed from the garment, the bladder may deflate. This is normal. The quick disconnect fitting on the garment hose is equipped with an emergency pressure valve. This allows deflation of the bladder to 1.5 psig within 4 seconds upon disconnect from the air source. The garment will then maintain internal pressure.

If feasible, failed units should be returned for analysis to:

Crew Systems Department
Naval Air Warfare Center Aircraft Division,
Code 4.6.3, Bldg 2187,
48110 Shaw Road
Patuxent River, MD 20670-1906

4. Remove leak test fixture and deflate garment bladder. Garments failing leak test shall be replaced.

4-105. SERVICE LIFE.

4-106. The CSU-20/P22P-16 Anti-g Garment shall remain in service until it fails leak test, requires more than three patches, develops growing holes or tears in fabric over the bladder, and/or can no longer be economically repaired.

4-107. REPAIR.

4-108. Repairs shall be performed by the lowest maintenance level possible. Damage which cannot be corrected by repairs listed in [table 4-12](#) shall be cause for replacement of the garment.

4-109. SMALL HOLES, TEARS, SNAGS, AND MISSING OR BROKEN STITCHING IN BASIC FABRIC. Repair of damage within repair specification shall be as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Thread, Aramid Size E, Sage Green	MIL-T-43636 NIIN 00-496-9901 or NIIN 00-512-1103
	-or-	-or-
As Required	Thread, Nylon, Size E, Sage Green	V-T-295 NIIN 00-204-3884
As Required	Cloth, Type II, Fire-Resistant	MIL-C-83429 NIIN 01-147-2064



Repair of material or stitching or replacement of components directly over the bladder is not authorized.



When opening seams to damage areas exercise care not to damage bladder system. All seams shall be restitched in original positions.

NOTE

All stitching shall be in accordance with Type 301, Lockstitch, 8 to 10 stitches per inch with 3/4 inch minimum overstitch or backstitch unless otherwise specified.

1. Open seams or broken stitching shall be resewn.
2. Small holes, tears, or snags up to 7/8 inch shall be darned with a reinforcing patch on the underside. Reinforcing patch shall be of same basic cloth as garment. Use a circular scan for holes or snags and up-and-down or zig-zag darn for straight tears.
3. Holes or tears in excess of 7/8 inch and not exceeding 3 inches shall be patched with all edges

of the patch turned inside 1/4 inch. The patch shall extend 3/4 inch beyond damaged area on the underside of the garment. Stitch in place to garment with stitching 1/8 inch from edge of patch. On outer side of garment, turn all damaged edges under approximately 1/4 inch and stitch in place 1/8 inch from folded edge.

NOTE

Number of patches shall not exceed three per garment.

4-110. Any damage or fraying detected in the metal stay areas shall be repaired or reinforced. As a preventive maintenance measure, the garment may be reinforced in the metal stay areas before any damage occurs.



Repair of material or stitching or replacement of components directly over the bladder is not authorized.

4-111. REPAIR OF BLADDER/BLADDER COVERING. There shall be no repair of the bladder. Garments that have leaks or defective bladders shall be condemned.

4-112. REPLACEMENT OF HOOK AND PILE TAPE. Damaged hook and pile tape shall be replaced with tapes conforming to Type I, Class 1, MIL-F-21840. Color class 1 shall approximately match color of basic fabric (table 4-13).

4-113. REPLACEMENT OF SLIDE FASTENERS. Broken or inoperative slide fasteners shall be replaced in the same manner as originally installed. Replacement slide fasteners shall be same type and manufacture or same type standard issue cut to required length (table 4-14).

4-114. REPLACEMENT OF LACING CORD. Determine required cord length and refer to paragraph 4-31 for installation procedures.

4-115. REPLACEMENT OF LACING COVER HOOK AND PILE TAPE. See table 4-13 for proper length and refer to paragraph 4-32 for installation procedures.

Table 4-13. Lacing Cover Hook and Pile Fastener Lengths (Inches)

G-Suit Size	Sideseams (inches)	Left or Right (inches)	Thigh (inches)	Calf (inches)
Small regular	11	8 1/2	10 3/4	9
Small long	11	8 1/2	11 1/2	10
Medium regular	11	8 1/2	11 1/2	9 3/4
Medium long	11	8 1/2	11 1/2	10 3/4
Large regular	11	8 1/2	11 1/2	10 3/4
Large long	11	8 1/2	12 1/4	11 1/2
Large extra long	11	8 1/2	12 1/4	12 3/4

Notes: Pile Fastener lengths:
 1. Pile tape for dart and side seam covers should be cut 5/8 inch longer than hook fastener tape lengths.
 2. Pile tape for thigh and calf covers shall be cut to fit garments.

Table 4-14. Slide Fastener Lengths

Suit Size	Location	NIIN No.	Type	Style	Size	Length (Inches)
All sizes	Waist closure	5325-00-170-2999	IV	7	MHS	8 1/2
All sizes	Pockets	5325-00-164-9752	I	7	MS	8
Small regular	Waist comfort slide fasteners cannot be replaced due to the close distance to the bladder.					
	L/H Leg opening	5325-00-935-5977	IV	7A	MHS	26
	R/H Leg opening	5325-00-186-6237	IV	8A	MHS	26
Small long	L/H Leg opening	5325-00-164-0814	IV	7A	MHS	27 1/2
	R/H Leg opening	5325-00-164-9984	IV	8A	MHS	27 1/2
Medium regular	L/H Leg opening	5325-00-935-5978	IV	7A	MHS	27 1/2
	R/H Leg opening	5325-00-164-9971	IV	8A	MHS	27 1/2
Medium long	L/H Leg opening	5325-00-935-5981	IV	7A	MHS	29
	R/H Leg opening	5325-00-164-9984	IV	8A	MHS	29
Large regular	L/H Leg opening	5325-00-935-5979	IV	7A	MHS	29
	R/H Leg opening	5325-00-164-0826	IV	8A	MHS	29
Large long	L/H Leg opening	5325-00-164-9913	IV	7A	MHS	30 1/2
	R/H Leg opening	5325-00-164-9772	IV	8A	MHS	30 1/2
Large X-long	L/H Leg opening	5325-01-471-3280	IV	7A	MHS	32
	R/H Leg opening	5325-01-471-3282	IV	8A	MHS	32

Table 4-14. Slide Fastener Lengths (Cont)

Suit Size	Location	NIIN No.	Type	Style	Size	Length (Inches)
SL/ML/LL/LXL	Comfort Zipper	5325-00-164-0827	I	3	MS	12 1/2
MR/LR	Comfort Zipper	5325-00-164-0827	I	3	MS	12

- Notes:
- Activities having problems ordering fasteners via the supply system can open purchase the zippers directly from the manufacturer (YKK, an approved government source) by calling Diversified Marketing Group at (610) 667-5589. They will ask you for the NIIN and build an approved fastener based on the specifications belonging to that NIIN.
 - This table reflects Federal Specifications V-F-106F (e.g. Type and Style) even though the standard was superseded by Commercial Item Description (CID) A-A-55634 in March of 1998. Below you will find the basic specifications for the fasteners needed in the G-Suit so as to make future purchases easier. Please note that both the V-F-106F and the A-A-55634 standards are listed (Notes 4 and 5).
 - All slide fasteners are Size Medium Heavy Special (MHS) or Medium Special (MS) and slide in an upward direction.
 - Specs for the V-F-106 Standard Waist and Leg Opening Fasteners are as follows: The R/H Fastener is a Type IV, Style 7, Separating, Non-reversible fastener with an automatic lock, open top stop, closed bottom stop, right hand separating unit, single slider arrangement. The L/H Fastener is identical to the R/H Fastener except that the Style is 8 on the L/H Fastener. The Waist Fasteners are identical to the R/H Fastener.
 - Specs for the A-A-55634 Waist and Leg Opening Fasteners are as follows: The R/H Fastener is a Type III, Style 7A, Separating, Non-reversible fastener with an automatic lock, open top stop, closed bottom stop, right hand separating unit, single slider arrangement. The L/H Fastener is identical to the R/H Fastener except the Style is 8A on the L/H Fastener. Waist Fasteners are identical to the R/H Fastener.

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4-116. REPLACEMENT OF SLIDERS AND TOP STOPS ON CLOSURE SLIDE FASTENERS See table 4-14 for slide fastener lengths and refer to paragraph 4-33 for installation procedures.

4-117. REPLACEMENT OF ANTI-g HOSE CONNECTOR.

Materials Required

Quantity	Description	Reference Number
As Required	Tape, Insulation Electrical, Pressure Sensitive, 3/4-Inch Wide, Black	MIL-I-24391 NIIN 01-189-6927 -or- NIIN 00-419-4291
As Required	Insulation, Sleeve Heat Shrinkable Polyolefin, Flexible	MIL-I-23053/5A NIIN 00-990-9911
1	Connector	NIIN 01-439-1334
1	Clamp, Hose	NIIN 00-585-8621 or equivalent

4-118. Removal.

1. Remove heat shrinkable tubing from connector.



Cut through the top of tiedown strap head using diagonal cut pliers. Do not cut underneath head.

2. Using diagonal cut pliers, cut and remove tiedown straps from sense line and remove sense line from connector port.
3. Remove additional layers of heat shrinkable tubing, clamps and electrical tape.
4. Remove and retain rubber sleeve from connector.

4-119. Installation.

1. Extend bladder extension on flat surface.
2. Bladder extension tube and bladder extension covering should be the same length.
3. Cut bladder spacer fabric back 5/8 inch from end.

4. Install three inch piece of rubber sleeve on connector so that it is flush with shoulder.

NOTE

When installing the connector it is necessary that the sense line port located on the connector is in direct line with the center of the channel provided on the anti-g hose.

5. Locate the bladder spacer material over the rubber sleeve such that it extends slightly over the connector hose barb but not under the inner leg of the clamp.

6. Wrap 2 1/2 turns of tape centering over the connector hose barb. Tape should overlap spacer material and rubber sleeve and be located under both legs of the clamp. Tape should be taut when applying.

7. Install clamp centering over connector hose barb. Clamp tightly.

8. Wrap 2 1/2 turns of tape centering over the clamp.

9. Slide bladder extension tube on connector until it is flush with the shoulder.

10. Wrap 2 1/2 turns of tape over bladder extension adjacent to connector shoulder.

11. Slide bladder extension cover on connector until it is flush with the shoulder.

12. Wrap 2 1/2 turns of tape over bladder extension cover adjacent to connector shoulder.

13. Install clamp over the tape and adjacent to the connector shoulder so that it does not overlap the previously installed clamp.

14. Wrap 2 1/2 turns of tape centering over clamp.

15. Install 2-inches of heat shrinkable tubing over the connection such that it overlaps the connector body approximately the width of the rear flange. Direct heat at shrinkable tubing and do not over heat tubing.

16. Slide the 7-inch spring into the 8-inch sense line.

17. Route sense line through anti-g hose channel and connect sense line to sense line port on connector. Secure sense line to connector with two tiedown straps using tensioning tool set at 3.

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18. Install sense line tap to sense line and secure with a tiedown strap using tensioning tool set at 3.

19. Install 2-inches of heat shrinkable tubing over the connection such that it overlaps the connector body approximately the width of the rear flange. Direct heat at shrinkable tubing and do not over heat tubing.

20. Ensure connector is sufficiently tightened by grasping hose and jerking sharply on fitting.

21. Leak test in accordance with [paragraph 4-104](#).

4-120. g-SENSE LINE DISASSEMBLY AND INSTALLATION.

4-121. Disassembly.



Cut through tiedown strap head using diagonal cut pliers. Do not cut under strap head.

1. Disconnect the g-sense line from CRU-103/P regulator and the g-suit.

2. Remove quick disconnect from sense line and retain. Retain inner spring.

4-122. Installation.

1. Have the aircrewmember don the lower anti-g garment (CSU-20/P22P-16) and harness with the CRU-103/P regulator.

2. Install male sense line connector to sense line hose and secure with tiedown strap using tensioning tool set at 3.

3. Connect sense line male connector to the female connector at the bottom port of CRU-103/P regulator. Route the g-sense line hose across the abdomen bladder and through the torso harness, down the left leg until the hose is one to two inches past the sense line connector on the anti-g hose connector.

4. With the g-suit hose fully extended, mark and cut hose at that location. (Verify length.)

5. Install female sense line connector to the hose and secure with a tiedown strap, using tensioning tool set at 3.

6. Place the spring next to the hose and cut the spring one inch shorter than the hose. File down both ends of the spring assuring that there are no sharp ends.

7. Insert spring into hose, install male sense line connector and secure with a tiedown strap, using tensioning tool set at 3.

8. Connect the male end of the sense line to the female quick disconnect port of the CRU-103/P regulator.

4-123. CLEANING.

1. Refer to [paragraph 4-83](#) for cleaning instructions.

Section 4-6. TTU-551/E Leakage Tester Preoperational Check

4-124. GENERAL.

4-125. The purpose of the preoperational check of the leak test equipment is to ensure the accuracy of critical leak tests performed on the CSU-21/P22P-16 Counter Pressure Vest and HGU-87/P22P-16 Helmet. Both items are components of the Navy Combat Edge A/P22P-16 Aircrew Protective System and are tested using the TTU-551/E Leakage Tester. (Refer to NAV-AIR 17-15GB-505 for details regarding the TTU-551/E).

4-126. PREOPERATIONAL CHECK PROCEDURE.

4-127. The preoperational check of the Leakage Tester shall be performed daily, prior to testing the CSU-21/P22P-16 Vest or HGU-87/22P-16 Helmet Bladder. To perform Leakage Tester Preoperational Check, proceed as follows. If leakage is detected, forward the test set to AIMD ALSS division for repair.

NOTE

Index letters refer to [figure 4-6](#) unless otherwise noted. Tests are arranged so as to proceed from one test to another with minimal change in valve positioning or hose attachments.

1. Ensure test set inlet pressure valve (F) is in the OFF position and oxygen supply cylinder valve is fully closed.
2. Connect regulator (A) to the oxygen supply cylinder. Ensure regulator is not loaded by turning pressure adjusting handle counterclockwise until tension is released.
3. Ensure oxygen flow control valve (B) on regulator is closed.
4. Slowly open the oxygen supply cylinder valve. Relieve any pressure indicated on regulator gage (I) by opening and closing the oxygen flow control valve (B).
5. Connect oxygen hose (C) to quick disconnect fitting (B1) and connect the other end of oxygen hose (C) to test set oxygen INLET (D).

6. Connect helmet/vest bladder hose assembly (O) to test set oxygen OUTLET (H). Connect intermediate hose (S) to helmet/vest adapter (L) of hose assembly (O). Connect adapter cap assembly (Q) to intermediate hose (S).

7. Fully open the oxygen flow control valve (B) attached to regulator (A).

8. Slowly turn regulator (A) tee handle clockwise until 1.0 ± 0.1 psig is indicated on regulator outlet gage (I). Observe test set pressure gage (G) for 2 minutes. Any indication of pressure on test set pressure gage will determine if test set inlet pressure valve (F) is leaking.

WARNING

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

9. Using leak detection compound, check for leakage of oxygen hose (C) at test set oxygen INLET (D) and regulator connection (B1).
10. Slowly turn test set inlet pressure valve (F) to the ON position. Allow the pressure on test set pressure gage (G) to stabilize.
11. Turn test set inlet pressure valve (F) to the OFF position and observe test set pressure gage (G) for thirty seconds. Pressure on test set pressure gage shall remain constant; no leakage allowed.
12. Remove adapter cap assembly (Q) from intermediate hose assembly (S) to relieve pressure from the test set. Remove intermediate hose (S) from helmet/vest adapter fitting (L).
13. Disconnect helmet bladder/vest hose assembly (O) from oxygen OUTLET (H).
14. Connect vest hose assembly (J) to the oxygen OUTLET (H).
15. Connect adapter cap assembly (R) to vest adapter fitting (K) of vest hose assembly (J).

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16. Turn test set inlet pressure valve (F) to the ON position. Using regulator (A), adjust pressure to 1.0 ± 0.1 psig as indicated on test set pressure gage (G).

17. Turn test set inlet pressure valve (F) to the OFF position and observe test set pressure gage (G) for 30 seconds. No leakage allowed.

18. Remove the adapter cap assembly (R) from vest adapter fitting (K) of vest hose assembly (J).

19. Remove vest hose assembly (J) from oxygen OUTLET (H).

20. Close oxygen supply cylinder and relieve pressure from test set by turning test set inlet pressure valve (F) to the ON position.

21. Turn regulator (A) pressure adjusting tee handle counter-clockwise until spring tension is relieved.

22. Close regulator oxygen flow control valve (B).

23. Turn test set inlet pressure valve (F) to the OFF position.

NOTE

Replace all dust caps when stowing equipment.

24. Disconnect oxygen hose assembly (C) from regulator (A) and oxygen INLET (D).

25. Disconnect regulator (A) from oxygen supply cylinder and stow in space provided in test set.

26. Stow all hoses and adapter fittings/caps in space provided in test set.

4-128. SPECIAL TOOLS.

4-129. Special equipment or tools peculiar to the support of Navy Combat Edge A/P22P-16 components are initially provided with TTU-551/E Leakage Tester. If an individual item of equipment or tool should become lost or broken, contact NAWCAD - Lakehurst (Code 4.8.2.4) for interim support. Refer to [figure 4-8](#) for leak test fixture to be used to test CSU-20/P22P-16.

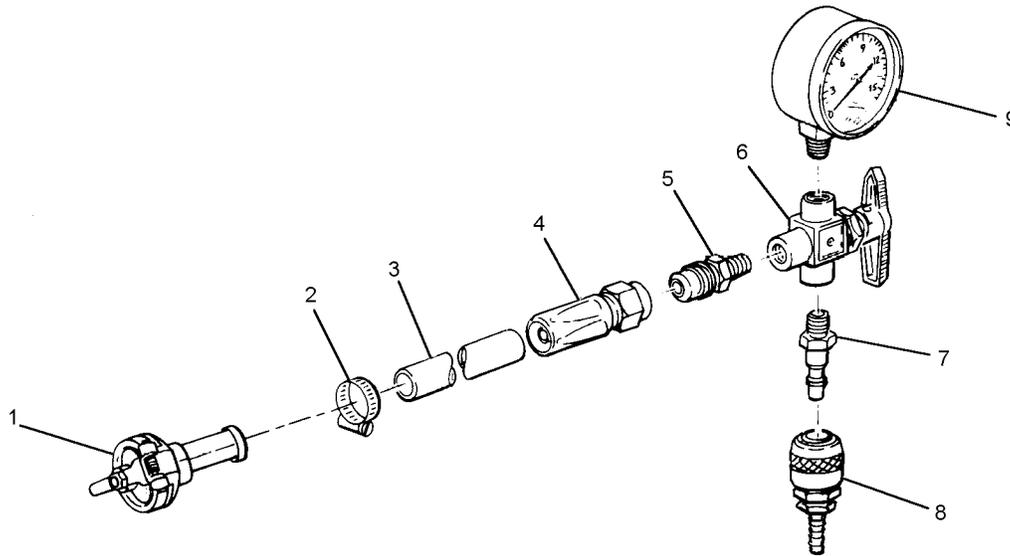


Figure 4-8. Anti-g Suit Leak Test Fixture

004008

Figure and Index Number	Part Number	Description	Units Per Assembly	Usable On Code
4-8	No Number	ANTI-g SUIT LEAKAGE TEST FIXTURE (Note 4)	1	
-1	MS27755	. CONNECTOR, Hose, Quick-disconnect, Female, Anti-g suit	1	
-2	5415L	. CLAMP, Hose size 16 (39428)	A/R	
-3	No Number	. HOSE, Rubber, 1/2-inch ID, 3/4-inch OD	1	
-4	MS27404-8D	. FITTING, Hose	1	
-5	AN814-12-8D	. REDUCER, 3/4-inch tubing to 1/2-inch pipe	1	
-6	B43XVF4	. VALVE, 3-way with vent (12623)	1	
-7	MIL-C-4109	. COUPLING, Air Hose (Male) (Note 1)	1	
-8	MIL-C-4109	. COUPLING, Air Hose (Female) (Note 1)	1	
-9	GG-G-76	. GAGE, Pressure, 0 to 50 psig (Notes 2 and 3)	1	
	CC-TM-12	. MANOMETER, Mercury, Calibrated 0 to 6 psig (75331) (Note 3)	1	
Notes: 1. Select quick-disconnect coupling compatible with local low pressure air installation. 2. NSN: 6685-00-246-2363. 3. Select either a gage or manometer. 4. Use to test CSU-15/P, CSU-13B/P, and CSU-20/P22P-16 anti-g garment.				

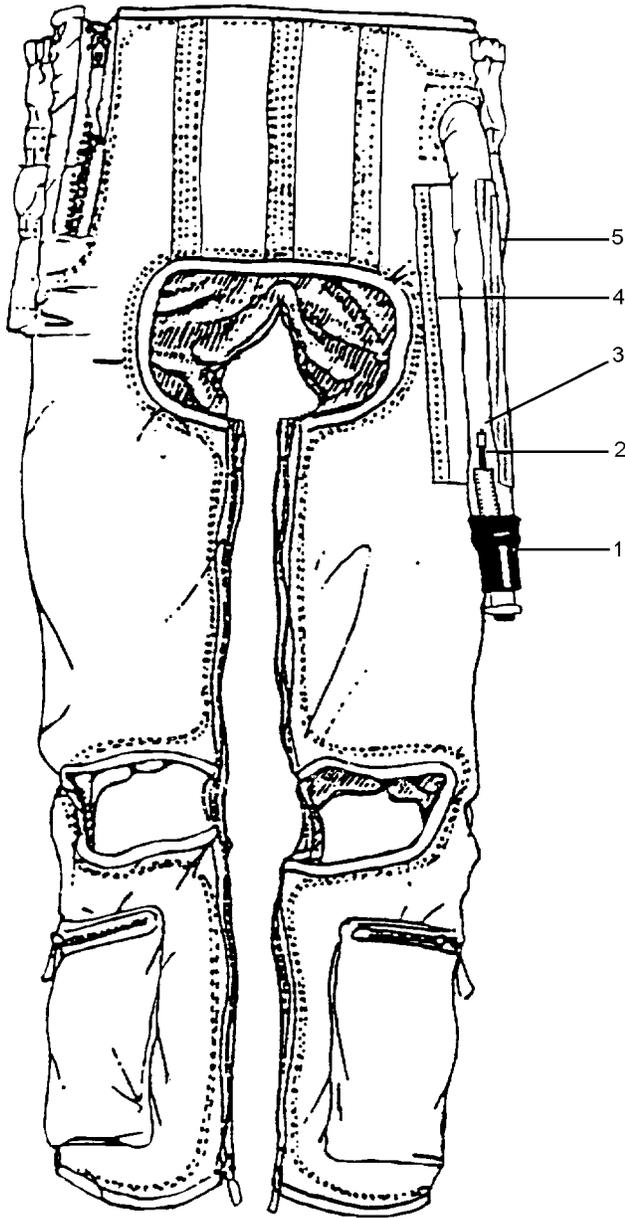


Figure 4-9. CSU-20/P22P-16 Enhanced Anti-g Garment Lower Ensemble

Figure and Index Number	Part Number	Description							Units Per Assembly	Usable On Code
		1	2	3	4	5	6	7		
4-9	TBD	CSU-20/P22P-16 ENHANCED ANTI-g							REF	
		GARMENT, Lower ensemble, (78673)								
		(Gentex P/N 94D8957-1) NIIN 01-439-1330								
-1	10225-01	.	CONNECTOR, Anti-g hose, NIIN 01-439-1334 . . .						1	
-2	97C9830-1	.	HOSE, Sense line, NIIN 01-439-1335						1	
	18976-01	.	SPRING, Sense line (12 inches),						1	
		NIIN 01-439-1336 (Not illustrated)								
-3	PMCD22-04	.	CONNECTOR, Sense line, Male (62661),						1	
		NIIN 01-353-6558								
-4	MIL-F-21840	.	FASTENER TAPE, Hook, Type I,						A/R	
		NIIN 00-935-6762								
-5	MIL-F-21840	.	FASTENER TAPE, Pile, Type I,						A/R	
		NIIN 00-926-4930								

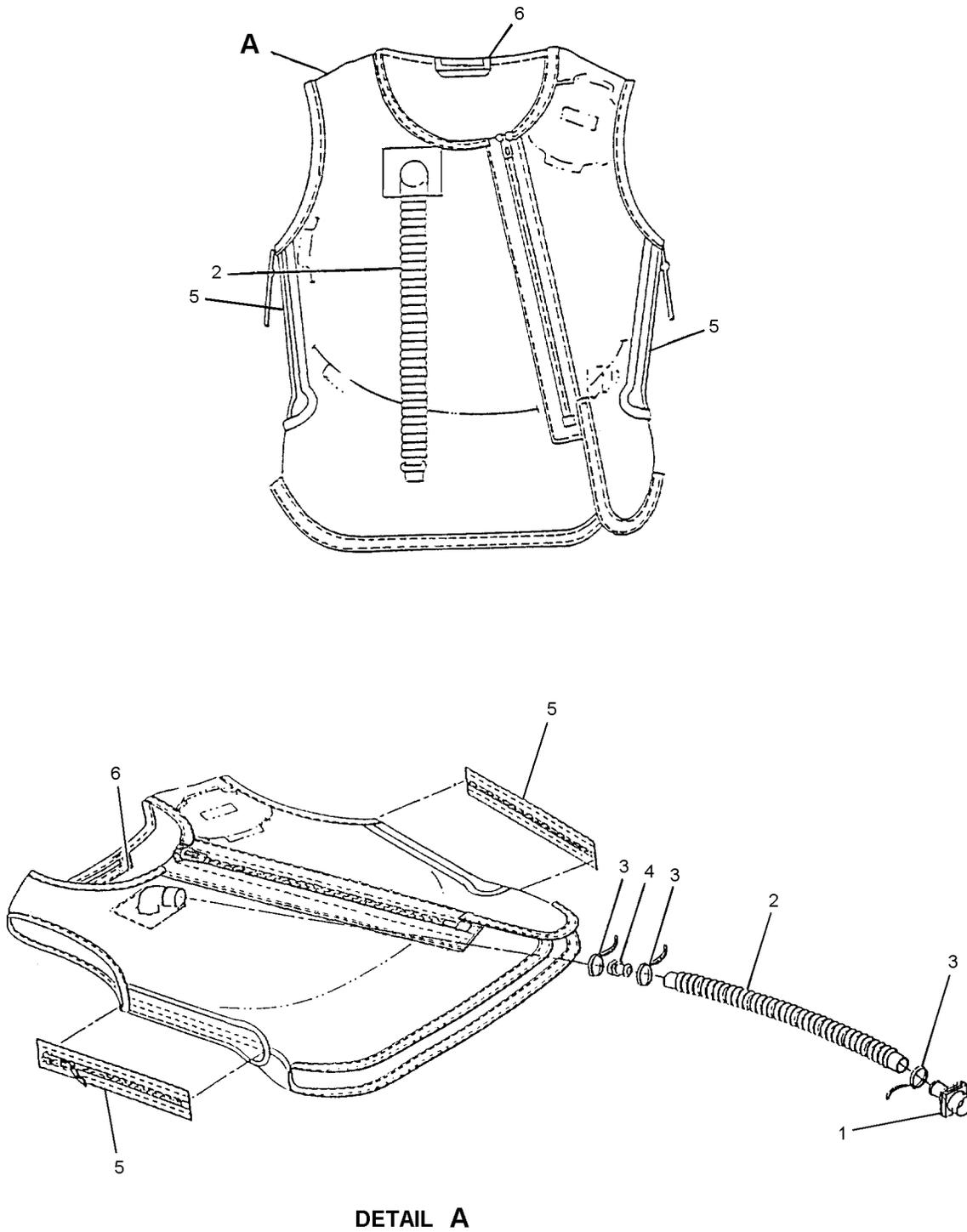


Figure 4-10. CSU-21/P22P-16 Counter Pressure Vest

Figure and Index Number	Part Number	Description	Units Per Assembly	Usable On Code
		1 2 3 4 5 6 7		
4-10	3473AS500-1	VEST, Assembly, Small (GENTEX P/N 93D8517-1)	1	
	3473AS500-2	VEST, Assembly, Medium (GENTEX P/N 93D8517-2)	1	
	3473AS500-3	VEST, Assembly, Large (GENTEX P/N 93D8517-3)	1	
	3473AS500-4	VEST, Assembly, X-large (GENTEX P/N 93D8517-4)	1	
-1	3473AS520-1	. VALVE, Assembly (GENTEX P/N G033-1012-01)	1	
-2	3473AS518-1	. HOSE, Supply, Vest	1	
-3	MS3367-1-0	. STRAP, Tiedown	3	
-4	89C7784-1	. ADAPTER, Elbow, Vest	1	
-5	3473AS504-01	. FASTENER, Slide, Left small	2	
	3473AS504-02	. FASTENER, Slide, Left medium	2	
	3473AS504-03	. FASTENER, Slide, Left large/X-large	2	
	3473AS504-04	. FASTENER, Slide, Right small	2	
	3473AS504-05	. FASTENER, Slide, Right medium	2	
	3473AS504-06	. FASTENER, Slide, Right large/X-large	2	
-6	89D7671-29	. LOOP, Stowage	1	

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
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Part Number	Figure and Index Number	SM&R Code
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AN814-12-8D	4-8-5
B43XVF4	4-8-6
CC-TM-12	4-8-9
GG-G-76	4-8-9
MIL-C-4109	4-8-7
	4-8-8
MIL-F-21840	4-9-4
	4-9-5
MS27404-8D	4-8-4
MS27755	4-8-1
MS3367-1-0	4-10-3
NO NUMBER	4-8
	4-8-3
	4-8-9
PMCD22-04	4-9-3
TBD	4-9
10225-01	4-9-1

18976-01	4-9-2
3473AS500-1	4-10
3473AS500-2	4-10
3473AS500-3	4-10
3473AS500-4	4-10
3473AS504-01	4-10-5
3473AS504-02	4-10-5
3473AS504-03	4-10-5
3473AS504-05	4-10-5
3473AS504-06	4-10-5
3473AS518-1	4-10-2
3473AS520-1	4-10-1
5415L	4-8-2
89C7784-1	4-10-4
89D7671-29	4-10-6
97C9830-1	4-9-2