
TECHNICAL MANUAL

OPERATION AND SERVICE INSTRUCTIONS

GROUND AND AIRCREW
BODY ARMOR

**THIS TECHNICAL MANUAL IS A REPRINT OF AIR FORCE
T.O. 14P3-1-102, 15 DECEMBER 1970, INCLUDING CHANGES 1 AND 2.**

DEPARTMENT OF THE ARMY
16 JANUARY 1984

OPERATION AND SERVICE INSTRUCTIONS

**GROUND AND AIRCREW
BODY ARMOR**

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SECTION I INTRODUCTION

1-1. PURPOSE.

1-2. This technical manual provides basic information which will be used as a general reference and guide to personnel using ground or aircrew body armor. This manual also includes use, inspection, repair and maintenance of various assemblies and components.

1-3. The data contained herein pertains to equipment and methods considered standard by the Air Force and approved by the responsible development agencies

1-4. The ground or aircrew body armor and components when issued as authorized in Table of Allowance 016. will be retained by ground or air-crew member as a personal retention item as long as assigned mission or duties require item usage.

SECTION II DESCRIPTION

2-1. GENERAL.

2-2. The effectiveness and complexity of modern weapons pose challenging problems in providing adequate body protection for the aircrewman. Weight limitations of the aircraft, available space, individual maneuverability, and performance of duties limit the area coverage and type of body armor which aircrewman can effectively use.

2-3. To achieve the maximum body protection possible within these limitations, anatomically shaped body armor has been developed to provide small arms fire protection for the aircrewman. This armor is designed to give more effective protection to vital body areas with little added weight and to improve the comfort of the aircrewman. Based upon its use in combat, the armor has proven both physically and psychologically acceptable.

2-4. DETAILDESCRIPTION.

2-5. Body armor for the aircrewman consists of front and back armor plates and a cotton and nylon outer shell to accommodate the plates. The outer shell has adjustable shoulder straps and waist bands and ballistic nylon felt shoulder pads give additional comfort and fragmentation protection. The armor plates are made of rigid ballistic-defeating material and are worn selectively to protect the front and back torso from the lower neck to the waist.

2-6. BODY ARMOR, SMALL ARMS PROTECTIVE.

2-7. Body Armor, aircrewman, small arms protective (see figure 2-1) is currently available in Southeast Asia (SEA) for USAF aircrew. This armor (sizes as shown in Table I) was designed primarily for Army Helicopter aircrew, though it has

Change 1

1-1/2-1



Figure 2-1. Armor, Small Arms Protective

Figure 2-1. Armor, Small Arms Protective
2-2

been tested for use with parachutes and is usable in other aircraft that do not employ ejection seats. This body armor consists of a nylon cotton cloth outer cover with fragmentation protective nylon felt shoulder pads. Pockets in the front and back of the carrier accommodate rigid ceramic armor plates. The plates have a covering of ballistic nylon for use as a spall shield. Additional spall protection is provided by a 1/2 inch layer of ballistic nylon felt which is permanently affixed inside the shell to cover the ceramic plate. Non-mobile crew members, such as pilots and copilots normally use the outer shell with armor plates in the front pockets only. Mobile crew members, such as gunners, crew chiefs, etc., use both front and back armor plates. Three different types of ceramic armor plates are available for this vest (see Table I):

- a. Aluminum Oxide.
- b. Silicon Carbide.
- c. Boron Carbide.

2-8. All three ceramics offer the same level of protection; .30 caliber armor piercing or equivalent at 0 degree obliquity, 100 yards range. However, boron carbide is the lightest material, while aluminum oxide is the

heaviest. Maximum weight difference is approximately three pounds per plate, between the aluminum oxide and the boron carbide. Silicone carbide is an intermediary material in weight. This item is available in three sizes as shown in Table I: Short, regular and long. Weight varies from approximately 13 pounds to 30 pounds depending upon size, type of ceramic and whether protection is for front only, or front and back.

2-9. BODY ARMOR, FRAGMENTATION PROTECTIVE WITH 3/4 COLLAR.

2-10. This armor was designed for ground troops (see figures 2-2) although, it has been used by both Army and Air Force crew members in various aircraft in SEA. The vest consists of a ballistic filler consisting of 12 plies of ballistic nylon cloth in the front, 10 plies of ballistic nylon in the back and 6 plies of ballistic nylon in a collar around the neck. The ballistic filler is sealed in a vinyl envelope for protection against moisture (which causes a loss of protective qualities in "soft" armor). The vest is a front closure, slide fastener design and has elastic laces on both sides.

2-11. This item is available in four sizes: Small, medium, large and extra large, see Table II.

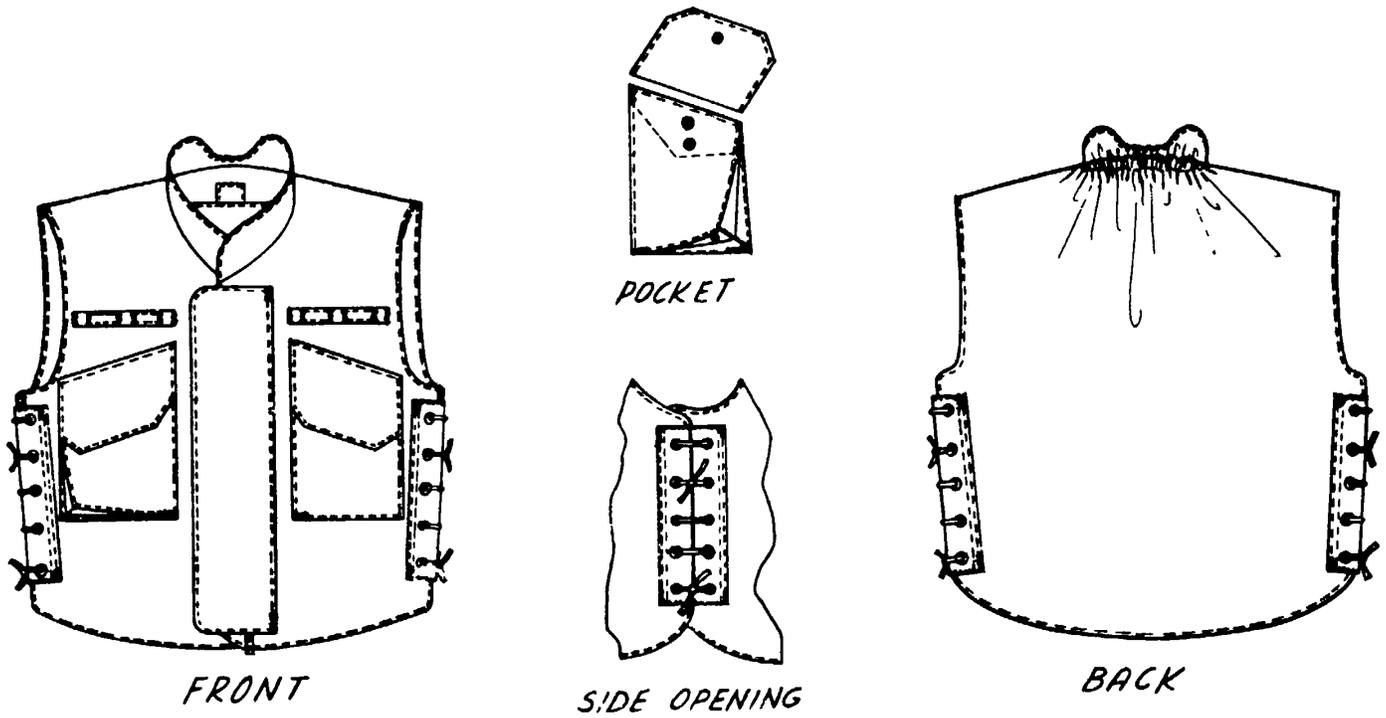


Figure 2-2. Body Armor, Fragmentation Protective, With $\frac{3}{4}$ Collar Front and Back Views

Table I. Body Armor Type

Stock Number

Nomenclature

* Body Armor Small Arms Fragmentation, Frontal Protection Purchase
Description LP/P4/es 42-69

	<u>Size</u>	<u>Ceramic Material</u>	<u>Class</u>
8470-935-3183	Short	Aluminum Oxide	1 (Heavy Wt)
-935-3184	Regular	Aluminum Oxide	1
-935-3185	Long	Aluminum Oxide	1
-935-3180	Short	Boron Carbide	3 (Light Wt)
-935-3181	Regular	Boron Carbide	3
-935-3182	Long	Boron Carbide	3
-935-3186	Short	Silicon Carbide	2 (Med Wt)
-935-3187	Regular	Silicon Carbide	2
-935-3188	Long	Silicon Carbide	2

** Body Armor, Small Arms Fragmentation, Front and Back
Protection, Purchase Description LP/P Des 42-69

	<u>Size</u>	<u>Ceramic Material</u>	<u>Class</u>
8470-935-3192	Short	Aluminum Oxide	1 (Heavy Wt)
-935-3193	Regular	Aluminum Oxide	1
-935-3194	Long	Aluminum Oxide	1
-935-3189	Short	Boron Carbide	3 (Light Wt)
-935-3190	Regular	Boron Carbide	3
-935-3191	Long	Boron Carbide	3
-935-3195	Short	Silicon Carbide	2 (Med Wt)
-935-3196	Regular	Silicon Carbide	2
-935-3197	Long	Silicon Carbide	2

*** Insert, Small Arms Protective Body Armor Purchase
Description LP/P Des 42-69 Type IV (Back Plate)

	<u>Size</u>	<u>LengthWidth</u>		<u>Ceramic Material</u>	<u>Class</u>
		<u>Inches</u>	<u>Inches</u>		
8470-935-3174	Short	14-1/2	12-3/4	Aluminum Oxide	1 (Heavy Wt)
-935-3175	Regular	16-1/4	14-3/8	Aluminum Oxide	1
-935-3176	Long	18	16-1/8	Aluminum Oxide	1
-935-3162	Short	14-1/2	12-3/4	Boron Carbide	3 (Light Wt)
-935-3163	Regular	16-1/4	14-3/8	Boron Carbide	3
-935-3164	Long	18	16-1/8	Boron Carbide	3
-935-3168	Short	14-1/2	12-3/4	Silicon Carbide	2 (Med Wt)
-935-3169	Regular	16-1/4	14-3/8	Silicon Carbide	2
-935-3170	Long	18	16-1/8	Silicon Carbide	2

Insert, Small Arms Protective Body Armor Purchase
Description LP/P Des 42-69, Type III (Front Plate)

	<u>Size</u>	<u>LengthWidth</u>		<u>Ceramic Material</u>	<u>Class</u>
		<u>Inches</u>	<u>Inches</u>		
8470-935-3177	Short	13-3/4	13-1/4	Aluminum Oxide	1
-935-3178	Regular	14-7/8	13-1/4	Aluminum Oxide	1

Table I Body Armor Type (Cont)

	<u>Size</u>	<u>LengthWidth</u>		<u>Ceramic Material</u>	<u>Class</u>
		<u>Inches</u>	<u>Inches</u>		
8470-935-3179	Long	16	15	Aluminum Oxide	1
-935-3165	Short	13-3/4	13-1/4	Boron Carbide	3
-935-3166	Regular	14-7/8	13-1/4	Boron Carbide	3
-935-3167	Long	16	15	Boron Carbide	3
-935-3171	Short	13-3/4	13-1/4	Silicon Carbide	2
-935-3172	Regular	14-7/8	13-1/4	Silicon Carbide	2
-935-3173	Long	16	15	Silicon Carbide	2

**** Vest, Small Arms Protective Body Armor MIL-C- 43544 (GL)

<u>Size</u>	
8470-999-1473	Short
-999-1474	Regular
-999-1475	Long

* FSN's are for the vest carrier and front plate only.

** FSN's are for the vest carrier and front and back plates.

*** FSN's are ceramic inserts only, listed by size, type ceramic and either front or back plates.

**** FSN's are for the vest carrier only.

Table II. Body Armor Size

<u>Stock Number</u>	<u>Nomenclature</u>
	Body Armor, Fragmentation Protective, designed for front and back protection, from neck to waist, side protection, armpits to waist with 3/4 collar
84701221299	Small
8470-1221300	Medium
8470122-1301	Large
8470-122-1302	X-Large

2-12. This vest provides fragmentation protection, only, and does not protect against small arms projectiles. Protection provided by 12 plies of ballistic nylon have a V50 (ballistic resistance) of 1225 feet per second against a .22 caliber, 17 grain, fragment simulator.

2-13. Weight of Vest varies from approximately 8 pounds to 11 pounds depending on size.

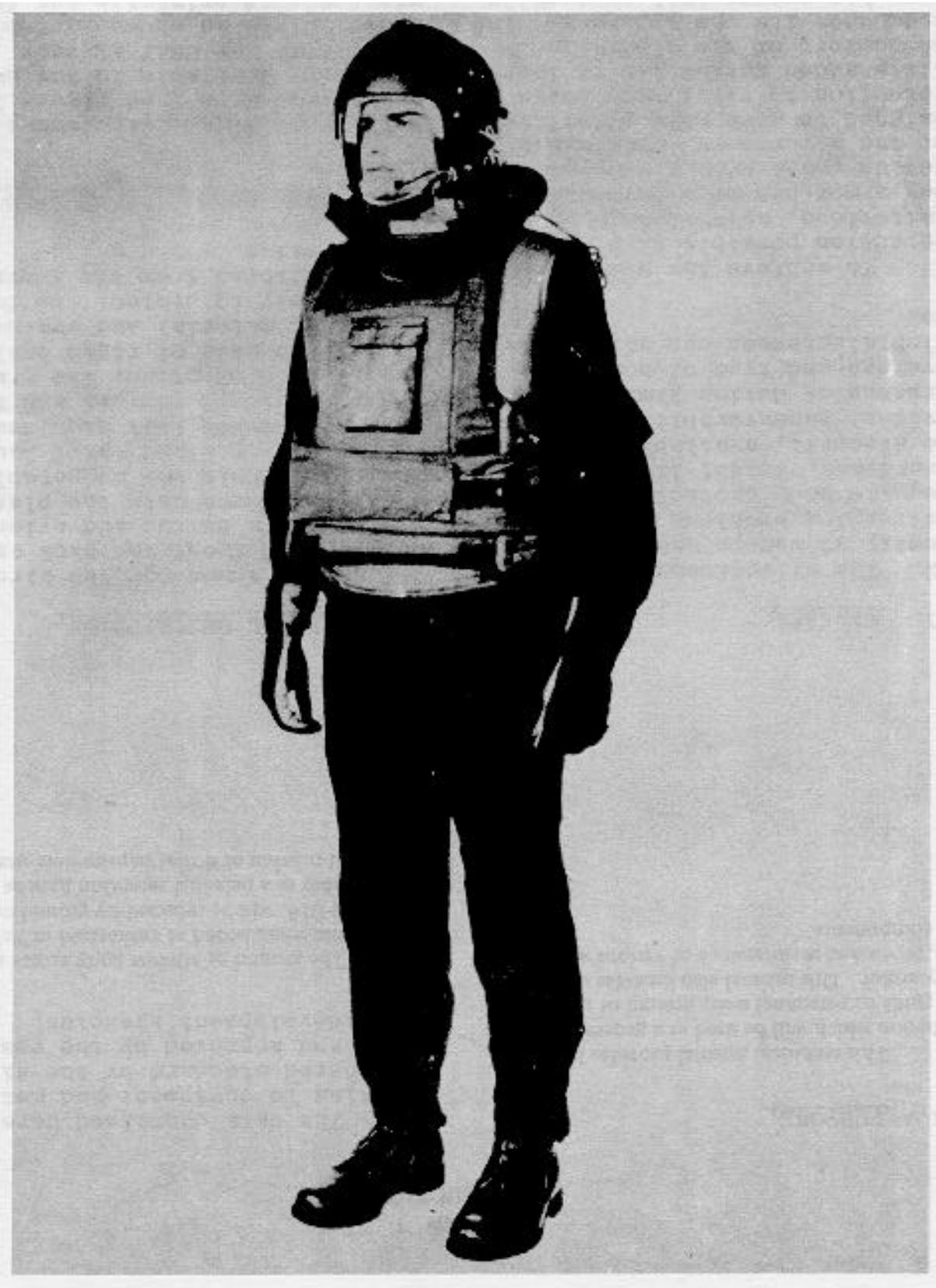
2-14. UC-123 RANCH HAND BODY ARMOR. head and chaffing and bulk

2-15. This is a specialized design (see figure 2-3) for UC-123

"Ranch Hand" aircrew by the Aerospace Medical Division and the Natick Laboratories. This body armor was evaluated by TAC in 0-1, 0-2, U-10, A-1E, AC-47 and C-128 aircraft.

NOTE

Only a limited number were manufactured, and not recommended for general procurement primarily because of restriction to movement, when worn with a parachute and, life preserver.



*Figure 2-3. Ranch Hand Body Armor
2-7/(2-8 blank)*

SECTION III AIRCREW BODY ARMOR UNDER DEVELOPMENT

3-1. GENERAL

This item is available in two sizes. The aircrew body armor contained in this Section are items currently under development or undergoing operational test and evaluation (OT&E) in the Air Force.

NOTE

Upon completion of OT&E, standardization action will be taken and appropriate FSNs and data will be incorporated in this manual.

3-3. BODY ARMOR FOR SELECTED AIRCRAFT.

3-4. The body armor, shown in figures 3-1 and 3-2, has been designed for crew members of HH-3, O-1, AC-130 and UC-123 aircraft. It is currently undergoing an OT&E by TAC and MAC.

3-5. The armor is designed to be worn over the USAF survival vest and parachute harness. Fragmentation protection is provided for front and back torso and a boron carbide ceramic plate provides frontal protection only against .30 caliber armor piercing projectiles, 0 degree obliquity at 100 yards.

3-6. Additional fragmentation protection is provided at the wearer's option in the neck and groin regions. On missions where the back parachute is worn, the back half of the armor vest is removed and the front half is

adjusted and secured to the wearer with a strap accessory. This item is available in two sizes: Medium and large. Weight of this armor is approximately 20 pounds.

3-7. VEST, FRAGMENTATION, SURVIVAL SRU-32/P.

3-8. This vest, shown in figure 3-3, was designed for aircrew flying aircraft with ejection seats whose cockpit environment does not permit heavier or more bulky armor to be worn.

3-9. The vest is designed for donning over the head like a serape with a mesh back and wrap around straps that wrap around the front and fasten in the front with velcro tape. The outer shell containing the ballistic protective material, closing straps and pockets are made of fire retardant Nomex material.

3-10. Fragmentation protection for the front torso only is provided, (V50 of approximately 1250 feet per second against a .22 caliber fragment simulating projectile).

3-11. The ballistic filler consists of 6 plies of ballistic nylon felt and 2 plies of ballistic nylon encapsulated in vinyl for water proofing. This vest is available in four sizes; small, medium, large and extra large. Total weight varies from 2-1/2 to 3-1/2 pounds depending on size.



Figure 3-1. Armor, Body Selected Aircraft (Without Collar)



Figure 3-2. Armor, Body Selected Aircraft (With Collar)



Figure 3-3. Vest, Fragmentation SRU-32/P

3-12. FIGHTER/ATTACK FRAGMENTATION VEST.

3-13. This design, shown in figure 3-4, is under development for aircrew flying fighter, attack and observation aircraft with and observation aircraft with ejection seats whose cockpit environment does not permit heavier or more bulky armor to be worn.

3-14. The vest features a side and shoulder closure. The outer shell, containing the ballistic protective material and the pockets are made of fire retardant Nomex material. The back consists of nylon Raschel Knit with a center panel of cotton coated rubber

fabric. The standard USAF survival container pockets are incorporated as part of the design of the outer shell.

3-15. Fragmentation protection for the front torso only is provided (V50 of approximately 1250 feet per second against a .22 caliber fragment simulating projectile). The ballistic filler consists of 16 plies of ballistic nylon encapsulated in vinyl for water proofing. This item is available in four sizes: Small, medium, large and extra large. Total weight varies from 3-1/2 to 4-1/2 pounds depending on size.



Figure 3-4. Fighter/Attack Fragmentation Vest

SECTION IV. INSPECTION

4-1. PRIOR TO USE.

4-2. Body armor will be inspected prior to and after each use by the individual to whom issued or Assigned. The inspection will be accomplished as follows

- a. Check outer cover for open seams, tears and or snags.
- b. Inspect waist band, shoulder straps, and

velcro fastener tapes for frays or damaged areas.

c. Check slide fasteners snaps and/or buckles for proper operation.

d. Carefully check front and back plates or inserts to assure no damage is evident.

e. If as a result of this inspection, conditions are found that indicate an unserviceable assembly, return the body armor to the issuing activity for repair and/or replacement.

SECTION V. SIZING AND FITTING

5-1. SIZING.

Short, regular and long (refer to Table I). The chart

5-2. Aircrewman body armor is designed to provide maximum area coverage possible without undue interference with the aircrewman's required activities. The upper chest area is shaped to allow free movement of the arms and shoulders, and the width of the plates is increased at the waist area. The length of the armor should permit the aircrewman to sit without the weight of the armor plate resting on his thighs.

NOTE

To avoid discomfort or interference with arm and body movement, the selection of the proper size armor is important.

5-3. The current armor is available in three sizes:

below indicates the range of body measurements for each size of body armor

SHORT

Height: Under 5 feet 7 inches
Chest: Less than 40 inches
Waist: Less than 36-1/2 inches

REGULAR

Height: 5 feet 7 inches
through 5 feet 10-1/2 inches
Chest: 31 inches through
42-1/2 inches
Waist: 24 inches through
36-1/2 inches

LONG

Height: Over 5 feet 10-1/2
inches
Chest: More than 34 inches
Waist: More than 25 inches

5-4. FITTING

5- 5. For maximum comfort and protection, fragmentation/flak vest with ceramic plates must be properly adjusted. The design of the armor requires that it be worn straight and centered on the front and back torso from the neck to the waist. Twisted or off-center armor affects body balance and interferes with required activities.

5-6. To keep armor balanced and properly positioned, the shoulder straps and waist bands must be adjusted evenly. Bending over slightly when adjusting armor simulates the sitting position and helps to assure properly adjusted armor when seated in the aircraft.

5-7. The fragmentation/flak vests should be snug but not tight and should allow free movement of the body.

NOTE

Snuggly fitted, properly adjusted armor reduces the possibility of injury from the armor in event of an emergency landing.

**SECTION VI.
MAINTENANCE**

6-1. **CLEANING**

6-2. Prior to cleaning, the over- all condition of the outer shell should be carefully examined to determine whether it is worthy of cleaning and repair or whether it should be replaced with a new outer shell. of outer shells shall be service- able materials recovered from similar salvaged items, or new Do not use any dry clean- Do not use any dry cleaning solvent, gasoline or grade as original fabric. similar products.

CAUTION

Do not use any dry cleaning solvent, gasoline or similar products.

6-3. **SPOT CLEANING.**

CAUTION

Do not clean vest with any solutions if the vinyl casing is damaged.

6-4. Apply a warm soap or detergent solution to the soiled or stained area. Rub or brush the area vigorously to wet and loosen the soil. Tinsing thoroughly with warm water and air dry the vest away from heat or open flame.

6-5. **OUTER SHELL.**

6-6. When the outer shell requires complete cleaning, remove the vinyl encased ballistic insert by opening the bottom seam on the back panel of the vest and then pull the outer shell over the insert taking care not to damage the component.

NOTE

When facilities/equipment is not available the entire outer shell may be cleaned as outlined in paragraph 6-4.

6-7. The outer shell may be cleaned in a domestic home laundry type machine with household detergent and/or soap. Rinse thoroughly and air dry.

6-8. **REPAIR.**

6-9. Materials used in the repair of outer shells shall be serviceable materials recovered from similar salvaged items, or new material of matching color and grade as original fabric.

6-10. Small holes or tears in outer shell in which the vinyl casing has not been damaged, the repair may be made on the outer cover without removal of the vinyl casing with ballistic insert.

6-11. Cut a patch of matching cloth nylon oxford one-inch larger in each direction than the hole or tear to be repaired (preferably circular patches). Apply adhesive, cement, liquid, tent patching, FSN 8040-266-0850 to the parch, and immediately, while the adhesive is still wet, position the patch over the hole, and press or roll the ssurfaces firmly together. Allow adhesive to set for 15-20 minutes before subjecting cover to severe handling or water immersion.

6-12. Open seams and broken stitches in outer shell. Remove outer shell, open seams and broken stitches may be repaired by using types stitch, stitches and thread as originally used. Seams shall be back stitched ½ inch.

NOTE

Repairs to vinyl encased ballistic insert is unauthorized.

6-13. Damaged snap, fasteners, slide fasteners and velcro fastener tape will be replaced using matching components and installed in original style and position.

NOTE

MAJCOM OPTION:

Damaged slide fasteners may be replaced with Velcro fasteners. Parachute chord MIL-C-5040, with intercore removed, may be used to replace damaged/missing side straps.

6-14. **STORAGE.**

6-15. Proper storage increases the life of the body armor and preserves its protective qualities. The following rules for the proper storage of body armor are simple but important:

- a. Always clean armor thoroughly before storing.
- b. Store the armor plates in the carrier and secure the waist bands over the front panel with the Velcro tape fasteners.
- c. Armor should be stored in a box, carton, or open bin.
- d. Carefully cover the stored armor with a cloth or plastic sheet to keep out dust, dirt and moisture.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

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°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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