REPAIR AND RECONDITIONING INSTRUCTIONS

CONTENTS

TABLES

REPAIR AND RECONDITIONING INSTRUCTIONS

INTRODUCTION

1. This repair scheme is to be read in conjunction with the general repair scheme given in A. P. 108C-0001-6. This scheme is suitable for Service Units manned and equipped to deal with the repair of this type of parachute; however, assemblies are to be categorised Repairable at Depot where the damage is classified as major in Tables 2 to 4. All damage classified as minor in Tables 2 to 4 is to be repaired at 2nd line.

CANOPY REPAIRS

PATCHING

2. Due to the high operating loads imposed upon the canopies and to the small areas of the individual panels, simplified methods of repair are not permitted. In addition, the narrow width of E and F panels precludes insertion patches and these panels are to be repaired temporarily with self-adhesive patches or permanently by full panel replacement. Darning causes local overstressing and is not to be used to repair holes in canopies. Small holes and tears up to $\frac{1}{2}$ in maximum dimension may be accepted subject to a close examination following the next stream. The conditions of A. P. 108C-0001-6

apply together with the following:-

(1) All machine stitching is to be made with 9 lb nylon thread.

(2) Broken or scuffed stitching is to be removed by carefully unpicking up to 1 in beyond each end of the damaged run. Replacement stitching is to overrun the ends of the remaining stitching for a minimum of 2 in.

(3) The total number of patches in any one panel is not to exceed three.

(4) The total patched area in any one panel is not to exceed 25 per cent of the area of that panel.

(5) No edge of any patch is to be within 2 in of any edge of any other patch, seam or hem. When damage is near to an existing patch, seam or hem; the new patch is to be cut large enough to cover the existing damage and the new damage, or to extend into the seam or hem.

(6) Patches which extend into a seam or hem are to project at least 2 in into that panel.

(7) When a patch is required in the area covered by a main seam radial tape it is to project at least 2 in into the panels on each side of the seam.

Note...

It is preferable to replace a panel rather than to insert a number of small patches. Insertion patches are not permitted in the two upper panels of each gore, but self-adhesive patches may be applied by User Units. Panels containing self-adhesive patches are to be replaced as soon as local considerations permit.

SELF-ADHESIVE PATCHES

3. For expediency self-adhesive patches may be applied by User Units in any panel. Two patches, one on each face of the damaged area, are to be used for each repair with a maximum difference of alignment of $\frac{1}{4}$ in. Ensure overall contact and freedom from trapped air by rubbing from the centre of the patch towards the edges. The following limits apply:-

(1) No edge of any patch is to cover a seam or hem tape.

(2) When damage occurs close to an existing patched area and new patches cannot be applied without overlapping the previous repair; the latter is to be peeled off and a new patch applied to cover both the previous and the new areas of damage. If the peeling-off process causes breaks or raggedness in the fabric, then the area affected must be cut out prior to patching.

(3) Where possible the patches are to extend for a minimum of 2 in beyond the edges of the damage. Where this is impractical, e. g. in E and F panels, the patch is to extend to the edge of the panel, but note sub-para. (1) above.

PANEL INSERTION

4. There is no technical limit to the number of panels which may be inserted in a canopy. When a panel is inserted, the seams and ring hem tapes are to be carefully unpicked and the new panel inserted with its edges interleaved with the edges of the panels on each side. The hem tapes are then to be re-sewn in position following the original sewing lines. The panels are to be cut from templates made from the appropriate drawing (Ref. GQ 10334) or by using the individual panels as patterns after they have been unpicked. The stitching securing a new panel should overlap existing sewing by a minimum of 2 in at each end.

PART PANEL INSERTION

5. Part panel insertion does not compare economically with the work required for full panel replacement. Where the limits for patching are exceeded, full panel insertion is to be carried out.

TASCHENGURTS

6. Broken taschengurts are to be renewed with replacements made from $6\frac{1}{4}$ in lengths of tape, plus an allowance for at least $\frac{1}{4}$ in turnback at each end. Following the original sewing lines, the tape is to be secured at each end with a $1\frac{1}{2}$ in long box and a diagonal pattern of stitching.

PERIPHERAL HEM BAND

7. Remove any taschengurts as necessary and unpick the four rows of stitching securing the band and the zig-zag stitching securing the radial tapes on each side of the gore. Cut away the damaged 2 in tape at points 3 inches from the radial tapes on each side of the damage. Fit a new length of hem band covering the full width of the gore, passing under the radial tapes and extending into the adjacent gore for 3 inches. Sew into position with four rows of stitching, following the original sewing lines and overlapping the ends of the existing stitching by 3 inches. It is not necessary to stitch parallel to each end of the new tape. Renew the zig-zag stitching on the radial tapes and replace any taschengurts removed for this repair.

MAIN RADIAL TAPES

8. Damaged radial tapes are to be repaired by overlaying lengths of new tape to extend a minimum of 6 inches beyond the limits of the damage and stitching them in position following the lines of the original sewing. It is not necessary to stitch parallel to the ends of the tape. Both inner and outer tapes may be repaired by this method so long as repairs do not coincide. There must not be more than three thicknesses of tape at any point. Joins may not be made within 12 inches of the peripheral hem or vent. When damage occurs in these areas the assembly is to be categorised Repairable at Depot.

RING HEM TAPES

9. Hem tapes are to be repaired by overlaying lengths of new tape extending at least 6 inches beyond the limits of the damage and stitching them in position following the lines of the original sewing. It is not necessary to stitch parallel to the ends of the tape. If the new length of tape extends beyond a main seam the radial tape must be unpicked and re-stitched after

the hem tape has been passed under it.

RIGGING LINES

10. Rigging lines are to be repaired by replacement. Broken or frayed zig-zag stitching may be renewed. Old stitching is to be carefully unpicked, the thread removed and the new stitching inserted on the original sewing lines. It is possible that under load the lines may slip through the strop. In this event the whipping and taping are to be removed, the lines adjusted and the strop re-made in accordance with the instructions in para. 11.

11. Damaged lines are to be removed by taking off the whipping at the strop, unpicking and untying the attachments at the D-rings and then untying the larkshead knots at the periphery. New lines are to be cut 30 ft 4 in long under a tension of 25 lb per line and both ends heat-sealed. This length provides for 8 inches at each end for the attachments, 14 feet from periphery to top of whipping, 3 inches depth of whipping and 14 ft 9 in from the bottom of the whipping to the centre of the half-hitches on the D-ring. Each new line has one end formed into a loop containing 2 inches of free cord with the two parts of the line zig-zag stitched together for a minimum of 3 inches. The end of the line is to be zig-zag stitched on top of the main length and over-sewn by at least 1 inch.

12. To fit a new line, first make the larkshead knot at the periphery and then temporarily tie the other end to the D-ring. Next lay the lines side by side in the correct sequence to make the whipping. Measure a distance of 14 ft from the larkshead knots and pass one end of a roll of adhesive tape, adhesive side upwards, under all the lines. Refer to A. P. 108C-0507-5F fig. 1 and lift the ends and centre of the tape so that it assumes a 'W' formation with six lines in each leg of the 'W'. Gather the lines tightly in this formation and wrap the roll of tape tightly round them. The finished taped wrapping is to cover 3 inches of the lines. Then make a common whipping of 400 lb nylon cord (Ref. 15D/1203454) over the tape, ensuring that the ends of the cord are covered. Draw the lower part of the line towards the D-ring so that it is of comparable length with the other lines, make the half-hitches on the D-ring in the correct sequence and complete the fitting of the line by zig-zag stitching the short end on top of the main length for 2 inches.

RIGGING LINES PROTECTIVE SLEEVE

13. Repairs to the sleeve are to be limited to patching in accordance with A. P. 108C-0001-6 and para. 2(5) and (6) of this publication, but consideration should be given to the fact that the sleeve is relatively inexpensive to replace. Abraded or broken whipping is to be renewed.

FITTINGS

14. Minor burrs and abrasions may be removed by rubbing with Grade 00 abrasive paper and polishing with a clean rag. Major abrasion and distortion render rings beyond repair. To change D-rings, unpick and untie the lines, noting the order in which they are attached and fit the new D-rings by re-making the attachments of the lines in the original sequence.

TABLE 1

Equipment and materials required

Equipment

Reference No.	Nomenclature	Application
3A/2006711	Machine, sewing Type 331K4	Canopy repairs, lockstitch, using 9 lb nylon thread.
3A/4278820	Machine, sewing Type 132K7	Pack repairs, lockstitch, using 27 lb nylon thread.
3A/2033607	Machine, sewing Type 457G-135	Canopy repairs, zig-zag stitch, using 9 lb nylon thread.

Materials

Reference No.	Material	Specification	Application
15A/4177183	Thread, linen	BSF 54	Whipping strop sleeve
15A/4177202	Webbing, cotton, 1 in	BSF 49	Mouthlock loops
15A/4177227	Fabric, nylon, white	DTD 556	Auxiliary sleeve and vanes
15D/1060370	Tape, nylon $\frac{3}{4}$ in 200 lb	GQ/MS/115	Canopy panel hem tapes
15D/4111619	Thread, nylon 9 lb	BSF/120/NT4	Canopy and pack repairs
15D/1059630	Pack cover	GQ/10339	Replacement part
15D/1058849	Sleeve rigging lines	GQ 30819	Replacement part
✱ 15D/1058717	Bridle	GQ 30783	Replacement part
15D/1060930	Tape, terylene $\frac{1}{2}$ in	GQ/MS/124	Main seam radial tapes
15D/1060371	Tape, nylon 1 in	GQ/MS/107	Taschengurts. Vent reinforcement.
✱ 15D/1058993	Parachute, auxiliary	GQ 1771	Replacement part
15D/4111648	Fabric, nylon, white	DTD 793	Alternative for auxiliary
15D/4111682	Webbing, nylon 2 in	IAC S603	Peripheral hem
15D/4111683	Webbing, nylon $1\frac{1}{4}$ in	IAC S608	Pack reinforcement
15D/1203454	Cord, nylon 400 lb	DTD 5502	Auxiliary lines, rigging line whipping
15D/4111689	Fabric, nylon, white	DTD 854	Canopy rings
15D/4111687	Fabric, nylon, khaki	IAC S1301	Pack repairs
15D/4111692	Fabric, cotton, white	DTD 407	Rigging line sleeve repairs
15D/4111705	Fastener, durable dot	No. 7050	Replacement fasteners
15D/4111902	Thread, nylon, 27 lb	BSF/120/NT6B	Pack repairs
32A/9008620	Cord, nylon 400 lb	DTD 481	Canopy rigging lines
32B/406	Tape, cotton $\frac{3}{4}$ in	BS 1625	Pack edge binding
15D/4111731	Webbing, cotton 4 in	DTD 5505	Cable cover flap repair
32B/1250522	Thread, linen, No. 18	F34/18/3	Auxiliary lines knots. Bridle becket.
32B/1250528	Webbing, cotton $1\frac{1}{2}$ in	BSF 49	Cable stowage loops
32B/2202350	Tape, adhesive, 1 in	DEF 1311	Strop whipping, cord ends

(continued)

TABLE 1 (continued)

Materials (continued)

Reference No.	Material	Specification	Application
15D/1371347	Fabric, nylon, adhesive	RFD-GQ 483A	Fabric, self-adhesive patches
L. P. O.	Elastic, grey, 1 in	Clutson and Kemp 4010	Mouthlock and strop stowage loops

Classification of Repairs

TABLE 2

Auxiliary Parachute

Damage	Classification	Nature of Repair
Tears, holes or severe scuffing of canopy	Minor	See para. 23
Broken or damaged rigging lines	Minor	See para. 26
Minor distortion of the spring	Minor	See para. 22
Severe distortion of the spring	Major	NONE. Scrap and replace auxiliary
Damaged reinforcing tapes	Minor	See para. 25
Broken whipping at attachment eye	Minor	Re-whip
Broken stitching	Minor	Make good

Note...

Auxiliary parachutes removed from life expired assemblies are to be re-used if serviceable

TABLE 3

Parachute Pack

Damage	Classification	Nature of Repair
Holes or tears in pack	Minor	See para. 15
Damage to auxiliary stowage flaps	Minor	See para. 21
Damage to cable stowage cover flaps	Minor	See para. 16
Damage to mouthlock and stowage loops	Minor	See para. 17
Damaged press fasteners binding or mounting tape	Minor	See para. 18 and 19
Damage to auxiliary connecting becket and nylon webbing	Minor	See para. 20

Note... Packs removed from life expired assemblies are to be re-used if serviceable

TABLE 4

Main canopy and rigging lines

Damage	Classification	Nature of Repair
Small holes and tears in canopy up to $\frac{1}{2}$ inch diameter	Acceptable damage	Encircle the damage by stamping with $\frac{1}{2}$ in dia. ring stamp. If, through usage, damage extends beyond circumference of circle, repair by patching.
Holes and tears in canopy in excess of $\frac{1}{2}$ inch	Minor	Repair by patching or panel insertion as applicable. See para. 2 and 4.
Broken/torn taschengurts	Minor	See para. 6
Damaged peripheral hem band	Minor	See para. 7
Broken/torn main radial tapes	Minor	See para. 8
Broken/torn ring hem tapes	Minor	See para. 9
Damaged/broken main seam tapes crossing over vent ring	Major	Return to 3rd/4th line for repair
Broken stitching	Minor	Make good
Broken or damaged rigging lines	Minor	See para. 10
Damaged rigging lines protective sleeve	Minor	See para. 13
Damaged/broken apex bridle cords	Minor	Renew

Note...

Life expired canopies and rigging lines are to be scrapped at 2nd line and mutilated to prevent further usage.