CHAPTER 1

INTRODUCTORY REPAIR INFORMATION

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Introduction

1. The individual characteristics of each component unit of the aircraft have limited the number of standard repairs which can be applied generally; these repairs are illustrated in fig. 9 to 12. Since such a large portion of the structure is not visible, more details have been illustrated in the subsequent chapters of this Volume than would otherwise have been necessary.

2. General information and standard repairs have been covered, as far as possible, in this chapter. The remaining chapters describe the respective repair schemes of the major component units. The information is given in the form of pictorial indexing, which calls for the minimum of descriptive text; the system of pictorial indexing will be described in the relative chapters.

3. The list of basic repair rules given in para. 5 to 41 forms a basis from which all the repair schemes have been constructed. These rules are to be thoroughly understood and applied to all repairs carried out on the aircraft.

4. Owing to the highly stressed nature of the structure, the limits laid down in this Volume must be regarded as the minimum requirements to maintain the original strength of the aircraft, and unless otherwise stated through official channels, no deviations from these limits will be made.

BASIC REPAIR RULES

Supporting the structure

5. Before the commencement of any repairs the structure is to be supported by the approved types of trestles at the authorized points; these points are marked on the exterior of the aircraft. Refer to the associated Vol. 1, Sect. 2, Chap. 4.

Inspection of damage

6. The inspection of areas to be repaired is to be carried beyond the obvious damage, to ensure that the surrounding structure is not affected. Checks are to be made for wrinkles in the skin, loose rivets, elongated rivet holes, etc. It is permissible to cut two-inch diameter inspection holes in damaged skin for the examination of the interior structure when doubt exists whether the damage is within the unit's capacity to repair.

Assessment of damage

Dents

7. Before assessing damage of this nature, endeavour to restore the member to its original shape by dressing the area with a mallet, or with a hammer and wooden blocks, afterwards examining it for cracks. The dimensions of any permanent deformations which then remain should be measured and classified.

Nicks

8. Nicks in the free edges of members should be carefully cleaned out, before assessment, to a smooth-edged curvature and, if possible, gradually merged into the undamaged edges.

Holes

9. Before assembling, all holes should be cleaned out, preferably by drilling, and all burrs removed with fine emery cloth. The minimum distance between negligible holes and the edges of the plate, edges of bolt holes, or the commencement of the flanged radius on flanged lightening holes is two times the least diameter of the damage, and from rivet holes two times the diameter of the damage. The minimum distance between two negligible holes is restricted by the pitch ratio, e.g. a pitch ratio 4:1 implies that two holes of 0.5 in. diameter must be at least 2 in. apart.

Scores

10. Scores or scratches should be

RIVET DIAM.	24G.	22G.	20G.	18G.	16G.	14G.	12G.	10G.
3/32"	WITHIN		120°	90°	—	—	—	→
1/8"	THIS RANGE		120°	120°	90°	—	—	→
5/32"	DEPRESSED PLATE			120°	120°	90°	—	→
3/16"	COUNTERSINKING ONLY				120°	90°	—	→

Fig. 1. Table of countersinking angles for solid rivets

smoothed out to a gradual curvature before assessing their depth. They may be assessed as negligible if their depth is not greater than 1/10 of the plate gauge.

Strength and shape of repairs

11. Repairs must conform to the original strength and shape of the structure. The specification and gauge of the repair material, rivet size, etc. is to be the same as the existing material, except when a thicker gauge or larger size is given in this Volume.

Preparation of repair patches

12. All sharp edges are to be removed from the patch. Corners of plates, etc. are to be radiused to a minimum of 2D, where D = the diameter of the rivet shank.

Streamlining of repairs

13. Under no circumstances are repairs to interfere with the streamlining of the aircraft. Patches and riveting to the skin must be absolutely flush with the exterior surface.

Rivets

14. Solid rivets are to be used whenever possible. Alternative types of rivets are called up on the appropriate repair drawing.

15. The angle to be used for each rivet size and skin gauge when using countersunk rivets is given in fig.1.

16. Details of the dimensions of Tucker monel-metal pop rivets with break stem mandrels are given in fig.6.

Elongated rivet holes

17. When existing rivet holes are found to be elongated they are to be redrilled 1/32 in. larger in diameter than the original size. Where it is not possible to enlarge the existing hole, a patch is to be fitted to pick up at least two sound rivets on either side of the elongated hole. The patch thickness is to be equal to the sum of the plate thicknesses involved.

Riveting

18. All repair riveting must conform to the standards described in para.19.

Types of riveting *(fig.2)*

19.

Type A
Snap head rivet. Hammered. Used for general structure.

Type A.1
Snap head rivet. Driven head formed by squeezing. Used for tanks.

Type B
Countersunk head. Hammered. Outer plate cut-countersunk. Used where head must be flush.

Type B.2
Close tolerance, countersunk head rivet. Milled flush. Hammered or squeezed. Controlled countersink.

Type C
Countersunk head rivet. Inner plate cut countersunk and outer plate dimpled into it. Used where outer plate is thin compared with inner plate.

Type D
Similar to Type C.

Type E
Countersunk head rivet. Inner plate cut countersunk, two outer plates dimpled.

Type F
Countersunk head rivet. Inner and outer plates dimpled. Used for skin joints.

Type G
Countersunk head rivet. Both plates cut countersunk. Driven head formed into countersink. Used where rivet must be flush with both surfaces.

Type H
Countersunk head rivet. Inner plate cut countersunk both faces, outer plate dimpled. Driven head formed into countersink. Used where rivet must be flush with both surfaces.

Type K
Tucker pop rivet with dome head. Used where only one surface is accessible.

Type L
Tucker pop rivet with countersunk head. Cut-countersink in outer plate.

Type L.1
Tucker pop rivet with countersunk head. Inner plate cut-countersunk, outer plate dimpled.

Type L.2
Tucker pop rivet with countersunk head. Inner plate cut-countersunk, two outer plates dimpled.

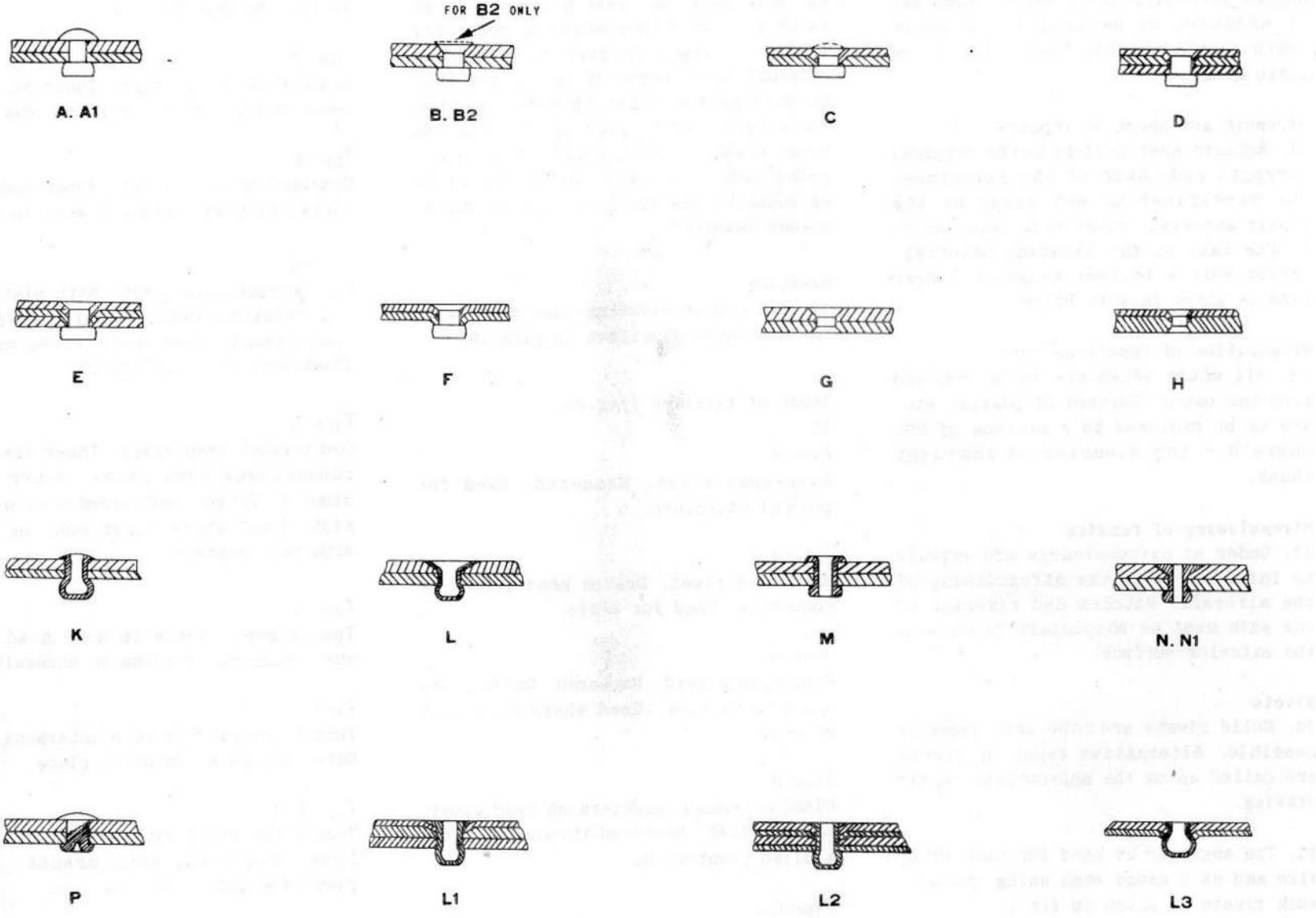
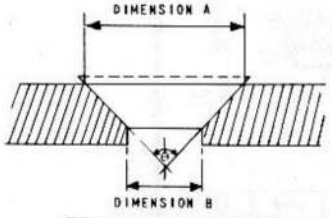


FIG. 2. TYPES OF RIVETING

3453



STANDARD A.S. RIVETS

LIMITS

DIMENSION A $^{+0.001}_{-0.001}$ ALL SIZES

DIMENSION B
$^{+0.006}_{+0.0035}$ UP TO 3/16 INCLUSIVE
$^{+0.007}_{+0.0045}$ OVER 3/16

WHERE θ = 90 DEG

RIVET SIZE DIMENSION B	DIMENSION A
1/8 - 0.210	
5/32 - 0.264	
3/16 - 0.319	
1/4 - 0.429	
5/16 - 0.540	
3/8 - 0.651	

WHERE θ = 120 DEG

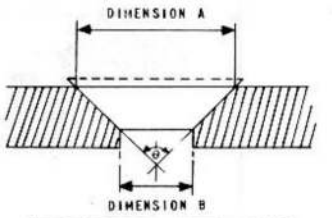
RIVET SIZE DIMENSION B	DIMENSION A
1/8 - 0.241	
5/32 - 0.303	
3/16 - 0.366	
1/4 - 0.491	
5/16 - 0.618	
3/8 - 0.745	

NOTES...

(1) THE COUNTERSINKS ARE SUCH THAT THE RIVETS WILL PROTRUDE TO BE MILLED FLUSH.

(2) ALL HOLES MUST BE NORMAL TO THE SKIN SURFACE.

NOTE...
ALL DIMENSIONS ARE IN INCHES



CLOSE TOLERANCE A.S. RIVETS

LIMITS

DIMENSION A $^{+0.001}_{-0.001}$ ALL SIZES

DIMENSION B
$^{+0.0015}_{+0.0005}$ 3/32 ONLY
$^{+0.004}_{+0.0015}$ 1/8 TO 3/16 INCLUSIVE
$^{+0.005}_{+0.0015}$ OVER 3/16

WHERE θ =90 DEG

RIVET SIZE DIMENSION B	DIMENSION A
3/32 - 0.159	
1/8 - 0.214	
5/32 - 0.269	
3/16 - 0.324	
1/4 - 0.434	
5/16 - 0.544	

WHERE θ =120 DEG

RIVET SIZE DIMENSION B	DIMENSION A
3/32 - 0.179	
1/8 - 0.241	
5/32 - 0.304	
3/16 - 0.366	
1/4 - 0.491	
5/16 - 0.616	

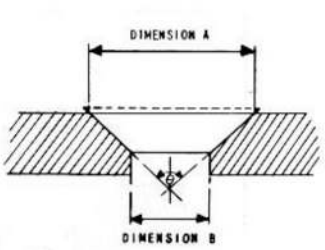
NOTES...

(1) THE COUNTERSINKS ARE SUCH THAT THE RIVETS WILL BE FLUSH WITH THE SKIN.

(2) HOLES AND COUNTERSINKING ARE FOR CLOSE TOLERANCE A.S. RIVETS ONLY. (NOT STONES RIVETS)

FIG. 3. CONTROLLED COUNTERSINKING DIMENSIONS (1)

3454



LIMITS

DIMENSION A $^{+0.002}_{-0.001}$ ALL SIZES

DIMENSION B $^{+0.006}_{+0.0035}$ ALL SIZES

WHERE θ = 120 DEG

RIVET SIZE / DIMENSION B

RIVET SIZE	DIMENSION B
1/8	0.203
5/32	0.243
3/16	0.337
1/4	0.399
5/16	0.524
3/8	0.613

} DIMENSION A

NOTES...

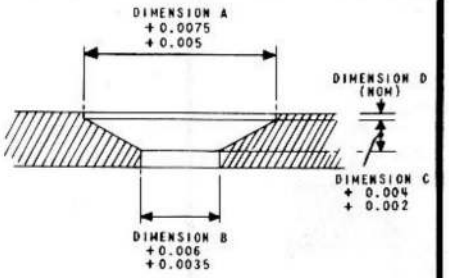
(1) THE COUNTERSINKS ARE SUCH THAT THE RIVETS WILL PROTRUDE TO BE MILLED FLUSH.

(2) SEALING PINS MUST PROTRUDE BY 1/16 AND BE MILLED FLUSH.

(3) ALL HOLES MUST BE NORMAL TO THE SKIN SURFACE.

(4) NOT TO BE USED FOR STEEL CHOBERT RIVETS AGS 2041.

CHOBERT RIVETS



DIM. \ RIV	1/8	5/32	3/16	1/4	5/16	3/8
A	0.210	0.250	0.344	0.406	0.531	0.620
B	0.125	0.156	0.188	0.247	0.313	0.375
C	0.025	0.027	0.045	0.046	0.063	0.071
D	0.005	0.005	0.005	0.005	0.005	0.010

NOTES...

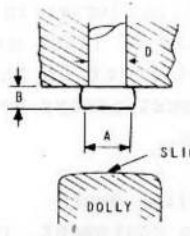
(1) THE RIVET HEADS SHOULD FINISH FLUSH AND ARE ON NO ACCOUNT TO BE MILLED.

(2) SEALING PINS TO BE DRIVEN FLUSH WITH RIVET HEAD.

(3) ALL HOLES ARE TO BE NORMAL TO SKIN SURFACE.

NOTE...
ALL DIMENSIONS ARE IN INCHES

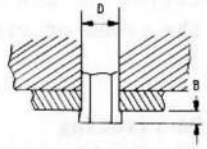
FIG. 4. CONTROLLED COUNTERSINKING DIMENSIONS (2)



D	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8
A	0.13	0.17	0.22	0.26	0.30	0.35	0.44	0.52
B	0.06	0.08	0.09	0.11	0.13	0.15	0.19	0.23

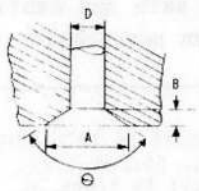
A = 1.39D B = 0.6D

TYPES A B C D E AND F RIVETING



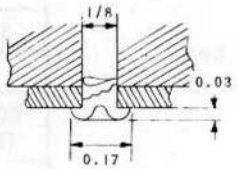
D	1/8	5/32	3/16	3/16	1/4	5/16	3/8
TYPE	TX	TL	TX	R220	R221	R222	R223
B MAX.	0.14	0.14	0.14	0.125	0.125	0.125	0.125

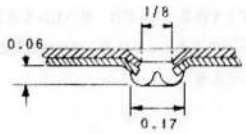
TYPES M AND N RIVETING



Θ	D	1/16	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8
90°	A	0.109	0.164	0.218	0.273	0.328	0.383	0.437	0.547	0.656
	B	0.023	0.035	0.047	0.059	0.070	0.082	0.094	0.117	0.141
120°	A	0.125	0.188	0.250	0.313	0.375	0.438	0.500	0.625	0.750
	B	0.018	0.027	0.036	0.045	0.054	0.063	0.072	0.090	0.108

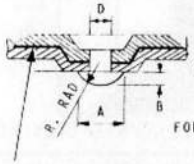
TYPES G AND H RIVETING





TYPE P RIVETING

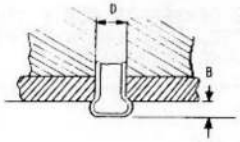
TYPE Q RIVETING



D	3/32	1/8	5/32	3/16	
B	0.06	0.08	0.10	0.12	B 0.6D
A	0.19	0.25	0.31	0.37	A 2.0D
R	0.11	0.14	0.17	0.21	R 1.1D
A	0.20	0.26	0.33	0.39	A 2.1D
R	0.11	0.15	0.19	0.22	R 1.2D

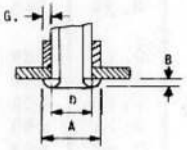
PETROLITE 1/64" THICK BETWEEN EACH PLATE

TYPE J RIVETING



D	1/8	5/32	3/16
B MAX.	0.12	0.12	0.18

TYPES K AND L RIVETING AND L1, L2, L3



D	1/8	5/32	3/16	3/16	1/4	1/4	5/16	5/16	3/8	3/8	1/2
S.W.G.	22	22	22	20	20	17	20	17	20	17	17
A	0.20	0.23	0.27	0.30	0.37	0.39	0.45	0.47	0.53	0.55	0.70
B MAX.	0.028	0.028	0.028	0.036	0.036	0.056	0.036	0.056	0.036	0.056	0.056

TYPE R RIVETING

NOTE...
ALL DIMENSIONS ARE IN INCHES

FIG. 5. DRIVEN HEAD DIMENSIONS

3456

Type L.3
Tucker pop rivet with countersunk head. Both plates dimpled.

Type M
Chobert rivet with dome head. Used where only one surface is accessible.

Type N
Chobert rivet with countersunk head. Unmilled flush finish. Controlled countersink.

Type N.1
Chobert rivet with countersunk head. Milled. Controlled countersink. Not steel rivets.

Type P
Mushroom head, semi-tubular rivet. Used for light structural purposes.

Controlled countersinking

20. In some cases it is essential that the dimensions of countersinks be strictly controlled. Where the milling of rivet heads is allowed, controlled countersinking may still be necessary in order to limit the amount by which the head is reduced.

21. Controlled countersinking is carried out by countersinking attachments which are fully adjustable and guarantee not only that the countersink is dimensionally correct, but also that it is accurately formed. It is recommended that all countersinks should be made with these tools, even when controlled countersinking is not specifically called for.

Driven head dimensions

22. Consideration of space and strength make it necessary that the dimensions of the driven head of a rivet conform with the standards reproduced here. The titles of the illustrations refer to the types of riveting detailed in para. 19.

Re-riveting

23. Drilled out rivets should be replaced by rivets of the same size. If the rivet hole is deformed, it is to be re-drilled, 1/32 in. larger in diameter, and the next size of rivet used. Where the drilled-out rivet is the Chobert type the hole must always be enlarged to the next size.

Control of drilling depth

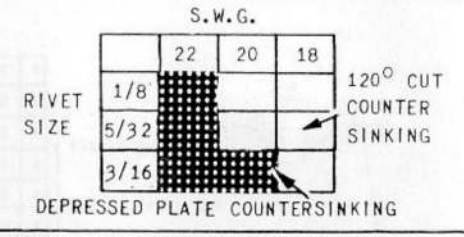
24. Much of the equipment, piping and electrical wiring lies close beneath the external skin and caution must be exercised when penetration of the skin

TUCKER MONEL - METAL POP RIVETS
WITH BREAK STEM MANDRELS

COUNTERSUNK HEAD TLP/K (AGS.2051)			DOME HEAD TLP/D (AGS.2050)	
RIVET DIA.	TO BE RIVETED	CODE NO.	TO BE RIVETED	RIVET DIA.
1/8	0.10	419	0.07	1/8
	0.15	424	0.12	
	0.20	429	0.17	
	0.26	435	0.23	
	0.31	440	0.28	
5/32	0.08	519	0.05	5/32
	0.13	524	0.10	
	0.19	530	0.16	
	0.26	537	0.23	
	0.29	540	0.26	
	0.34	545	0.31	
3/16	0.12	624	0.09	3/16
	0.18	630	0.15	
	0.23	636	0.20	
	0.26	650	0.34	
	0.52	665	0.49	
	0.62	675	0.59	

NOTE 1 :-
THE FIGURES QUOTED IN THE GRIP COLUMNS ARE MAXIMA

NOTE 2:-
THE FIRST FIGURE OF EACH NUMBER IN THE CODE NO. COLUMN GIVES THE DIA. OF THE RIVET IN 32nds. in. THE REMAINING TWO FIGURES GIVE THE LENGTH OF THE RIVET, EXCLUDING THE HEAD, IN 100ths. in.



DEPRESSED PLATE COUNTERSINKING

LENGTH OF RIVET IN DIMPLED HOLE

WHEN ALL SKINS ARE DEPRESSED PLATE COUNTERSUNK, AS ILLUSTRATED, THE LENGTH OF RIVET MUST BE AS FOR A DOME HEAD RIVET

DRILLING TABLE

	RIVET DIA.		
DRILL SIZE FOR HOLE	30	1/8	31 DRILL SIZE BEFORE
	20	5/32	25 DEPRESSED PLATE
	12	3/16	16 COUNTERSINKING

Fig.6. Tucker riveting details

is intended. A non-abrasive stop, adjusted to suit the skin gauge, must be fitted to the drill being used and the smallest practicable diameter of drill must always be chosen. Where skin penetration with a skin knife, or other cutting instrument, is intended, packing must be inserted beneath the skin if it is possible to do this.

Dimpling

25. In repair, cut-countersinking is to be used in accordance with the repair schemes provided. Dimpling of these skins by the normal cold method will result in cracking along the rivet lines and is, therefore, not permissible.

Rivet spacing

26. Rivet spacing is to be the same as the original spacing where holes are picked up, but otherwise it must be as detailed below.

Rivet size	Minimum spacing	Maximum spacing
3/32 in.dia.	0.50 in.	0.70 in.
1/8 in.dia.	0.50 in.	0.75 in.
5/32 in.dia.	0.60 in.	0.80 in.
3/16 in.dia.	0.70 in.	1.00 in.

Rivets must not be positioned at distances less than 2D from the edges of the plates, skin, flanges, etc. Except when following existing rivet runs, or otherwise detailed in these instructions, the distance between staggered rivet rows is not less than 2D.

Pressurized repairs

27. Repairs to the pressure cabin or pressure bulkhead are to be sealed as described in Chapter 2, and on the completion of the repair are to be pressure tested in accordance with the associated Vol.1, Sect.3, Chap.8.

Bending and heat treatment

28. Except where stated otherwise, the figures given in the following table are to be applied to sheet materials when heat treatment is not used. Where solution treatment facilities are available for duralumin sheets the minimum bend radius for L.72 and L.73, bent within two hours of treatment, is twice the sheet thickness up to 10 s.w.g., and 2½ times the sheet thickness for 8 s.w.g. and thicker. The radii given apply only to angles of bend of 120 deg and less, bent over radiused bending blocks or bars.

Marking out repairs

29. All marking out on aluminium alloys used for the repair of airframes should be carried out with a pencil; the use of scribers only being permitted when the scribe mark will be completely removed on shaping the repair. However, because graphite can cause galvanic corrosion, all traces of pencil lines must be removed when the repair is completed. If it is necessary to delineate a defect such as a crack, where the marking has to remain on the metal for a few hours, a grease pencil of any colour except black (a black one may contain carbon) must be used.

Waste clearance

30. Rivets, broken stems, swarf, etc., must be removed on completion of the repair; they must not be left in the aircraft. The danger of such waste material fouling the controls, electrical installation, etc., cannot be over-emphasized.

Drain holes

31. Moisture must not be allowed to accumulate in the aircraft. When drain holes are removed during repair, new holes are to be formed in exactly the same position as the original holes.

Repair jointing compound

32. Jointing compound Ref.No.3311/2201306

Minimum internal bend radii (in.)

Thickness (mm)	S.W.G.	B.S.3 L.59	B.S.2 S.514 (softened) (condition)	B.S. S.524	L.72	L.73	D.T.D.687
0.40	28	–	–	–	0.03	–	–
0.45	26	–	–	–	0.04	–	–
0.55	24	–	–	–	0.05	–	–
0.70	22	0.03	0.06	0.03	0.06	0.09	0.08
0.90	20	0.04	0.07	0.04	0.08	0.12	0.10
1.20	18	0.05	0.10	0.07	0.12	0.16	0.16
1.60	16	0.07	0.13	0.13	0.16	0.21	0.20
2.00	14	0.08	0.16	0.16	0.20	0.27	0.26
2.50	12	0.11	0.21	0.21	0.31	0.35	0.34
3.20	10	0.18	0.32	0.32	0.38	0.51	0.48
4.00	8	0.24	0.40	0.40	0.48	0.64	0.60
5.00	6	0.29	0.48	0.48	0.58	0.77	0.72

must be used on all joint faces except the following:-

(1) Cowlings and small assemblies on the engine side of the firewall.

(2) Rivets.

(3) Close-tolerance parts.

(4) Screwed unions in fuel, oil, and hydraulic systems.

(5) Lockers, stowages, and similar non-structural assemblies.

(6) Light-alloy spot welded joints.

PROTECTIVE COATINGS

33. The protective coating must be applied and maintained in accordance with the following instructions. The aircraft is finished to the high-gloss finishing scheme B.S. X.29. Schemes may be encountered which are to specifications D.T.D.899A (Cellulose finish, ester lubricant resistant) or D.T.D.5555 (High gloss, cold catalysed, ester lubricant resistant). Further information on the three specifications is given in the A.P.119A-0600-1, Sect.9, Chap.4, 6 and 7.

Note...

The finishing of the flying control surface tabs is of extreme importance and special consideration has been given to this in the following paragraphs. It is essential that only the operations detailed are carried out.

External surfaces

34. This finish is not applicable to the control surface tabs or the plywood covered portion of the fin. The finish for those components is given in para. 35 and 36.

Operation 1. - When working to specification B.S. X.29, clean the surface with Deoxidine 202, Ref.No.33C/2204346, for specifications D.T.D.899A and D.T.D. 5555 clean with Toluene Ref.No.33C/1392. Allow to dry and finally clean with Deoxidine 202, Ref.No.33C/2204346.

Operation 2. - Spray one coat of primer Ref.No.33B/2204527 and 2204529 then allow to dry for one hour. This operation is the same for specifications D.T.D. B.S. X.29 D.T.D.899A and D.T.D.5555.

Operation 3. - Stop all hollow rivets, in the external surfaces only, with stopper Ref.No.33B/942884.

Operation 4. - When working to specification B.S. X.29 spray one coat of filler Ref.No.33B/9428800 and allow it to dry for one hour. For specifications D.T.D.899A use filler Ref.No.33B/9428774 and for D.T.D.5555 use filler Ref.No. 33B/2242077, spray one coat and allow to dry for 4 hours. When the filler is dry, wet scuff with 320C grade waterproof abrasive paper Ref.No.33J/1293939. Retouch any exposed places.

Note...

Ailerons, elevators, and rudder are to be only lightly sprayed and only lightly scuffed.

Operation 5. - Repeat operation 4 on the fuselage nose only, and on the main plane and tail plane, from the leading edge back to the maximum thickness only, in each case.

Operation 6. - Spray final colours in accordance with the specification being used, leave to dry for 2 hours. Wet scuff all surfaces except the ailerons and elevators with 320C grade waterproof abrasive paper Ref.No.33J/1293939.

Operation 7. - Repeat operation 6 on all surfaces except the ailerons and elevators and wet scuff the black surfaces only.

Operation 8. - Spray black surfaces only, except the elevators and ailerons. Allow 24 hours for hardening.

Operation 9. - Apply the external markings with colours to specification B.S. X.29, Ref.No.33B/-.

Control surface tabs

35. When it becomes necessary to refinish the control surface tabs, the existing finish is to be completely removed, and the tab is to be refinished in the following manner.

Operation 1. When working to specification B.S. X.29 clean the surface with Deoxidine 202 Ref.No.33C/2204346, for specifications D.T.D.899A and D.T.D. 5555 clean as in operation (1) para.34.

Operation 2. Spray one coat of primer Ref.No.33B/2204527 and 2204529 and leave it to dry for two hours.

Operation 3. - Spray on the final colours in accordance with the specification being used, and leave to dry for 2 hours.

Note...

After final colouring each tab is to

be balanced in accordance with the instructions given in the associated chapters.

Ply-covered portion of fin

36. The ply-covered portion of the fin should only be completely refinished when absolutely necessary, since stripping the finish would necessitate the removal of the madapollam covering. The procedure for the complete refinishing is detailed below.

Operation 1. - Brush on one coat of transparent tautening dope Ref.No.33B/9428857 and allow it to dry for approximately one hour.

Operation 2. - Stop all screw holes, crevices, etc., with stopper AFS.388 Ref.No.33B/9428884 allow four hours for it to dry and then rub down with No.0 glass paper Ref.No.33J/9426818.

Operation 3. - Spray or brush on two further coats of transparent tautening dope Ref.No.33B/9428857. Allow approx. one hour for it to dry between coats and after the second coat.

Operation 4. - Position the madapollam covering Ref.No.32B/1250440 with the lay in the same direction as originally, and dope it down with transparent tautening dope Ref.No.33B/9428857. Smooth down the covering until it is firmly secured. Fit the fabric strips Ref.No. 32B/1250432 and dope down.

Operation 5. - Brush on one coat of transparent tautening dope Ref.No.33B/9428857 and allow it to dry.

Operation 6. - Apply three coats of transparent cellulose finish Ref.No.33B/9428742 allow it to dry between applications and after the final coat.

Operation 7. - Spray three coats of the final colour, allowing each coat to dry before the application of the next.

Structure classification

37. Since the majority of the structure is load-carrying and must be considered as primary, the three-colour system of structure classification is not used in the subsequent chapters of this Volume; those portions which, for repair purposes, may be considered as non-primary are indicated on the structure illustrations. Those areas in which repairs are not permitted except by complete replacement, and those in which repairs are restricted are also indicated.

Special tools

38. The special tools required for the preparation and repair of the structure are illustrated in fig.8.

Repair material

39. Tables 1 and 2 list the repair material required to effect the repairs described in this and the following chapters of this Volume.

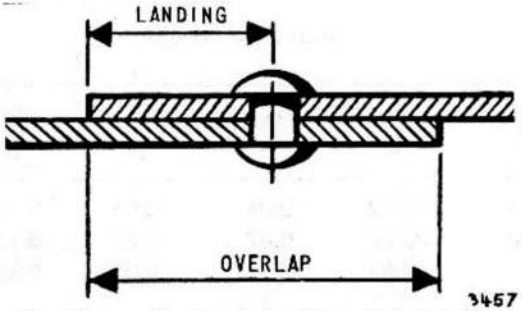


Fig.7. Typical landing and overlap

Landings *(fig.7)*

40. Throughout this book the word 'landing' signifies the distance between the centre of the hole, pin, or rivet and the nearest edge of the material.

Access panels, repair

41. A repair may be effected to worn panel-fastener countersinks by the use of cup washers, Part No.EEAS.7/- attached with P.R.1221 B T. sealant, Ref.No.33H/2201295 after the countersinks have been cleaned up using the correct countersinking tool. Cup washers, Part No.EEAS.7/C should be used in conjunction with 2 B.A. bolts and Part No. EEAS.7/G with 5/16 B.S.F. bolts. The repair is applicable to panels having cut countersinks only, and the panels on which the repair is permissible are as follows:-

Ref.No.	Part No.	Nomenclature
26FZ/3029	EA1.20.1117	Panel, upper, port
26FZ/3030	EA1.20.1118	Panel, upper, stbd
26FZ/3031	EA1.20.1119	Panel, upper, port
26FZ/3032	EA1.20.1120	Panel, upper, stbd
26FZ/3004	EA1.20.121	Cowl, front, port engine
26FZ/2973	EA1.20.123	Cowl, front, stbd engine
26FZ/3005	EA1.20.122	Cowl, front, stbd engine
26FZ/2974	EA1.20.124	Cowl, front, stbd engine

Note...

The repair is for worn countersinks only and must not be used where the hole is elongated or oversize.

TABLE 1

Standard material

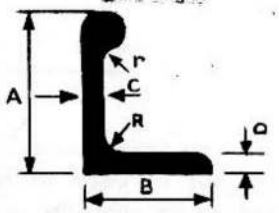
Ref.No.	Description	Thickness (mm)	S.W.G.	Ref.No.	Description	Thickness (mm)	S.W.G.
30A/N.I.V.		1.60	16	30B/9611213		2.50	12
30A/9610772		1.20	18	30B/9611215		2.00	14
30A/9610773	Steel sheet, S.515	0.90	20	30B/9611216		1.60	16
30A/9610774		0.70	22	30B/9611218		1.20	18
				30B/9611220	Aluminium alloy sheet, L.72	0.90	20
30A/N.I.V.		2.50	12	30B/9611222		0.70	22
(S.O.O.)				30B/9611224		0.55	24
30A/N.I.V.	Steel sheet, S.517	2.00	14	30B/9611226		0.45	26
(S.O.O.)							
30A/9610492		1.60	16	30B/9611030		1.60	16
				30B/9611031	Aluminium manganese alloy sheet, L.59	1.20	18
30B/9611249		4.00	8	30B/9611061		0.90	20
30B/9611240		3.20	10	30B/9611008		0.70	22
30B/9611241		2.50	12				
30B/9611242	Aluminium alloy sheet,	2.00	14	30B/9611334		2.20	13
30B/9611243	L.73	1.60	16	30B/9611334	Aluminium alloy coated aluminium sheet,	5.00	6
30B/9611244		1.20	18	30B/9611335	B.S. L.88	4.00	8
30B/9611245		0.90	20	30B/9611336		3.20	10

TABLE 2

Special sections

Extruded sections

Bulb angles

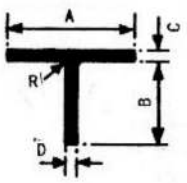
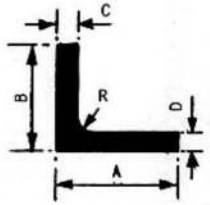


Eedx No.	Dimensions (in.) A	B	C	D	R	r	Material	Remarks
33	0.69	0.562	0.05	0.05	0.10	0.05	L.40	Reversed bulb
68	1.00	0.625	0.07	0.07	0.125	0.07	L.40	
106	0.69	0.562	0.05	0.031	0.10	0.05	L.40	Tapered

continued. . .

TABLE 2 Special sections — *continued*

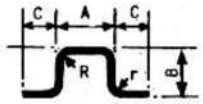
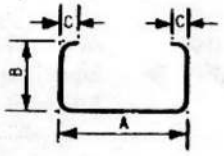
Extruded sections

	Eedx No.	Dimensions (in.) A	B	C	D	R	r	Material	Remarks
T section 	16	3.35	2.05	0.25	0.25	0.20	-	L.40	
	22	2.10	2.30	0.45	0.15	0.10	-	◀ D.T.D.5044	
	29	2.10	0.75	0.20	0.10	0.10	-	D.T.D.5044	
	30	2.10	0.75	0.15	0.10	0.10	-	D.T.D.5044	
	36	1.30	0.75	0.05	0.05	0.05	0.05	L.40	Bulb on leg
	37	1.187	0.982	0.08	0.08	0.078	-	D.T.D.	
	70	2.00	0.813	0.062	0.09	0.09	-	L.40	
	72	1.75	1.313	0.187	0.187	0.06	-	D.T.D.	
	73	1.60	1.10	0.15	0.15	0.06	-	L.40	
	74	1.375	1.255	0.12	0.25	0.187	-	L.40	
	75	2.562	1.75	0.25	0.312	0.125	-	D.T.D.	
	83	1.10	0.55	0.05	0.05	0.05	-	L.40	
	85	2.96	1.64	0.47	0.59	0.10	-	D.T.D.5044	
Unequal angles 	14	0.65	2.0	0.08	0.08	0.08	-	L.65	
	15	0.75	1.25	0.125	0.125	-	-	L.40	No radius
	18	0.75	0.75	0.15	0.20	0.031	-	D.T.D.5044	
	19	0.80	0.80	0.08	0.08	0.08	-	L.40	Equal angle
	21	1.25	1.00	0.104	0.104	0.15	-	L.40	
	23	1.00	1.50	0.15	0.15	0.10	-	L.40	
	25	2.00	1.50	0.25	0.25	0.25	-	D.T.D.5044	
	35	1.72	1.20	0.25	0.05	0.15	-	D.T.D.5044	Tapered
	42	1.15	4.00	0.15	0.50	0.40	-	D.T.D.5044	
	43	1.00	1.00	0.094	0.094	0.10	-	L.40	Equal angle
	44	0.75	1.00	0.125	0.125	0.07	-	L.40	
	47	0.75	0.75	0.125	0.125	0.10	-	L.40	Equal angle
	56	1.00	1.00	0.187	0.187	0.125	-	D.T.D.5044	
	65	2.00	2.00	0.25	0.25	0.125	-	D.T.D.5044	Angle 85 deg 30 min.
	94	0.75	0.75	0.05	0.05	0.05	-	L.65	
	96	1.60	0.85	0.20	0.10	0.10	-	D.T.D.5044	
	117	1.75	0.75	0.10	0.10	0.10	-	D.T.D.5044	
	138	1.25	1.25	0.125	0.125	0.187	-	D.T.D.5044	Angle 70 deg
	141	0.80	0.80	0.08	0.08	0.08	-	D.T.D.5044 ▶	Equal angle
	145	1.75	1.75	0.187	0.187	0.25	-	L.40	Angle 70 deg

continued. . .

TABLE 2 Special sections - *continued*

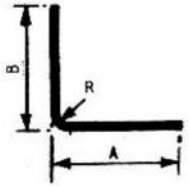
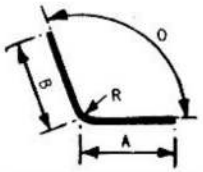
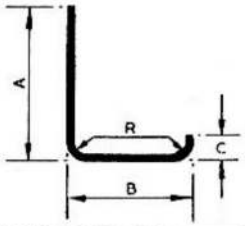
Drawn sections

Top-hat section	EEJ No.	Dimensions (in.) A	B	C	R	r	Thickness (mm)	S.W.G.	Material	Remarks
	◀ 56	0.60	1.95	0.65	0,10	-	0.9	20	L.72	
Top-hat section	57	0.456	1.00	0.45	0.07	-	1.6	16	L.72	
	57	0.456	1.00	0.45	0.07	-	0.9	20	L.72	
	57	0.456	1.00	0.45	0.07	-	0.7	22	L.72	
	58	0.50	0.50	0.45	0.07	-	0.7	22	L.72	
	59	0.75	1.70	0.65	0.16	-	2.0	14	L.72	
	59	0.75	1.70	0.65	0.16	-	1.6	16	L.72	
	59	0.50	0.722	0.45	0.07	-	0.7	22	L.72	
	64	0.75	1.70	0.65	0.10	-	1.2	18	L.72	
	64	0.75	1.70	0.65	0.10	-	0.9	20	L.72	
	119	2.00	0.60	-	0.16	-	0.9	20	L.72	
	373	0.50	0.60	0.65	0.10	-	2.0	14	L.72	
	237	1.36	1.25	0.80	0.10	-	1.2	18	L.72	
	135	0.50	0.50	0.63	0.078	-	0.9	20	L.72	
	135	0.50	0.50	0.63	0.078	-	0.7	22	L.72	
	136	0.456	1.00	0.60	0.076	-	0.9	20	L.72	
	136	0.456	1.00	0.60	0.076	-	0.7	22	L.72	
	138	0.75	1.47	0.55	0.093	-	1.6	16	L.72	
	139	1.00	1.85	0.75	0.18	0.12	1.6	16	L.72	
	139	1.00	1.85	0.75	0.18	0.12	1.2	18	L.72	
	140	1.438	0.72	0.65	0.071	-	1.2	18	L.72	
	140	1.438	0.72	0.65	0.071	-	0.7	22	L.72	
	141	1.698	1.94	0.552	0.142	0.092	1.2	18	L.73	
	142	0.50	0.75	0.65	0.08	-	1.2	18	L.72	
	142	0.50	0.75	0.65	0.08	-	0.9	20	L.72	
	142	0.50	0.75	0.65	0.08	-	0.7	22	L.72	
	147	2.50	1.09	0.52	0.12	-	2.0	14	L.72	
	70	3.128	1.25	0.50	0.10	-	1.6	16	L.72	
	16	3.098	0.60/ 0.45	0.25	0.10	-	1.2	18	L.72	Reversed lip on long flange
Lipped channel	75	2.00	1.00	0.25	0.125	-	1.6	16	L.73	
	77	2.00	0.75	0.25	0.125	-	1.6	16	L.73	
	77	2.00	0.75	0.25	0.125	-	1.2	18	L.73	
	131	3.00	0.65	0.15	0.12	-	1.2	18	L.73	R=external radius
	150	3.00	0.60	0.50	0.10	-	1.2	18	L.72	Dimension C out-
	150	3.00	0.60	0.50	0.10	-	0.7	22	L.72	wards with 0.15 in. ▶ lip downwards

continued. . .

TABLE 2 Special sections - *continued*

Drawn sections

Top-hat section - *contd.*	EEJ No.	Dimensions (in.) A	B	C	R	r	Thickness (mm)	S.W.G.	Material	Remarks
Lipped channel - *contd.*	◀ 214	3.00	0.60	0.15	0.08	-	0.9	20		
	214	3.00	0.60	0.15	0.08	-	0.7	22		
	233	3.00	0.90/0.70	0.50	0.10	-	1.2	18	L.72	Lip on 0.90 flange only
	240	2.55	1.05	0.20	0.16	-	2.0	14	L.72	
Right angle 	88	0.85	0.60	-	0.08	-	2.0	14	L.72	R=external radius
	90	0.70	0.70	-	0.20	-	1.6	16	L.72	
	90	0.70	0.70	-	0.20	-	1.2	18	L.72	
	92	0.65	0.65	-	0.087	-	1.2	18	L.72	
	92	0.65	0.65	-	0.087	-	0.9	20	L.72	
	92	0.65	0.65	-	0.087	-	0.7	22	L.73	
	94	0.80	0.80	-	0.102	-	1.6	16	L.72	
	94	0.80	0.80	-	0.102	-	1.2	18	L.72	
	96	0.60	0.60	-	0.10	-	1.2	18	L.72	
	96	0.60	0.60	-	0.10	-	0.9	20	L.72	
	98	0.75	0.75	-	0.10	-	1.6	16	L.72	
	98	0.75	0.75	-	0.10	-	1.2	18	L.72	
	98	0.75	0.75	-	0.10	-	0.9	20	L.72	
	99	0.50	0.50	-	0.11	-	0.9	20	L.72	
	99	0.50	0.50	-	0.11	-	0.7	22	L.72	
	101	0.60	0.50	-	0.074	-	0.9	20	L.72	
	103	0.65	0.50	-	0.08	-	0.9	20	L.72	
Obtuse angle 	55	1.25	0.90	-	0.15	-	2.0	14	L.72	Angle 96 deg 15 min.
Lipped right angle 	72	1.47	1.25	0.25	0.10	-	1.6	16	L.72	
	110	1.604	1.108	0.29	0.10	-	2.5	12		
	110	1.604	1.108	0.29	0.10	-	2.0	14		
	353	1.70	1.25	0.25	0.13	-	1.6	16		
	297	1.30	1.25	0.25	0.10	-	1.6	16		
	268	1.62	1.25	0.25	0.13	-	1.6	16	L.72	Reversed lip on short flange
									L.72	
	264	1.65	0.75	0.25	0.10	-	1.6	16	L.72	Reversed lip on short flange ▶

continued. . .

TABLE 2 Special sections - *continued*

Drawn sections

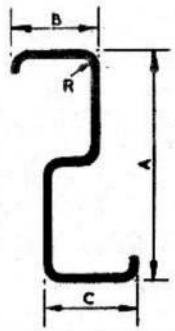
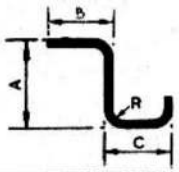
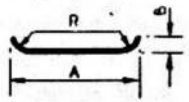
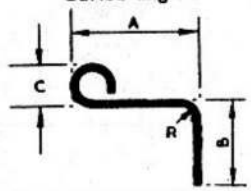
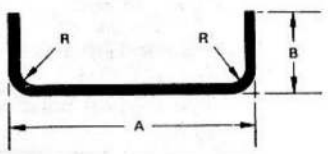
Lipped right angle	EEJ No.	Dimensions (in.) A	B	C	R	r	Thickness (mm)	S.W.G.	Material	Remarks
S section 	◀ 48	2.00	0.65	0.65	0.10	-	1.2	18	L.73	0.31 in. joggle in centre
Lipped Z section 	73	1.25	3.00	0.50	0,06	-	0,7	22	L.72	0.60 and 0.18 lips
	71	1.25	0.555	0.50	0.06	-	0.7	22	L.72	0.18 lip on one flange
	115	2.00	0.60	0.60	0.10	-	0.9	20	L.72	0.25 and 0.13 lips
	336	1.25	0.70	0.65	0.13	for	1.6	16	L.72	0.19 lip on one flange
					0.10	for	1.2	18	L.72	
Lipped strip 	105	0.74	0.19	-	0.13	-	1.6	16	L.72	
	105	0.74	0.19	-	0.13	-	0.9	20	L.72	
Curled angle 	143	0.62	0.60	0.20	0.08	-	0.7	22	L.72	
CHANNEL SECTION 	337	1.78	0.60		0.13		1.6	16	L.73	
	191	1.25	0.50		0.13		0.7	22	L.73 ▶	

TABLE 3

Protective treatment

Symbol	Process Specification	Description of treatment
B	D.T.D.904	Cadmium plating
B1	D.T.D.916	Chromium plating
B2	D.T.D.905	Nickel plating
B3	D.T.D.919	Silver plating
B4	D.T.D.919	Nickel plating
C	B.S., X 27, 28, or D.T.D.772	Universal primer
C2	B.S., X 27, 28, or D.T.D.722, 827, and 899	Self-etching primer
C14	D.T.D.900/4485	Self-etching primer, water resistant
D2	D.E.F.151	Hard anodising
D	D.E.F.151	Anodic treatment, chromic acid
E	D.T.D.911	Chromate treatment
F	D.T.D.901	Relevant cleansing process
G	D.E.F.29	Phosphate treatment and de-embrittle
G1		Glossy synthetic pigmented enamel and primers
G3	D.T.D.900/4165	Dulux red anti-tracking air-drying varnish
H	D.T.D.279 or 663	Lanolin resin solution
H1	D.E.F.279 or 2331	Temporary rust preventitive
K	◀ D.T.D.899 ▶	Enamel, black, resistant to hydraulic fluid
L	D.T.D.495	Calcium chromate inhibitor
M	B.S., X 28	Synthetic finish, matt black
M1	B.S. 381C/632	Synthetic finish, matt grey
N	D.T.D.915	Chromic acid pickling process
P	D.T.D.900/4549	Jointing compound, wet assembly
Q1	B.S., X 17	Seaplane varnish
S	D.T.D.902	Paint after assembly to suit local finish
Z	D.T.D.902	One coat of 'C' plus one coat of 'S'

TABLE 4

Metal plate thickness, conversion to metric dimensions

Standard wire gauge (S.W.G.)	Decimal Equivalent in.	Substitute metric thickness mm	Decimal equivalent in.
3	0.252 0	6.5	0.255 9
4	0.236.0	6.0	0.236 2
5	0.212 0	5.5	0.216 5
6	0.192 0	5.0	0.197 0
7	0.176 0	(4.5)	0.177 2
8	0.160 0	4.0	0.157 5
9	0.144 0	3.5	0.137 8
10	0.128 0	3.2	0.126 0
11	0.116 0	3.0	0.118 1
12	0.104 0	2.5	0.098 4
13	0.092 0	(2.2)	0.086 6
14	0.080 0	2.0	0.078 7
15	0.072 0	(1.8)	0.070 9
16	0.064 0	1.6	0.063 0
17	0.056 0	1.4	0.055 1
18	0.048 0	1.2	0.047 2
19	0.040 0	(1.0)	0.039 4
20	0.036 0	0.9	0.035 3
21	0.032 0	(0.8)	0.031 5
22	0.028 0	0.7	0.027 5
23	0.024 0	(0.6)	0.023 6
24	0.022 0	0.55	0.021 6
25	0.020 0	(0.5)	0.019 7
26	0.018 0	0.45	0.017 7
27	0.016 4	0.4	0.015 7
28	0.014 8	0.4	0.015 7
29	0.013 6	0.3	0.011 8
30	0.012 4	0.3	0.011 8
31	0.011 6	0.3	0.011 8
32	0.010 8	0.3	0.011 8

Note...
Metric sizes shown in brackets are non-preferred.

Metal plate thickness, conversion to metric dimensions

42. The conversion of metal plate thickness dimension figures from the British Standard Wire Gauge (S.W.G.) figures and inch equivalents, to metric dimensions is given in Table 4. The metric figures equivalent to s.w.g. figures 7, 13, 15, 19, 21, 23, and 25 are non preferred and the use of plate of this thickness must be avoided whenever possible.

Equivalent metric dimensions for number and letter drills

43. Drills dimensioned in inches and identified by letter or number are now obsolete. Table 5 indicates the metric size of drill required, the equivalent is indicated in bold type.

The use of P.R. sealant

44. P.R. sealant which is compatible in use with Bostik or Peratol sealants must be used for the repair of the pressure cabin sealing and for any structure repair undertaken in this area. P.R. sealant may also be used for wet assembly of structure repairs when called for in the appropriate repair leaflet.

(1) *Material and equipment*

(a) *Cleaning*

White paper tissues, Kimwipes, code 7105 or suitable alternative of industrial strength.

De-greasing fluid, Methyl Ethyl Ketone (M.E.K.) Ref.No.33C/2203584 or Bostik solvent 6322, Ref.No. 33H/9450628.

TABLE 5

Equivalent dimensions for number and letter drills

Drill gauge and letter size		British Standard (international) series			Drill gauge and letter size		British Standard (international) series			Drill gauge and letter size		British Standard (international) series		
OLD SIZE	Decimal equivalent	NEW SIZE		Decimal equivalent	OLD SIZE	Decimal equivalent	NEW SIZE		Decimal equivalent	OLD SIZE	Decimal equivalent	NEW SIZE		Decimal equivalent
	in.	mm	in.	in.		in.	mm	in.	in.		in.	mm	in.	in.
80	0.013 5	0.35		0.013 8	45	0.082 0	2.10		0.082 7	10	0.193 5	4.90		0.192 9
79	0.014 5	0.38		0.015 0	44	0.086 0	2.20		0.086 6	9	0.196 0	5.00		0.196 8
78	0.016 0	0.40		0.015 7	43	0.089 0	2.25		0.088 6	8	0.199 0	5.10		0.200 8
77	0.018 0	0.45		0.017 7	42	0.093 5		3/32	0.093 8	7	0.201 0	5.10		0.200 8
76	0.020 0	0.50		0.019 7	41	0.096 0	2.45		0.096 5	6	0.204 0	5.20		0.204 7
75	0.021 0	0.52		0.020 5	40	0.098 0	2.50		0.098 4	5	0.205 5	5.20		0.204 7
74	0.022 5	0.58		0.022 8	39	0.099 5	2.55		0.100 4	4	0.209 0	5.30		0.208 7
73	0.024 0	0.60		0.023 6	38	0.101 5	2.60		0.102 4	3	0.213 0	5.40		0.212 6
72	0.025 0	0.65		0.025 6	37	0.104 0	2.65		0.104 3	2	0.221 0	5.60		0.220 5
71	0.026 0	0.65		0.025 6	36	0.106 5	2.70		0.106 3	1	0.228 0	5.80		0.228 3
70	0.028 0	0.70		0.027 6	35	0.110 0	2.80		0.110 2	A	0.234 0		15/64	0.234 4
69	0.029 2	0.75		0.029 5	34	0.110 0	2.80		0.110 2	B	0.238 0	6.00		0.236 2
68	0.031 0		1/32	0.031 2	33	0.113 0	2.85		0.112 2	C	0.242 0	6.10		0.240 2
67	0.032 0	0.82		0.032 3	32	0.116 0	2.95		0.116 1	D	0.246 0	6.20		0.244 1
66	0.033 0	0.85		0.033 5	31	0.120 0	3.00		0.118 1	E	0.250 0		1/4	0.250 0
65	0.035 0	0.90		0.035 4	30	0.128 5	3.30		0.129 9	F	0.257 0	6.50		0.255 9
64	0.036 0	0.92		0.036 2	29	0.136 0	3.50		0.137 8	G	0.261 0	6.60		0.259 8
63	0.037 0	0.95		0.037 4	28	0.140 5		9/64	0.140 6	H	0.266 0		17/64	0.265 6
62	0.038 0	0.98		0.038 6	27	0.144 0	3.70		0.145 7	I	0.272 0	6.90		0.271 7
61	0.039 0	1.00		0.039 4	26	0.147 0	3.70		0.145 7	J	0.277 0	7.00		0.275 6
60	0.040 0	1.00		0.039 4	25	0.149 5	3.80		0.149 6	K	0.281 0		9/32	0.281 2
59	0.041 0	1.05		0.041 3	24	0.152 0	3.90		0.153 5	L	0.290 0	7.40		0.291 3
58	0.042 0	1.05		0.041 3	23	0.154 0	3.90		0.153 5	M	0.295 0	7.50		0.295 3
57	0.043 0	1.10		0.043 3	22	0.157 0	4.00		0.157 5	N	0.302 0	7.70		0.303 1
56	0.046 5		3/64	0.046 9	21	0.159 0	4.00		0.157 5	O	0.316 0	8.00		0.315 0
55	0.052 0	1.30		0.051 2	20	0.161 0	4.10		0.161 4	P	0.323 0	8.20		0.322 8
54	0.055 0	1.40		0.055 1	19	0.166 0	4.20		0.165 4	Q	0.332 0	8.40		0.330 7
53	0.059 5	1.50		0.059 1	18	0.169 5	4.30		0.169 3	R	0.339 0	8.60		0.338 6
52	0.063 5	1.60		0.063 0	17	0.173 0	4.40		0.173 2	S	0.348 0	8.80		0.346 5
51	0.067 0	1.70		0.066 9	16	0.177 0	4.50		0.177 2	T	0.358 0	9.10		0.358 3
50	0.070 0	1.80		0.070 9	15	0.180 0	4.60		0.181 1	U	0.368 0	9.30		0.366 1
49	0.073 0	1.85		0.072 8	14	0.182 0	4.60		0.181 1	V	0.377 0		3/8	0.375 0
48	0.076 0	1.95		0.076 8	13	0.185 0	4.70		0.185 0	W	0.386 0	9.80		0.385 8
47	0.078 5	2.00		0.078 7	12	0.189 0	4.80		0.189 0	X	0.397 0	10.10		0.397 6
46	0.081 0	2.05		0.080 7	11	0.191 0	4.90		0.192 9	Y	0.404 0	10.30		0.405 5
										Z	0.413 0	10.50		0.413 4

◀ Cleaning solvent W.D.606/615 (British Paints Ltd) for removing sealant from tools and equipment.

(b) *P.R. Sealants*

CODE NO.	REF.NO.	PHYSICAL CHARACTERISTICS
P.R.1422 B.T.2	33H/2203813	Application by brush, brown coloured.
P.R.1422 B.T.-½	33H/2203419	Application by brush for quick repair, brown coloured.
P.R.1422-2	33H/2203109	Application with spatula for filleting, brown coloured.
P.R.1422-½	33H/2203110	Application by spatula or extrusion gun for quick repair, brown coloured.
P.R.1431T	33H/224509	A long application life interface sealant with thixotropic properties suitable for spatula or extrusion gun. Colour red/brown.
P.R.1431T/6	33H/N.I.V.	A medium application life interface sealant with thixotropic properties suitable for spatula or extrusion gun application.
P.R.1440B-½	33H/N.I.V.	A quick repair filling compound with thixotropic properties, suitable for application with a spatula. Colour grey.
P.R.1440B-2	33H/N.I.V.	A filling compound with thixotropic properties

(2) *Preparation of P.R. sealants*

Sealant materials, P.R.1422, P.R.1422 B.T., P.R.1431 T and P.R.1440 B-2 are supplied in tins each having the correct amount of accelerator in an attached pack. When required for use the sealant base material in the tin and the accelerator in the pack must be mixed by the following procedure:-

(a) Remove the lid of the base compound tin and cut away the lip of the tin to ensure that all the compound is used.

(b) Thoroughly stir the accelerator in the container until an even consistency is obtained.

Note...

The base compound pack specifies the correct reference number of accelerator to be used and it must be ensured that this instruction is obeyed.

(c) To avoid aeration, slowly stir the accelerator into the base compound using a clean tool and continue stirring until all particles of accelerator have dispersed.

Note...

1. The mixing may be mechanical or manual dependent on the quantities being used. Mechanical mixer speed must not exceed 80 rev/min.

2. Curing will commence immediately the accelerator is added to the base compound and will continue at a rate dependent on temperature and humidity.

3. The complete kit of base compound and accelerator must always be mixed, any surplus mix must be discarded.

4. Not under any circumstances must P.R. sealant mixes be thinned ▶

◀ *by the addition of solvents of any kind.*

CAUTION

P.R.1440 B-2 sealant must be degassed after mixing by placing it in a container having 3 to 4 times the volume of material and applying a vacuum of 20 to 25 in. of mercury for a period of ten minutes.

(3) *Shelf storage life*

Assuming good conditions with the containers sealed against the ingress of air, the storage life is 6 months under arctic, temperate and tropical conditions.

Note...

Under arctic conditions the sealant must not be stored in temperatures less than 0 deg C.

(4) *Curing characteristics*

The application life is the period of time during which the P.R. sealant remains suitable for application, i.e. has not thickened excessively or become lumpy.

For repair application the short application life sealants P.R.1422-½, P.R. 1422 B.T.-½ and P.R.1440 B-½ must be used.

Table 6 details the curing characteristics of P.R. sealants.

(5) *Preparation of surfaces*

(a) Remove all swarf, dirt and any existing paint.

(b) Degrease the surface by pouring a liberal quantity of M.E.K. on to a clean paper tissue and washing one small area at a time, wiping each small area dry using a clean white tissue before the solvent evaporates, to prevent redisposition of oil, grease or dirt.

Note...

Where existing sealant is being repaired it is only necessary to remove any loose sealant before cleaning and degreasing.

(c) Ensure the surface cleanliness by rubbing with clean paper tissues until all indications of residual dirt cease.

Note...

A clean solvent supply must always be maintained by dispensing from a container on to the cleaning tissue.

(6) *Sealing air leakage in pressurized areas*

Note...

When locating the source of small amounts of leakage it must be appreciated that the perforation of sealant may be some distance away from the actual point of leakage; this is particularly applicable at skin joints.

(a) When the leak has been found de-pressurize the area.

(b) Clean and degrease the area, para.44 (5) refers.

(c) Apply a brush coat of P.R.1422 B.T.-½ over the prepared surface

TABLE 6

P.R. sealants curing characteristics

Material	Application life hours		Time to fully cure hours	
	18 °C	24 °C	18 °C	24 °C
P.R.1422 B.T.-½	1	½	40	24
P.R.1422-½	1	½	40	24
P.R.1422 B.T.-2	4	2	100	40
P.R.1422-2	4	2	100	40
P.R.1431 T	20	12	14 to 16 days	10 to 12 days
P.R.1431 T-6	6	4	6 to 7 days	5 to 6 days
P.R.1440 B-2	4	3	100	50

▶

◀ to overlap on to the existing sealant and allow to cure, Table 4 refers.

(7) *Sealing of bolts and rivets*
(a) Prior to fitting a bolt or rivet, degrease using M.E.K. solvent.

(b) Dip the bolt or rivet into P.R. 1422 B.T.-½ sealant before fitting. If possible avoid turning the bolt.

(8) *Interface sealing*
(a) Clean and degrease the contacting faces, para.44(5) refers.

(b) Apply a brush coat of P.R.1422 B.T.-2 to each of the contacting faces.

Note...
If subsequent filleting is to be undertaken the brush coating must be extended 0.25 in. beyond the edges of contacting faces.

(9) *Filleting*
Where structure repairs have been made in pressurized areas fillets of P.R. 1422-2 must be formed along the repair component edges. The fillets must be continuous and free from pin holes. Breaks in the flow of the P.R. sealant extrusion must be avoided by overlapping by 1.0 in. on to the existing sealant and pressing the joint into position.

Note...
1. It is permissible to lay P.R. 1422-2 sealant directly on top of small fillets of P.R.1422 B.T.-2 extruded from the contacting faces of the repair components, provided that the items have been fully secured.

2. It is impracticable to apply filleting to the edges of metals less than 0.1 in. thick, such edges must be sealed using P.R.1422 B.T.-½ sealant, brush applied.

(10) *Mating of joints*
Structure repair components wet assembled with P.R.1422 B.T.-2 must be brought together and secured within 30 minutes; bolting/riveting must be undertaken at once, and not systematically from one end.

(11) *Sealing of access doors and inspection panels*
Where structure repair has necessitated the removal of access doors or inspection panels originally sealed with a P.R. type sealant, P.R.1422 B.T.-2 must be used for re-sealing.

(12) *Drying out*
Ample ventilation must be provided during the application of P.R. sealants to allow the solvents in brush applied sealants to evaporate. After the completion of all sealing in closed areas a period of 72 hours must be allowed for drying out, and during the first 24 hours of this, fresh air must be circulated continuously.

(13) *Testing*
Where the repair to the sealant of a pressurized area has been extensive, pressure testing must not be undertaken within five days after completion of the final sealing.

(14) *Sealing air leaks revealed by tests in pressurized areas.*
(a) Precisely locate the point of leakage, note the point and depressurize the area.

(b) Remove the sealant from the leakage area.

(c) Clean and degrease, para.44(5) refers.

(d) Apply a brush coat of P.R.1422 B.T.-½ sealant over the prepared area overlapping on to the adjacent sealant by 1.0 in.

(e) Where existing filleting has been removed build up a new length of filleting using P.R.1422-½ sealant, ensuring that the new material is pressed well into contact with the existing fillet.

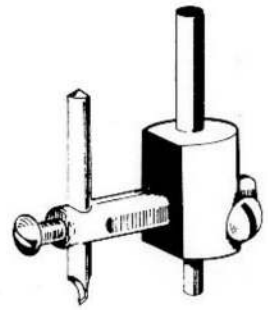
(f) If the leakage has occurred at a corner P.R.1440 B-½ must be used and pressed tightly into contact with the existing sealant.

(15) *Resealing rivets and bolts in pressurized area*
(a) Remove the rivet/bolt and examine the contacting surfaces and countersinks in the structure.

(b) Dip the replacement rivet/bolt in P.R.1422-½ sealant and fit.

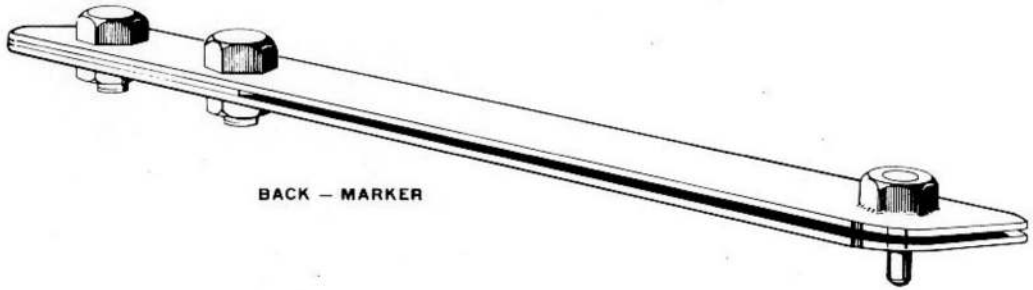
Note...
If possible, avoid turning the bolt.

(c) Apply a brush coat of P.R.1422 B.T.-½ over the nut or formed head of the rivet. ▶



ADJUSTABLE TREPANNER

SKIN KNIFE



BACK — MARKER

ADJUSTABLE TREPANNING TOOL:- CUTS CIRCULAR HOLES IN ALUMINIUM ALLOY SHEET WHEN HELD IN A DRILL CHUCK. THE TOOL IS ADJUSTABLE TO VARY THE SIZES OF THE HOLES WHICH CAN BE CUT.

MATERIAL	BODY	- MILD STEEL
	CUTTING TOOL	- TOOL STEEL OR CASE HARDENED MILL STEEL

SKIN KNIFE:- THIS TOOL DRAWN SEVERAL TIMES ALONG THE EDGE OF A STEEL RULE WILL PRODUCE A CLEAN STRAIGHT CUT IN ALUMINIUM ALLOY SHEETING.

MATERIAL	HANDLE	- WOOD
	BLADE	- HIGH-CARBON STEEL (SAW BLADE)

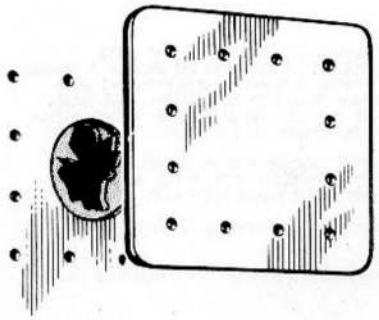
BACK-MARKER:- USED TO LOCATE BLIND HOLES, e.g. WHERE A PATCH HAS COVERED EXISTING HOLES AND IT IS NECESSARY TO DRILL HOLES IN THE PATCH TO MATE UP WITH THE EXISTING BLIND HOLES.

MATERIAL:- MILD STEEL WITH HARDENED PIN AND HOLE JIG PIECE.

THESE TOOLS CAN BE MANUFACTURED LOCALLY AND VARIED ACCORDING TO THE UNIT'S MANUFACTURING FACILITIES.

FIG. 8. SPECIAL TOOLS

3449

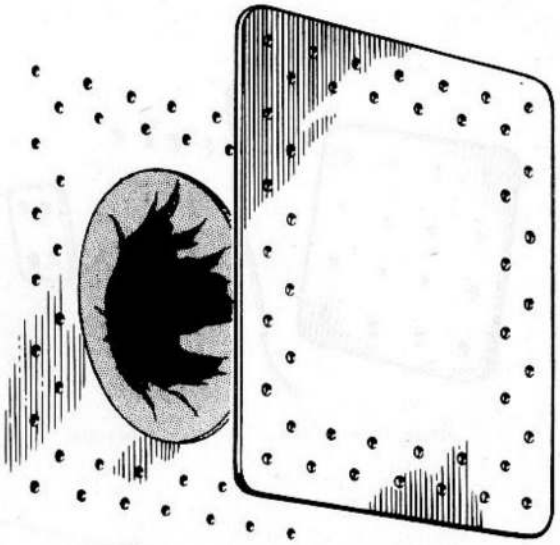


PATCH REPAIR FOR HOLE UP TO 1 IN. DIAMETER AFTER DAMAGE HAS BEEN DRESSED TO SMOOTH CIRCULAR SHAPE

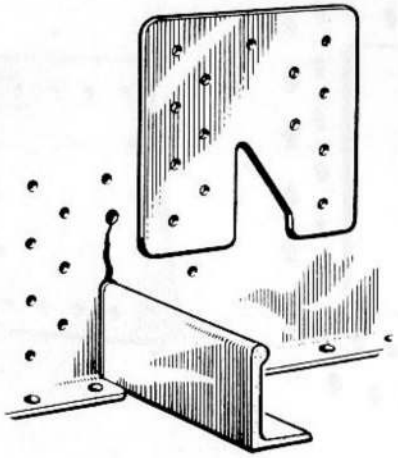
PATCHES MUST BE OF THE SAME SHEET - GAUGE AND MATERIAL SPECIFICATION AS THE ORIGINAL DIAPHRAGMS. RIVETS 5/32 IN. DIAMETER SOLID SNAP-HEAD (AS.2227) WHERE POSSIBLE, OR 5/32 IN. TUCKER DOME HEAD AGS.2050/-/8S WHERE NECESSARY AT 0.60 IN. PITCH. DISTANCE BETWEEN RIVET LINES (ILLUSTRATION ON RIGHT) MUST BE 0.50 IN. MINIMUM, DISTANCE FROM RIVET CENTRES TO PLATE EDGES MUST BE 0.30 IN. MINIMUM CORNER RADIUS 0.30 IN.

THE REPAIRS MUST BE FREE FROM BURRS. ANY SHARP CORNERS MUST BE RADIUSED AND THE RIVETS DRAWN UP TIGHT BEFORE HEADS ARE FORMED.

JOINTING COMPOUND REF.NO.33H/253 MUST BE APPLIED TO ALL JOINT FACES BEFORE RIVETING.

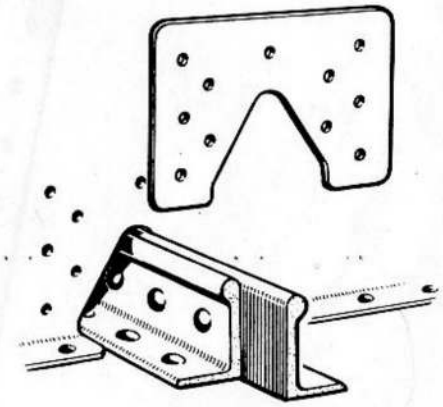


PATCH REPAIR FOR HOLE 1-3 IN. DIAMETER AFTER DAMAGE HAS BEEN DRESSED TO SMOOTH CIRCULAR SHAPE



PATCH REPAIR TO STRINGER CUT-AWAY SHOWN IN EXAMPLE ABOVE AS A CRACK OR FRACTURE. MAXIMUM DIAMETER DRILLED HOLE AT THE EXTREMITY OF CRACK 3/16 IN.

THESE REPAIRS MUST NOT BE USED ON ANY PRESSURE-SEALED AREAS AND ARE APPLICABLE ONLY TO L.72 SHEET MATERIAL NOT EXCEEDING 18 S.W.G. THICKNESS

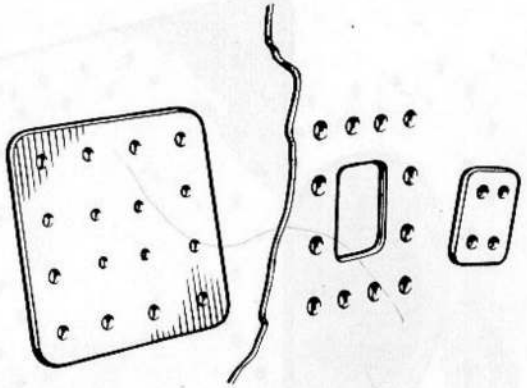


METHOD OF ENLARGING STRINGER CUT-AWAY SHOWN IN DIAGRAM ABOVE TO ACCOMMODATE REPAIR TO STRINGER (BACK TO-BACK METHOD AS ILLUSTRATED IN FIG.11)

FIG. 9. NON-FLUSH DIAPHRAGM PATCHES

MATERIAL SPECIFICATIONS AMENDED

3451



REPAIR TO DRESSED HOLE UP TO 1 IN. MAXIMUM WIDTH

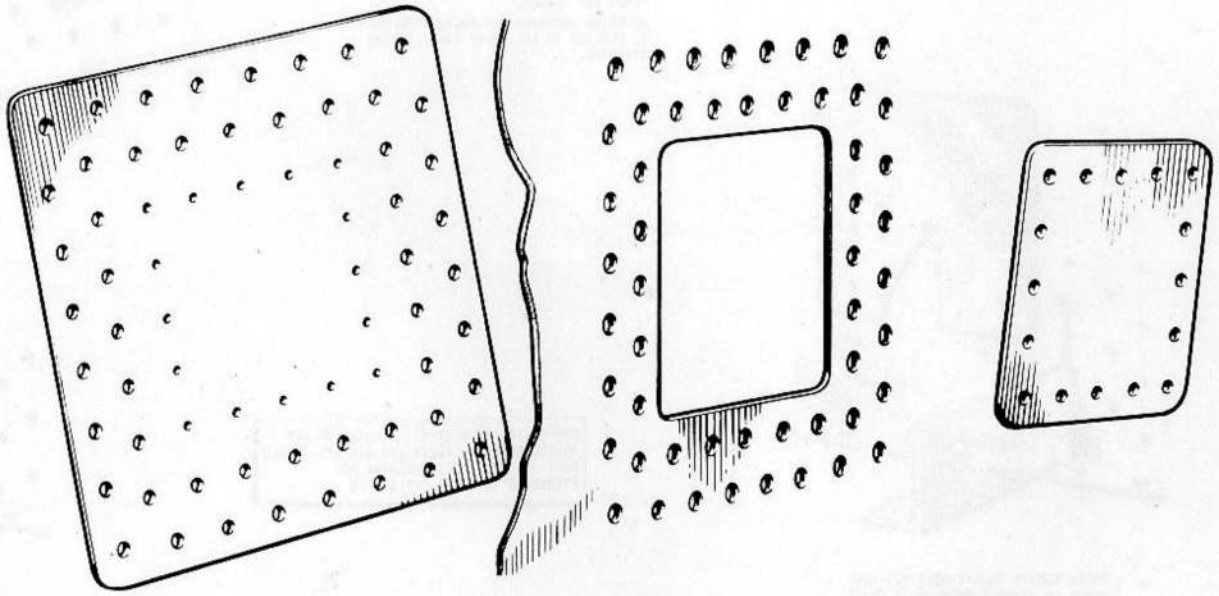
NOTE...
THESE REPAIRS ARE NOT TO BE USED ON ANY PRESSURE-SEALED AREAS AND ARE APPLICABLE ONLY TO L.72 SHEET MATERIAL NOT EXCEEDING 18 S.W.G. THICKNESS

PATCHES AND FILLER PLATES MUST BE THE SAME SHEET GAUGE AND MATERIAL SPECIFICATION AS THE ORIGINAL DIAPHRAGMS. MINIMUM CORNER RADIUS 0.30 IN. RIVETS ATTACHING SOLID PATCH TO DIAPHRAGM TO BE 5/32 IN. DIAMETER MONEL TUCKER COUNTERSUNK HEAD AGS.2051/-/8S AT 0.60 IN. MAXIMUM PITCH - HOLES MUST BE COUNTERSUNK 120 DEG TO SUIT.

FILLER PLATE RIVETS MUST BE 3/32 IN. DIAMETER SOLID (AS.2230) AT APPROXIMATELY 0.50 IN. PITCH, WITH 120 DEG COUNTERSUNK HEADS ON THE FILLER PLATE SIDE.

MINIMUM DISTANCE FROM RIVET CENTRES TO PLATE EDGES MUST BE 0.30 IN.

DISTANCE BETWEEN DOUBLE RIVET ROW LINES MUST BE 0.50 IN.



REPAIR TO DRESSED HOLE UP TO 3 IN. MAXIMUM WIDTH

FIG. 10. FLUSH DIAPHRAGM PATCHES

3452

1/8 IN. SOLID RIVETS MUST BE USED ON THE ATTACHMENT FLANGES TO EXISTING RIVET SPACING WHEN COMPLETE INSERTIONS ARE MADE

DIMENSION R = 0.10 IN. DIMENSION W = 0.60 IN.

ATTACH BRIDGING LENGTHS TO ACTUAL INSERTIONS WITH 1/8 IN. SOLID SNAP-HEAD RIVETS

A COMPLETE STRINGER SECTION MUST BE INSERTED WHEN THE INSERTION OF SHORT LENGTHS WOULD FOUL RADIO EQUIPMENT, ETC.

WHEN HEAT TREATMENT FACILITIES ARE NOT AVAILABLE FOR L.73 MATERIAL, THE REINFORCING STRIP MUST BE MANUFACTURED FROM L.72 AND THE S.W.G. THICKNESS MUST BE INCREASED BY 2 GAUGES, E.G. 18 TO 16, 14 TO 12 S.W.G.

STRINGER SECTION	TYPE OF REPAIR	REINFORCING STRIP	FILLER PACKING	NO. OF RIVETS EACH SIDE OF DAMAGE	RIVETS	RIVET PITCH	DIMENSIONS F	DIMENSIONS D
EEDX.68	FREE (BULB) FLANGE DAMAGE	L.73 14 S.W.G.		6	3/16 IN. SOLID SNAP-HEAD	0.70 IN.	0.30 IN.	
	SKIN ATTACHMENT FLANGE DAMAGE	L.73 14 S.W.G.	L.72	6	1/8 IN. SOLID	EXISTING PITCH		
	COMPLETE INSERT	EEDX.68	EEDX.68	6	3/16 IN. SOLID SNAP-HEAD	0.70 IN. ON BULB FLANGES		
EEDX.106	FREE FLANGE DAMAGE (BULB LEG)	L.73 18.S.W.G.		5	5/32 IN. SOLID SNAP-HEAD	0.60 IN.	0.25 IN.	
	SKIN ATTACHMENT FLANGE DAMAGE	L.73 18 S.W.G.	L.72 (TAPERED)	5	1/8 IN. SOLID	EXISTING PITCH		
	COMPLETE INSERT	EEDX.106	EEDX.106	6	5/32 IN. SOLID SNAP-HEAD	0.60 IN. ON BULB FLANGES		
EEDX.33 (REVERSED BULB)	FREE FLANGES DAMAGE (BULB LEG)	L.73 18 S.W.G.		7	1/8 IN. SOLID SNAP-HEAD	0.50 IN.		0.62 IN.
	SKIN ATTACHMENT FLANGE DAMAGE	L.73 18 S.W.G.	L.72	6	1/8 IN. SOLID	EXISTING SKIN PITCH		
	FORMED SHEET STRAP WITH INSERT	L.73 18 S.W.G.	EEDX.33	6	1/8 IN. SOLID SNAP-HEAD	0.50 IN.	0.30 IN.	0.75 IN.

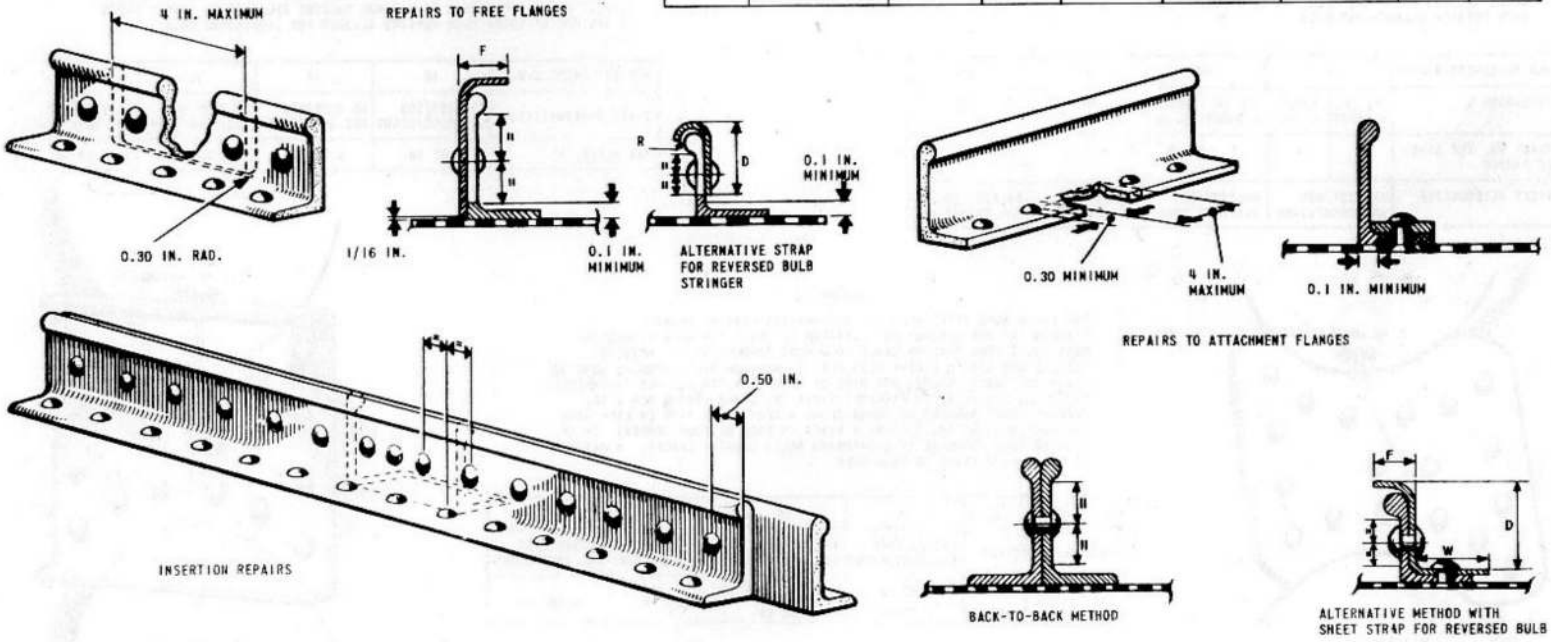


FIG.11. STRINGER REPAIRS

3448

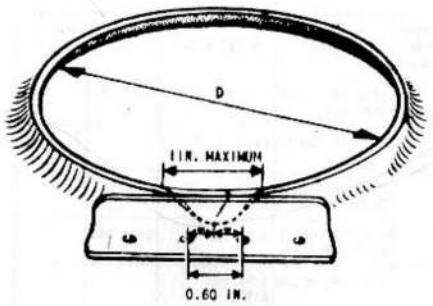


DIAGRAM 'A'

REPAIRS TO FLANGED LIGHTENING HOLES:-
MATERIAL L.72 THICKNESS NOT EXCEEDING 16 S.W.G.
(NOT APPLICABLE TO PLAIN OR RING - REINFORCED HOLES, OR TO HOLES IN SPARS, E.G. AILERON OR RUDDER SPARS.)
POSITION BOUNDARY RIVETS IN DIAGRAMS A, C & D AS CLOSE TO THE START OF THE FLANGE RADIUS AS POSSIBLE.
FLANGES SHOWN ON REINFORCING PLATES MUST HAVE THE SAME RADIUS AND DEVELOPED FLANGE LENGTH AS THE DAMAGED LIGHTENING HOLE.
ALTERNATIVE MONEL TUCKER POP RIVETS IN THE TABLES MUST BE USED ONLY WHEN SOLID RIVETTING IS IMPRACTICABLE.

ORIGINAL WEB THICKNESS S.W.G.	L.72 REPAIR MATERIAL THICKNESS
16	16
18	18
20	20
22	20

DIAGRAM 'A'

FOR NICKS, DENTS, OR FRACTURES, NOT EXTENDING PAST START OF FLANGE RADIUS AFTER CLEANING OUT. MINIMUM CLEAN-OUT RADIUS 0.25 IN. THE STRAIGHT ANGLE REINFORCER TO LIE CLOSE UP TO DAMAGED FLANGE. A MAXIMUM OF THREE SUCH REPAIRS ALLOWED PER HOLE

WEB THICKNESS S.W.G.	16		18		20	20
DIMENSION D	6½ IN. & UNDER	ABOVE 6½ IN.	6½ IN. & UNDER	ABOVE 6½ IN.	ANY	ANY
RIVET NO. PER SIDE OF DAMAGE	3	4	2	3	2	2
RIVET ALTERNATIVE	AS.2227/505 AGS.2050/5248S		AS.2227/505 AGS.2050/5248S		AS.2227/504 AGS.2050/5248S	AS.2227/504 AGS.2052/5198S

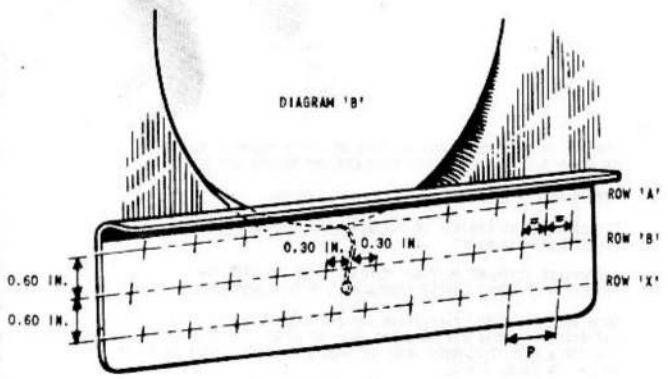


DIAGRAM 'B'

LOCALISE CRACK END BY A DRILLED HOLE, MAXIMUM DIAMETER 1/8 IN. AND REMOVE SHARP EDGES AND CORNERS. MEASURE TOTAL CRACK LENGTH (CURVE PLUS FLAT) TO END OF DRILLED HOLE. MINIMUM RIVET NUMBERS (NOT INCLUDING ROW 'X') ARE 6 PER INCH CRACK LENGTH, PER SIDE OF CRACK RUN, E.G. 1.30 IN. CRACK REQUIRES 8 RIVETS MINIMUM PER SIDE ON ROWS 'A' & 'B' TOGETHER. ROW 'A' CENTRE LINE MUST INTERSECT CRACK START ON FLANGE RIM (REFER TO DIAGRAM) WITH 3 RIVETS MINIMUM PER SIDE OF CRACK RUN. ROW 'X' SHOWN COVERING CRACK END IS ADDITIONAL TO MINIMUM NUMBERS REQUIRED ON ROWS 'A' AND 'B'. A MAXIMUM OF THREE SUCH REPAIRS ALLOWED PER LIGHTENING HOLE.

WEB THICKNESS S.W.G.	16	18	20	22
RIVET ALTERNATIVES	AS.2227/505 AGS.2050/6248S	AS.2227/404 AGS.2050/5248S	AS.2227/404 AGS.2050/5198S	AS.2227/403 AGS.2050/5198S
MAX PITCH 'P'	0.57 IN.	0.50 IN.	0.50 IN.	0.50 IN.

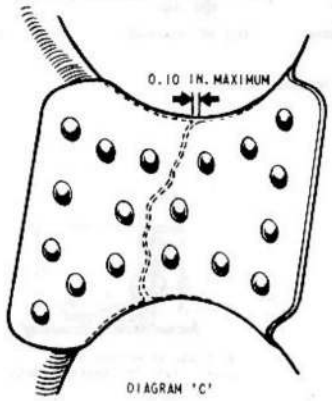


DIAGRAM 'C'

DIAGRAMS 'C' & 'D'

FOR CRACK RUNS BETWEEN HOLES, ALTERNATIVE REPAIRS SHOWN:-
DIAGRAM 'D' FOR GENERAL USE, DIAGRAM 'C' ONLY FOR WHEN REINFORCEMENT WOULD FOUL PIPE OR CABLE LOOM RUNS THROUGH HOLE. MEASURE TOTAL CRACK LENGTH (CURVE PLUS FLAT.) MINIMUM RIVET NUMBERS MUST BE 4 PER IN. CRACK LENGTH, PER SIDE OF CRACK RUN, IN ALL WEB THICKNESSES EXCEPT 22 S.W.G. WHICH REQUIRES 6 PER IN. CRACK LENGTH PER SIDE. ARRANGE RIVET NUMBERS AS SHOWN ROUND A CONTINUOUS RING ON EACH SIDE OF CRACK RUN AND POSITIONING A RIVET IN EACH OF FOUR CORNERS, OR IN EACH OF THREE CORNERS IF LIGHTENING HOLES CLOSELY SPACED. A MAXIMUM OF TWO SUCH REPAIRS TO EACH HOLE.

WEB THICKNESS S.W.G.		16	18	20	22
RIVET ALTERNATIVES		AS.2227/606 AGS.2050/6308S	AS.2227/504 AGS.2050/5248S	AS.2227/504 AGS.2050/6248S	AS.2227/403 AGS.2050/5198S
RIVET PITCH	MAX.	1.00 IN.	0.75 IN.	0.60 IN.	0.50 IN.
	MIN.	0.70 IN.	0.60 IN		

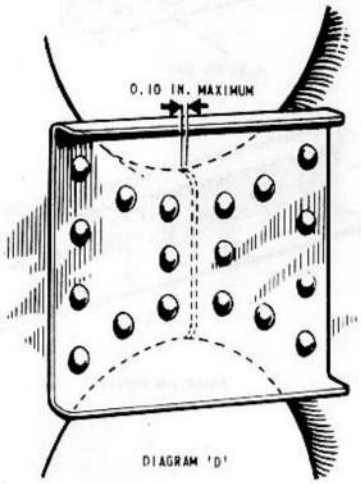


DIAGRAM 'D'

FIG. 12. LIGHTENING-HOLE REPAIRS

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