Chapter 28E

DIFFUSER CASING
RENEWALS, RECONDITIONING, REPAIR, AND SALVAGE

Contents

Illustrations

THIS CHAPTER, which is applicable to the diffuser casing, contains instructions for reconditioning and repairing worn or damaged components, and for replacing unserviceable parts by serviceable standard parts. Instructions for dismantling and reassembling these components are not given unless they are an essential part of the repair or renewal. Reference should be made to chapters 17, 23, 24, 33, or 34, as appropriate, for further information on dismantling or reassembling individual items before, or after, repair or renewal. The information given in chapter 32 must also be read in conjunction with all repairs dealing with the fitting of "Cross" wire inserts to damaged or worn threaded holes.

Most of the repair information contained in this chapter is based on the manufacturer's turbine repair (T.R.) schemes and process specifications, and, in each instance, the relevant drawing (T.R.) number or specification number followed by its issue number, is quoted; turbine repair schemes are introduced under the cover of a modification and this modification number is quoted also. After any repair or renewal has been completed, an entry should be made in the appropriate record book of the engine in accordance with British Air Registration Board Inspection Procedures, Section ML, Leaflet 1-1. Refer also to the instructions on page 3 of chapter 32 entitled "Repair Identification".

It should be noted that these repairs and renewals must only be carried out under the supervision of an Inspection Organisation approved for such repair work by the British Air Registration Board, or an equivalent authority, or under the supervision of an appropriately licensed engineer. It is assumed also that personnel possessing the requisite skill and experience will be employed and that the recommended tools and equipment will be used.

Normally, where special tools and equipment are available for carrying out the renewals and repairs described in this chapter, they are listed at the beginning of the relevant repair instructions and are referred to in the text as they are used. In some cases, even though no list is given, the tools are referred to in the text as they are used. Where special tools are not mentioned, reference should be made to The Service Department of The de Havilland Engine Company.

With the exception of damaged studs, damaged diffuser bolts, and damaged tip clearance

unions, no additional work other than that required for normal assembly is necessary to renew any standard part; the defective parts rejected being discarded and new, serviceable, or repaired parts substituted. A new diffuser bolt must be carefully blended to suit the diffuser vane through which it passes and, after blending, must be cadmium plated to D.H. Process Specification No. 106 (latest issue) before fitting. Tip clearance unions which are renewed should be fitted with a new tab-washer (Part No. N.3775). The effective length of the new union must be checked as follows. Position setting gauge T.72502 on a surface table; insert the spindle of the dial test indicator T.72779 into the setting gauge; abut the body of the D.T.I. on the gauge and set the D.T.I. to read zero. Insert the spindle of the dial indicator gauge into the tip

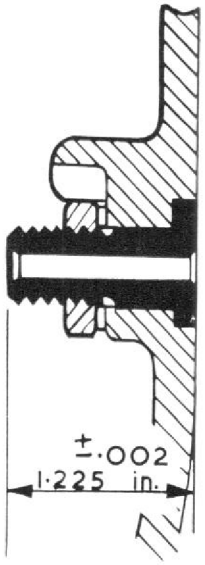


Fig. 1. Section through diffuser casing showing dimensions for impeller tip clearance unions.

clearance union. Place a steel rule or similar flexible strip over the inner face of the union to follow the contour of the diffuser casing so that the stylus of the gauge abuts the rule. The gauge will indicate the difference between the effective length of the union and the dimension stamped on the setting gauge, and this sum when added to or subtracted from the setting gauge dimension will determine the effective length of the union. If this is not within the limits shown in Fig. 1, the minimum amount of metal must be removed from the outer end of the union to bring the length of the union within the high limit. The original length which is stamped on the diffuser casing must be obliterated and the new length stamped thereon immediately adjacent to it. To renew damaged studs, a $\frac{5}{16}$ in. B.S.F. stud box T.71006, a $\frac{1}{4}$ in. B.S.F. stud box T.70809, and a 2 B.A. stud box T.70965 are required. Damaged studs may be removed, and serviceable replacements fitted in accordance with standard practice.

REAR COVER, STUD HOLES
T.R. 268 issue 8—Mod. 311

This repair may be applied to all Ghost diffuser casing rear covers.

Diffuser casing rear covers in which any of the fifty-two $\frac{5}{16}$ in. B.S.F., or the eight $\frac{3}{8}$ inch B.S.F., holes have become worn or damaged may be rectified in accordance with these instructions.

This repair may also be applied, without extensive dismantling of the engine, in accordance with the sequence of operations headed T.R.268B.

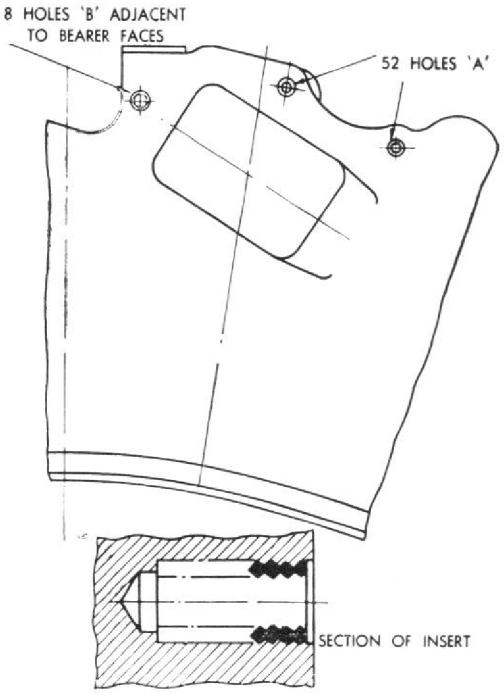


Fig. 2 (T.R.268). Location of holes for fitting "Cross" wire inserts to diffuser casing rear cover.

SEQUENCE OF OPERATIONS

Holes 'A' (Fig. 2)

1. Drill the defective $\frac{5}{16}$ inch B.S.F. hole 0·3230 inch diameter by 0·900 inch deep, using a letter P drill.

2. Using taper tap T.77321 followed by plug tap T.77333, thread the hole 0·3727 inch diameter by 22 T.P.I. Whitworth thread form, to a depth of 0·775 inch. The effective diameter of the thread is to be 0·3436 + ·0023 inch, and the minor diameter 0·3145 + ·0141 inch. Counterbore the hole $\frac{3}{8}$ inch diameter by 0·025 inch deep.

3. Remove any burrs and sharp edges, blow out the hole with compressed air and check the thread with a John Bull small bore gauge used in conjunction with a $\frac{5}{16}$ inch (effective diameter) mandrel and ring screw gauge T.77363.

4. Using inserting tool T.77341, screw in wire insert Part No. N.5041 and then break off and remove the tang.

5. Fit the existing stud if serviceable, or a new stud.

Holes 'B' (Fig. 2)

1. Drill the defective $\frac{3}{8}$ inch B.S.F. hole 0·386 inch diameter by 0·900 inch deep, using a letter W drill.

2. Using taper tap T.77322 followed by plug tap T.77334, thread the hole 0·441 inch diameter by 20 T.P.I. Whitworth thread form, to a depth of 0·775 inch. The effective diameter of the thread is to be 0·4090 + ·0027 inch, and the minor diameter 0·3770 + ·0170 inch. Counterbore the hole $\frac{29}{64}$ inch diameter by 0·025 inch deep.

3. Remove any burrs and sharp edges, blow out the hole with compressed air and check the thread with a John Bull small bore gauge used in conjunction with a $\frac{3}{8}$ inch (effective diameter) mandrel and ring screw gauge T.77364.

4. Using inserting tool T.77347, screw in wire insert Part No. N.4997 and then break off and remove the tang.

5. Fit the existing stud if serviceable, or a new stud.

6. After repair to either holes 'A' or holes 'B', lightly stamp T.R.268 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

T.R.268B

This repair may be applied without separating the diffuser casing and the rear cover and, since the stud holes concerned are comparatively inaccessible in the assembly, it will be necessary to use special tools. All drills called for in this repair must be not less than 6·00 inches long, to provide clearance between the drill chuck and the diffuser casing, while reaching through the diffuser casing and into the rear cover for the required depth.

SEQUENCE OF OPERATIONS

Holes 'A' (Fig. 2)

1. Drill the existing $\frac{5}{16}$ inch clearance hole in the diffuser casing 0·386 inch diameter down to the joint face of the casing, using a letter W drill 6·00 inches long.

2. Blow out any swarf and insert guide sleeve T.79166 in the hole.

3. Drill the defective $\frac{5}{16}$ inch B.S.F. hole in the rear cover 0·3230 inch diameter by 0·900 inch deep, using a letter P drill 6·00 inches long.

4. Remove the guide sleeve, blow out any swarf and, using taper tap T.79157 followed by plug tap T.79152 (both special taps with extended shanks) thread the hole in the rear cover 0·3727 inch diameter by 22 T.P.I. Whitworth thread form, to a depth of 0·775 inch from the joint face. Counterbore the rear cover 0·386 inch diameter by 0·025 inch deep from the joint face, using a letter W drill 6·00 inches long with the point ground flat.

5. Remove any burrs and sharp edges, blow out the hole with compressed air and check the thread with a John Bull small bore gauge used in conjunction with a $\frac{5}{16}$ inch (effective diameter) mandrel and ring screw gauge T.77363.

6. Using special inserting tool T.79163, screw in insert Part No. N.5041 and then break off and remove the tang.

7. Using special stud box T.79162, fit the existing stud if serviceable, or a new stud.

Holes 'B' (Fig. 2)

1. Drill the existing $\frac{3}{8}$ inch clearance hole in the diffuser casing 0·4531 inch diameter down to the joint face of the casing, using a $\frac{29}{64}$ inch diameter drill 6·00 inches long.

2. Blow out any swarf and insert guide sleeve T.79165 in the hole.

3. Drill the defective $\frac{3}{8}$ inch B.S.F. hole in the rear cover 0·386 inch diameter by 0·900 inch deep, using a letter W drill 6·00 inches long.

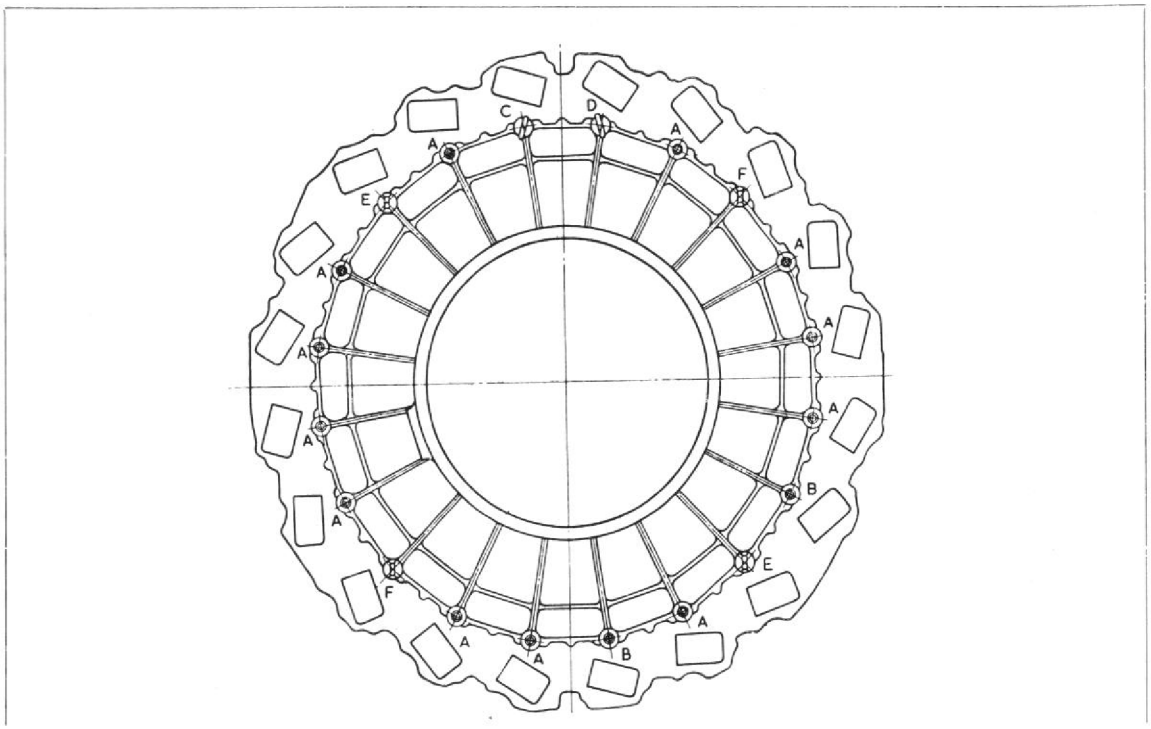
4. Remove the guide sleeve, blow out any swarf and, using taper tap T.79158 followed by plug tap T.79153 (both special taps with extended shanks) thread the hole in the rear cover 0·4410 inch diameter by 20 T.P.I. Whitworth thread form, to a depth of 0·775 inch from the joint face. Counterbore the rear cover 0·4531 inch diameter by 0·025 inch deep from the joint face, using a $\frac{29}{64}$ inch diameter drill 6·00 inches long with the point ground flat.

5. Remove any burrs and sharp edges, blow out the hole with compressed air and check the thread with a John Bull small bore gauge used in conjunction with a $\frac{3}{8}$ inch (effective diameter) mandrel and ring screw gauge T.77364.

6. Using special inserting tool T.79164, screw in insert Part No. N.4997 and then break off and remove the tang.

7. Using special stud box T.79161, fit the existing stud if serviceable, or a new stud.

8. After repair to either holes 'A' or holes 'B', lightly stamp T.R.268B adjacent to the existing part number and make an entry in the appropriate record book of the engine.



Dia. of holes in Inches	*Oversize Bolt 'A'*	*Prior to mod. 483 Oversize Bolt 'B'*	*Subsequent to mod. 483 Oversize Bolt 'B'*	*Oversize Bolt 'C'*	*Oversize Bolt 'D'*	*Ident. No.*
0·6300 + ·001	MR.29518-5	MR.29391-5	MR.29518-5	M.R.49203-5	MR.49204-5	T.R.250-1
0·6350 + ·001	MR.29518-10	MR.29391-10	MR.29518-10	M.R.49203-10	MR.49204-10	T.R.250-2
0·6400 + ·001	MR.29518-15	MR.29391-15	MR.29518-15	M.R.49203-15	MR.49204-15	T.R.250-3
0·6450 + ·001	MR.29518-20	MR.29391-20	MR.29518-20	M.R.49203-20	MR.49204-20	T.R.250-4

Dia. of holes in Inches	*Oversize Bolt 'E'*	*Oversize Bolt 'F'*	*Ident. No.*
0·8800 + ·001	MR.46104-5	MR.46105-5	TR.250-5
0·8850 + ·001	MR.46104-10	MR.46105-10	TR.250-6
0·8900 + ·001	MR.46104-15	MR.46105-15	TR.250-7
0·8950 + ·001	MR.46104-20	MR.46105-20	TR.250-8

REAR COVER, SECURING AND MOUNTING BOLTS
T.R. 250 issue 10—Mod. 311

This repair may be applied to all Ghost Forty-eight Mk 1 diffuser casings.

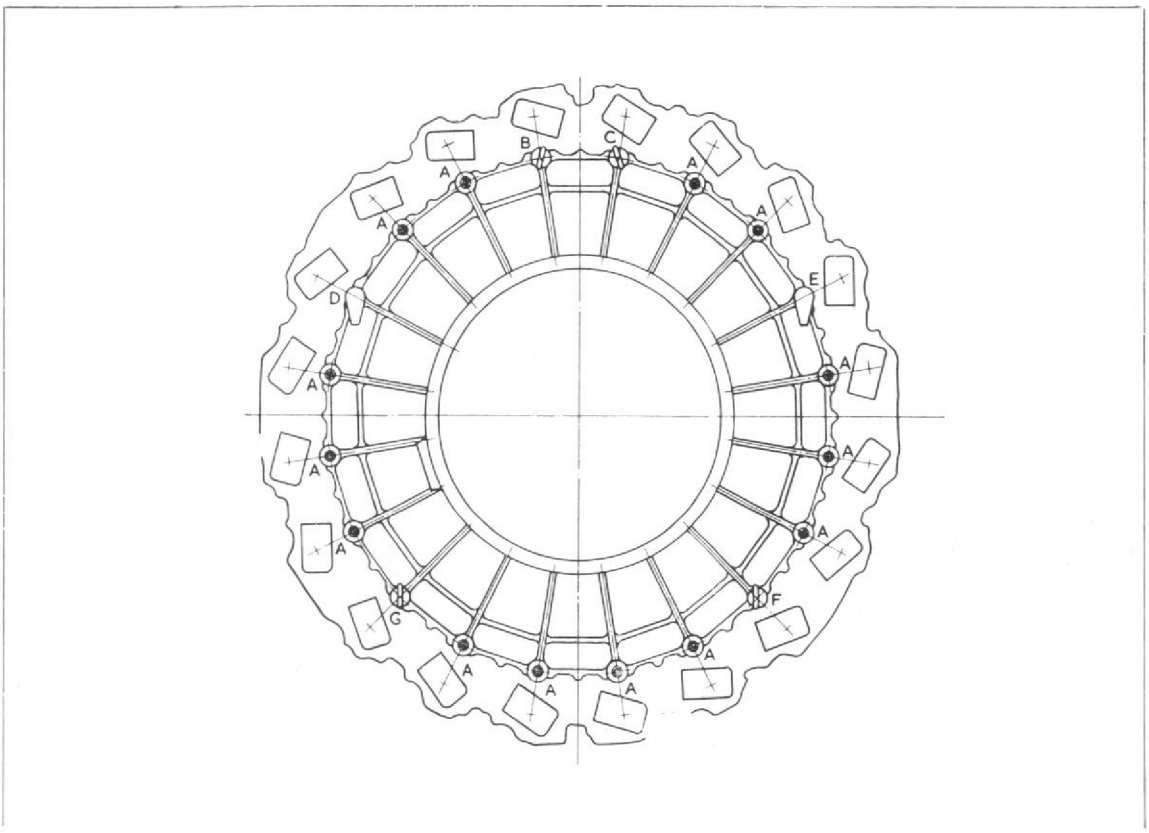
Diffuser casings and rear covers in which any of the securing or mounting bolt holes have become damaged, may be rectified in accordance with these instructions.

NOTE: Repair may only be applied to complete units comprising diffuser casing and rear cover and not to individual parts.

SEQUENCE OF OPERATIONS

1. Remove existing bolt from damaged hole.
2. Ream the hole to the smallest applicable diameter that will remove all traces of damage.
3. Fit appropriate oversize bolt specified in the table.
4. If necessary, fit oversize bolt dowel in accordance with T.R.227.
5. Blend protruding portion of bolt shank, until it is flush with surrounding surface of diffuser casing vane (see diffuser bolt fitting assembly drawing).
6. Remove the bolt; cadmium plate in accordance with D.H. Process Specification No. 106 and refit to modified hole.
7. If this repair has not been carried out previously, lightly stamp T.R.250 and the appropriate suffix adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

Revised by Amendment No. 131
February, 1957



Dia. of holes in inches	*Oversize Bolt 'A'*	*Oversize Bolt 'B'*	*Oversize Bolt 'C'*	*Identification No.*
0·6300 + ·001	MR.29518-5	MR.49203-5	MR.49204-5	T.R.308-1
0·6350 + ·001	MR.29518-10	MR.49203-10	MR.49204-10	T.R.308-2
0·6400 + ·001	MR.29518-15	MR.49203-15	MR.49204-15	T.R.308-3
0·6450 + ·001	MR.29518-20	MR.49203-20	MR.49204-20	T.R.308-4

Dia. of holes in inches	*Oversize Bolt 'D'*	*Oversize Bolt 'E'*	*Oversize Bolt 'F'*	*Oversize Bolt 'G'*	*Identification No.*
0·8800 + ·001	MR.95352-5	MR.95353-5	MR.95354-5	MR.95355-5	T.R.308-5
0·8850 + ·001	MR.95352-10	MR.95353-10	MR.95354-10	MR.95355-10	T.R.308-6
0·8900 + ·001	MR.95352-15	MR.95353-15	MR.95354-15	MR.95355-15	T.R.308-7
0 8950 + ·001	MR.95352-20	MR.95353-20	MR.95354-20	MR.95355-20	T.R.308-8

REAR COVER, SECURING AND MOUNTING BOLTS T.R. 308 issue 3—Mod. 751

This repair may be applied to all Ghost Forty-eight Mk. 2 diffuser casings.

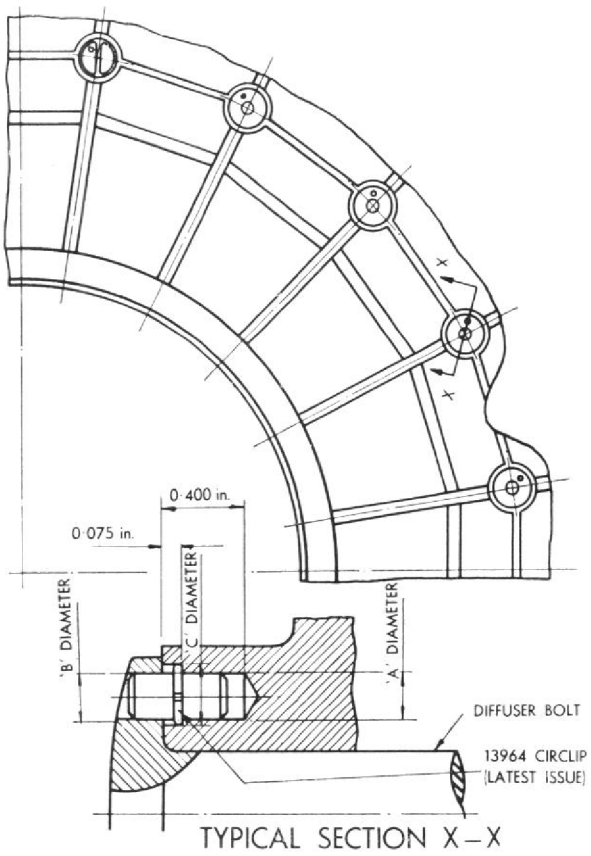
Diffuser casings and rear covers in which any of the securing or mounting bolt holes have become damaged, may be rectified in accordance with these instructions.

NOTE: Repair may only be applied to complete units comprising diffuser casing and rear cover and not to individual parts.

SEQUENCE OF OPERATIONS

1. Remove existing bolt from damaged hole.
2. Ream the hole to the smallest applicable diameter that will remove all traces of damage.
3. Fit appropriate oversize bolt specified in the table.
4. If necessary, fit oversize bolt dowel in accordance with T.R. 227.
5. Blend protruding portion of bolt shank until it it is flush with surrounding surface of diffuser casing vane (see diffuser bolt fitting assembly drawing).
6. Remove the bolt; cadmium plate in accordance with D.H. Process Specification No. 106 and refit to modified hole.
7. If this repair has not been carried out previously, lightly stamp T.R.250 and the appropriate suffix adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

Issued by Amendment No. 123
March, 1956



TYPICAL SECTION X–X

Diameter 'A' in Inches	*Diameter 'B' in Inches*	*Oversize Dowel Part No.*	*Oversize in Inches*	*Identification No.*
0·2535 + ·0005	0·2550 + ·0005	N.2456	0·005	TR 227-1
0·2585 + ·0005	0·2600 + ·0005	N.2457	0·010	TR 227-2
0·2635 + ·0005	0·2650 + ·0005	N.2474	0·015	TR 227-3
0·2685 + ·0005	0·2700 + ·0005	N.2475	0·020	TR 227-4

OVERSIZE DIFFUSER-BOLT DOWELS
T.R. 227 issue 6—Mod. 311

This repair may be applied to all Ghost diffuser casings and diffuser bolts.

Diffuser casings and diffuser bolts in which the dowels have become loose, or damaged, may be rectified in accordance with the following instructions.

SEQUENCE OF OPERATIONS

1. Remove the existing dowel complete with its circlip from the diffuser casing.
2. Fit the diffuser bolt and line ream the dowel hole to the smallest diameter 'A' that will remove the damage.
3. Open out the dowel hole in the diffuser bolt to the corresponding diameter 'B'.
4. Open out the counterbore diameter 'C' to 0·330 inch.
5. Fit a new circlip, Part No. 13964, to the appropriate oversize dowel.
6. Fit the oversize dowel complete with circlip into the diffuser casing.
7. Lightly stamp T.R.227 and the appropriate suffix on both components adjacent to the existing part number, and make an entry in the record book of the engine.

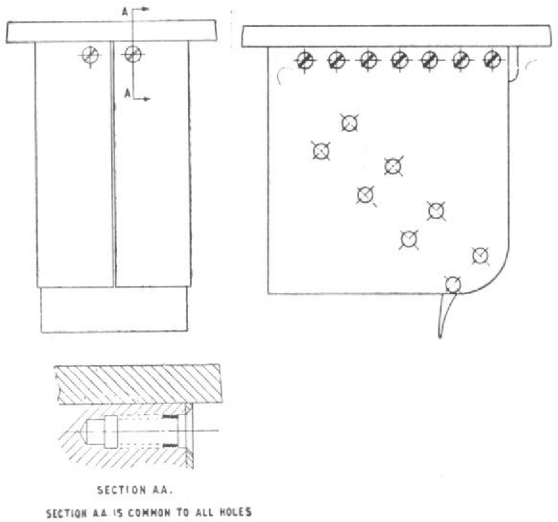
DEFLECTOR, DAMAGED SCREW HOLES
T.R. 322 issue 2—Mod. 900

This repair may be applied to all Ghost Forty-eight deflector assemblies, pre-mod. 843.

Deflectors in which any of the sixteen threaded screw holes in the cover have become damaged may be repaired in accordance with these instructions.

SEQUENCE OF OPERATIONS

1. If the screw is broken in the screw hole, assemble drill jig T.78080 to the deflector cover and locate with two locating pins T.78081. Fit drill bush T.78082 to the appropriate hole and, using a $\frac{1}{8}$ inch diameter drill, drill down the centre of the screw. Extract the screw, using an Easy-Out, and remove the drill jig.



2. Drill the defective hole 0·1935 inch diameter (No. 10 drill) by 0·786 inch deep (0·850 inch deep from deflector cover outer face).

3. Thread the hole 0·2252 inch diameter, 31·300 T.P.I., B.A. thread form, by 0·586 inch deep (0·650 inch deep from deflector cover outer face): effective diameter 0·2061 + ·0021 inch, minor diameter 0·1870 + ·0121 inch. Use taper tap T.77331 followed by plug tap T.77343 for this operation.

4. Clean the hole with a jet of compressed air and, using inserting tool T.77345, screw insert, Part No. N.4954, fully into the threaded hole. Break off and remove the tang.

5. Fit new screw, A.G.S.968-14. The head of the screw should be flush with the surrounding material of the deflector cover: it is permissible, however, for the screw head to be up to 0·010 inch below the surface. Lock the screw by peening metal into the screw slot, using a spherical-ended punch.

6. Lightly stamp T.R.322 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

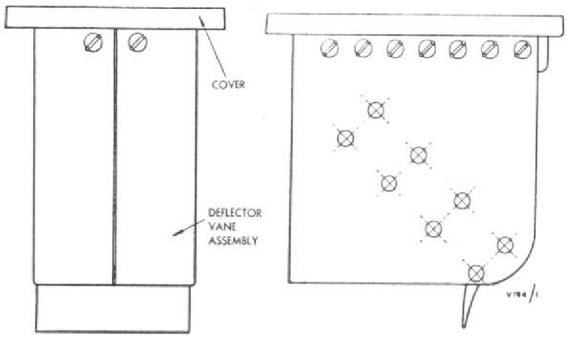
DEFLECTOR, CORROSION
T.R. 351 issue 4—Mod. 1043

This repair may be applied to all Ghost Forty-eight deflector assemblies, pre-mod. 843.

Deflectors which have become corroded may be repaired in accordance with these instructions.

SEQUENCE OF OPERATIONS

1. Remove the sixteen screws that secure the deflector vane and casing assembly to the cover, and withdraw the vane assembly. Alternatively, the magnesium alloy cover may be left in position, in which case, it must be suitably protected against the effects of blasting.



2. Shot blast the vane assembly with grade 60-80 grit at a maximum pressure of 20 pounds. Alternatively, the vapour blasting process may be used.

3. Inspect for evidence of residual rust in indentations, and if necessary, remove the rust by treating with deoxidine 125 or 175.

4. Wash the assembly in fresh water, immerse in de-watering oil 1LO No. 5 and then degrease.

5. Completely immerse the assembly—with or without the cover—in Rockhard lacquer 444/20 (viscosity 13/14 secs. in number 4 ford cup). Alternatively, lacquer 444/19 (viscosity 14/15 secs.) may be sprayed on, in which instance, the building-up of lacquer on the lower edges must be avoided.

6. Dry in air at room temperature for a period of not less than 15 minutes (important).

7. Stove at a temperature of 180 to 200 deg. C. for one hour.

8. Repeat operations 5, 6 and 7, and thus provide a second coat.

9. If the cover was removed, reassemble to the vane assembly; refit the sixteen screws and lock by centre-punching the heads.

10. Lightly stamp T.R.351 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

DEFLECTOR PORTS, REPAIR TO $\frac{1}{4}$ inch B.S.F. STUD HOLES T.R.315 issue 2—Mod. 900

Diffuser casings (Ghost 48 Mk. 1, 48 Mk. 2, or 53 Mk. 1) in which any of the $\frac{1}{4}$ inch B.S.F. stud holes in the deflector ports, Fig. 3, have become damaged beyond the scope of T.R.275, page 9, may be repaired in accordance with these instructions. This repair may be applied to any one hole, or to any number up to all forty holes.

The following tools will be required.

Tool No.	*Description*
T74107	Setting ring 0·252 in. dia.
T75048	Setting ring 1·125 in. dia.
Standard	0·290 in. dia. (letter L) drill
Standard	$\frac{19}{64}$ in. dia. reamer
Standard	$1\frac{1}{8}$ in. dia. facing cutter
Standard	$\frac{19}{64}$ in. dia. pilot for cutter
Standard	0·154 in. dia. (No. 23) drill
Standard	2 B.A. taper tap
Standard	2 B.A. plug tap
Standard	$\frac{3}{4}$ in. dia. countersink
Standard	John Bull Intercheck small bore gauge
Standard	John Bull small bore gauge Type SBY
Standard	Depth gauge

On receipt of the component which is to be repaired, its part number and serial number should be checked against the accompanying documents.

To carry out this repair proceed as follows.

1. With its rear face downwards, and resting on parallel blocks, mount the diffuser casing on the work table of a suitable radial drilling machine. Ensuring that the casing is not distorted in any way, securely clamp it to the table.

2. Use a 0·290 inch diameter (letter L) drill to drill through the defective stud hole.

3. Using a $\frac{19}{64}$ inch diameter reamer, ream through the hole to $\frac{19}{64}$ + ·0006 inch diameter.

4. Blow out the hole with compressed air to remove all traces of swarf, and check the diameter of the hole using a John Bull Intercheck small bore gauge in conjunction with setting ring T.74107.

5. Using a $1\frac{1}{8}$ inch diameter facing cutter, with a $\frac{19}{64}$ inch diameter pilot in the reamed hole, counterbore the flange face to a diameter of $1\frac{1}{8}$ + ·003 inch, and to a depth of 0·126 + ·003 inch.

6. Blow out the counterbore, and check its diameter using a John Bull small bore gauge Type SBY in conjunction with setting ring T.75048. Check the depth of the counterbore using a standard depth gauge.

7. Using a suitable $\frac{3}{4}$ inch diameter countersink, countersink the reamed hole to a 90 deg. included angle, and to a depth of $\frac{1}{32}$ inch.

8. Remove all burrs and sharp edges, and ensure that the face of the counterbore, and the underside of the flange of insert Part No. 600836, are perfectly clean, and free from any damage which might prevent their accurate seating.

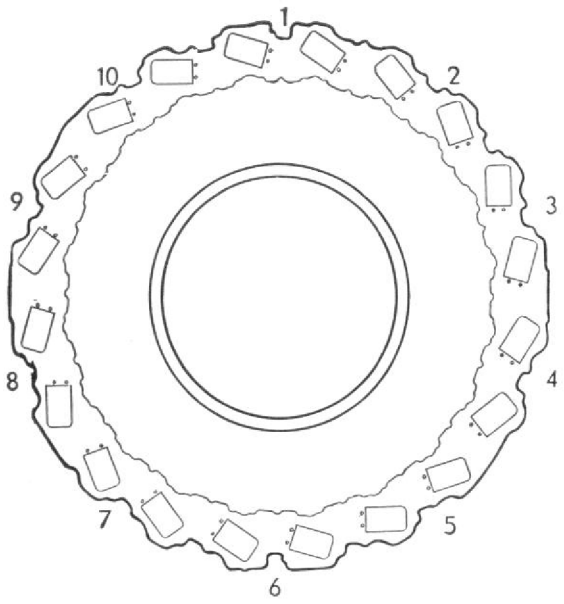


Fig. 3. Deflector port stud holes in diffuser casing.

9. Apply an approved jointing compound to the underside of the flange of the insert, and press the insert, flange uppermost, into the counterbore, so that the two countersunk holes in the insert are on the centre line A-A, Fig. 4.

10. Using the countersunk holes in the insert as a template, spot centre, and use a 0·154 inch diameter (No. 23) drill to drill two holes through the diffuser casing.

11. Using a 2 B.A. taper tap, followed by a 2 B.A. plug tap, thread through the two holes.

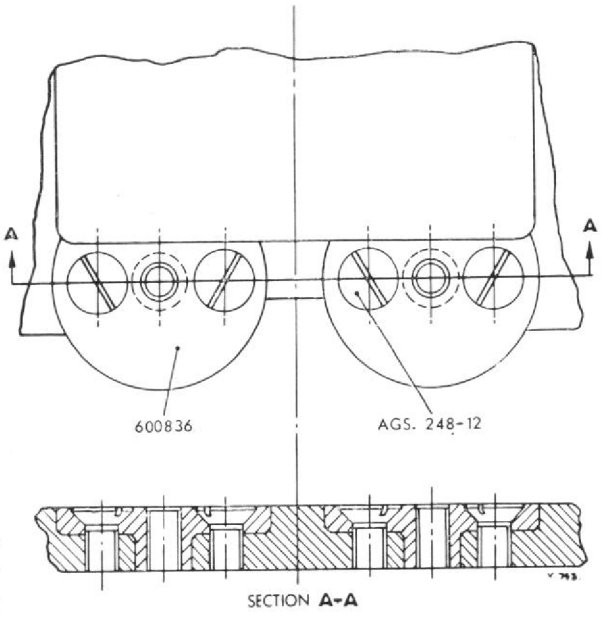


Fig. 4. Inserts and screws fitted to deflector port.

12. Blow out all swarf, and use two 2 B.A. countersunk screws AGS.248-12 to secure the insert, refer to Fig. 4.

13. Apply operations 2 to 12 to each one of the other stud holes which has to be repaired.

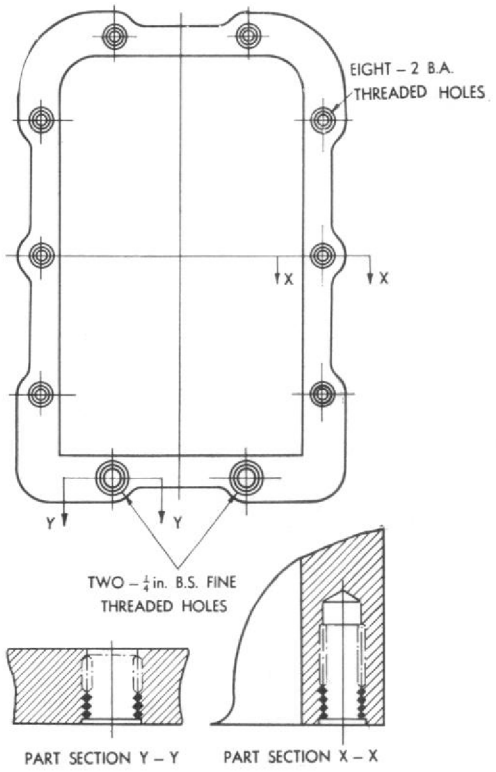
14. Any protrusion of the flanges of the inserts into the deflector apertures must be removed, and finished off flush; similarly, any protrusion of the flanges, or of the countersunk screws, above the joint faces of the deflector apertures must be cleaned up.

15. Fit a new 2 B.A. stud AGS.884-CC into each of the inserts which have been fitted.

16. Remove the diffuser casing from the drilling machine.

17. Clean off flush any portions of the countersunk screws, and of the fast ends of the studs, and of the insert bosses, which may protrude above the rear face of the casing.

18. If this is the first time that this repair has been applied, lightly stamp T.R.315 adjacent to the existing part number on the diffuser casing. Make the appropriate entry in the engine log book.



DEFLECTOR PORT STUD HOLES
T.R. 275 issue 7—Mod. 311

This repair may be applied to all Ghost diffuser casings.

Diffuser casings in which deflector port stud holes have become damaged may be repaired in accordance with these instructions.

2 B.A. holes

1. Remove the existing 2 B.A. stud from the hole affected.

2. Open out the hole to a diameter of 0·1935 inch (No. 10 drill) to a depth of 0·625 inch.

3. Thread the hole to a diameter of 0·2252 inch by 31·300 T.P.I. B.A. thread form to a depth of 0·525 inch. The thread effective diameter is to be 0·2061 + ·0021 inch, and the minor diameter 0·1870 + ·0121 inch. Counterbore the hole to a diameter of $\frac{15}{64}$ inch to a depth of 0·025 inch.

4. Screw in the wire insert Part No. N.5040 and break off and remove the tang.

5. Re-fit the original stud, if serviceable; if unserviceable, fit a new stud.

¼ in. B.S.F. holes

1. Remove the existing ¼ inch B.S.F. stud.

2. Drill the hole right through to a diameter of 0·257 inch (letter F drill).

3. Thread the hole to a diameter of 0·3012 inch by 26 T.P.I. Whitworth thread form to a depth of 0·350 inch. The effective diameter of the thread is to be 0·2766 + ·0020 inch, and the minor diameter 0·2520 + ·0117 inch. Counterbore the hole to a diameter of $\frac{5}{16}$ inch to a depth of 0·025 inch.

4. Screw in the wire insert Part No. N.4962 and break off and remove the tang.

5. Re-fit the original stud, if serviceable; if unserviceable, fit a new stud.

6. After either repair, lightly stamp T.R.275 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

Revised by Amendment No. 131
February, 1957

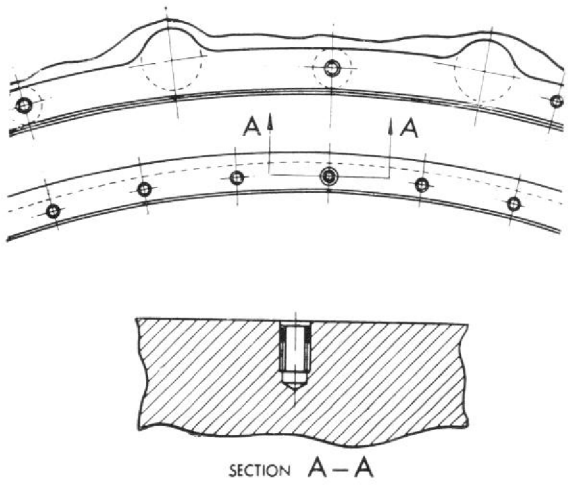
T.R.277

REAR COVER, $\frac{1}{4}$ inch B.S.F. HOLES

T.R. 277 issue 6—Mod. 311

This repair may be applied to all Ghost rear diffuser covers.

Diffuser casing rear covers in which any of the sixty $\frac{1}{4}$ inch B.S.F. holes have become damaged may be rectified in accordance with the instructions given below.



SEQUENCE OF OPERATIONS

1. Drill the hole to a diameter of 0·257 inch (letter F drill) to a depth of 0·600 inch.
2. Thread the hole to a diameter of 0·3012 inch by 26 T.P.I. Whitworth thread form to a depth of 0·525 inch. The thread effective diameter is to be 0·2766 + ·0020 inch and the minor diameter 0·2520 + ·0117 inch. Counterbore the hole to a diameter of $\frac{5}{16}$ inch to a depth of 0·025 inch.
3. Screw in the wire insert Part No. N.4968 and break off and remove the tang.
4. Re-fit the original stud if serviceable; if unserviceable, fit a new stud.
5. Lightly stamp T.R.277 adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

T.R.279

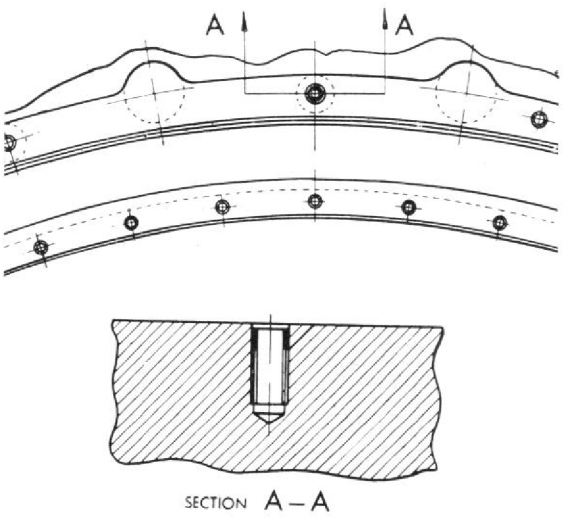
de Havilland
Ghost Forty-eight

REAR COVER, $\frac{5}{16}$ inch B.S.F. HOLES IN REAR FACE

T.R. 279 issue 6—Mod. 311

This repair may be applied to all Ghost rear diffuser covers.

Diffuser casing rear covers in which any of the twenty $\frac{5}{16}$ inch B.S.F. holes have become damaged may be repaired in accordance with the instructions given below.



SEQUENCE OF OPERATIONS

1. Drill the hole to a diameter of 0·323 inch (letter P drill) to a depth of 0·900 inch.
2. Thread the hole to a diameter of 0·3727 inch by 22 T.P.I. Whitworth thread form to a depth of 0·775 inch. The effective diameter of the thread is to be 0·3436 + ·0023 inch, and the minor diameter 0·3145 + ·0141 inch. Counterbore the hole to a diameter of 0·375 inch to a depth of 0·025 inch.
3. Screw in the wire insert Part No. N.5041 and break off and remove the tang.
4. Re-fit the original stud if serviceable; if unserviceable, fit a new stud.
5. Lightly stamp T.R.279 adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

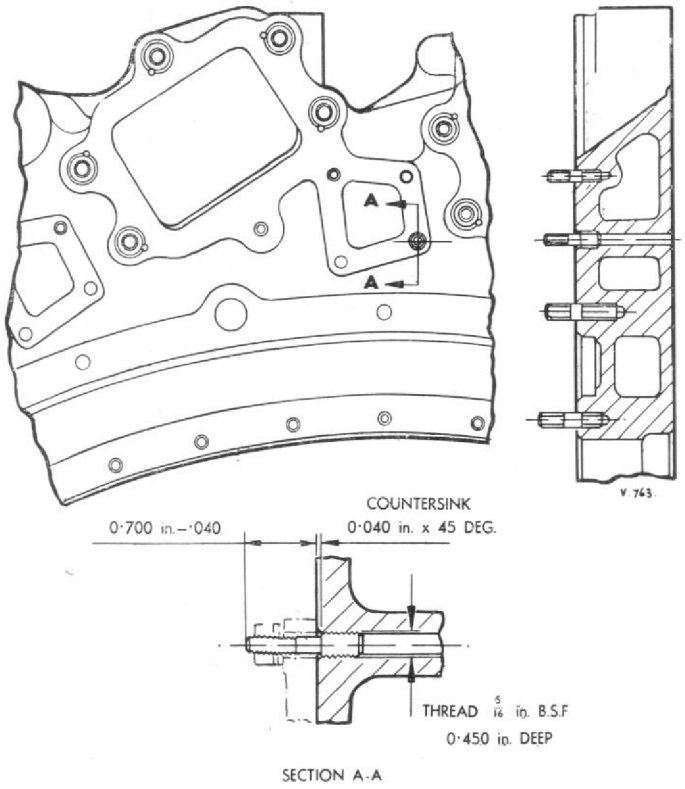


Fig. 5. Through-stud holes in diffuser casing rear cover.

REAR COVER, AIR ANNULUS COVER STUDS
T.R.313 issue 4—Mod. 751

Diffuser casings pre-mod. 507 (Ghost 48 Mk. 1 or 48 Mk. 2) in which alternate vanes each have one stud hole which is beyond repair within the scope of T.R.384, page 15, may be repaired by applying these instructions to the rear cover. This repair may be applied to one hole only in each alternate vane, up to a maximum of ten holes.

The following tools will be required.

Tool No.	*Description*
T77363	5/16 in. B.S.F. ring screw gauge
Standard	5/16 in. B.S.F. taper tap
Standard	5/16 in. B.S.F. plug tap
Standard	3/4 in. dia. countersink
Standard	John Bull Intercheck small bore gauge
Standard	John Bull 5/16 in. B.S.F. mandrel

On receipt of the component which is to be repaired, its part number and serial number should be checked against the accompanying documents.

To carry out this repair proceed as follows.

1. Place a chalk mark on the rear cover adjacent to each one of the through-stud holes, Fig. 5, which is aligned with a damaged stud hole in the diffuser casing.

2. With its centre-casing-joint face uppermost, mount the rear cover on parallel blocks on the work table of a suitable radial drilling machine. Ensuring that the rear cover is not distorted in any way, securely clamp it to the table.

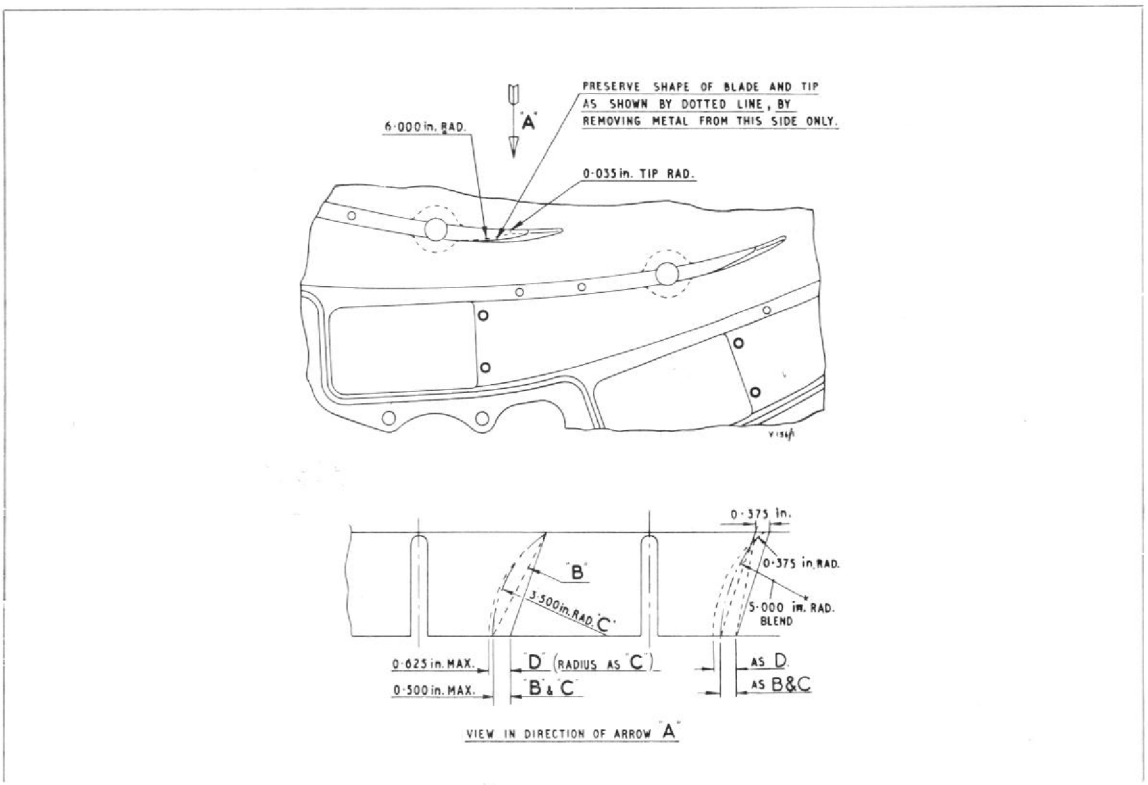
3. Taking each marked hole in turn, use a 5/16 inch B.S.F. taper tap, followed by a 5/16 inch B.S.F. plug tap, to thread the hole to a depth of 0·450 inch.

4. Using a suitable 3/4 inch diameter countersink, countersink the tapped hole to a 90 deg. included angle, and to a depth of 0·040 inch.

5. Remove any burrs from the edge of the hole, blow out the hole with compressed air to remove all traces of swarf, and check the thread, using a John Bull Intercheck small bore gauge in conjunction with a 5/16 inch B.S.F. mandrel and ring screw gauge T.77363.

6. Screw in step stud, Part No. N.941, to the bottom of the thread. Check that the length of the 2 B.A. portion of the stud, which stands out from the joint face of the cover, is within the limits shown in Fig. 5.

7. If this is the first time that this repair has been applied, lightly stamp T.R.313 adjacent to the existing part number on the rear cover. Make the appropriate entry in the engine log book.



DAMAGED DIFFUSER VANES
T.R. 338 issue 3—Mod. 900

This repair may be applied to all Ghost diffuser casings which do not embody mod. 1105.

Diffuser casing vanes which have become damaged may be repaired in accordance with these instructions. Any individual vane, or any required number up to all twenty vanes, may be rectified to repair 'B'. Repair 'C' may be applied to less than ten vanes, which can include one vane rectified to the limits at 'D', but no two adjacent vanes must be affected and no repair can be carried out on the remaining vanes.

Where repairs to the limits of 'B' and 'C' are insufficient to eradicate signs of damage, then as a final stage of repair, all the vanes may be cut back to the limits of 'C' and one vane repaired to the limits of 'D' may be included. Diffuser casings which cannot be repaired within these limits must be renewed.

SEQUENCE OF OPERATIONS

Repair 'B'

1. Scurf off the minimum amount of metal necessary to remove the damaged portion of the vane tip, tapering the blade from crest to root, as shown, using a rotary file with extension T.78261 and a Flextol unit. The maximum amount of metal which may be removed from the tip of the vane is 0·500 inch.
2. Remove metal from one side only of the vane, as shown, so as to preserve the shape of the vane. Maintain a 6·000 inch radius to the vane and a 0·035 inch radius at the tip. Use form gauge T.78264 to check.

Repair 'C'

1. Mark off the limits of repair, using scribing gauges T.78262, T.78263, T.78278 and T.78279 as required.
2. Scurf off the minimum amount of metal necessary to remove the damaged portion of the vane tip, maintaining a radius of 3·500 inch from root to crest, as shown, using a rotary file with extension T.78261 and a Flextol unit. The maximum amount of metal which may be removed from the tip of the vane is 0·500 inch (or 0·625 inch for repair limits 'D', which can be applied to one vane only).
3. Remove metal from one side only of the vane, as shown, so as to preserve the shape of the vane. Maintain a 6·000 inch radius to the vane and a 0·035 inch radius at the tip. Use form gauge T.78264 to check.

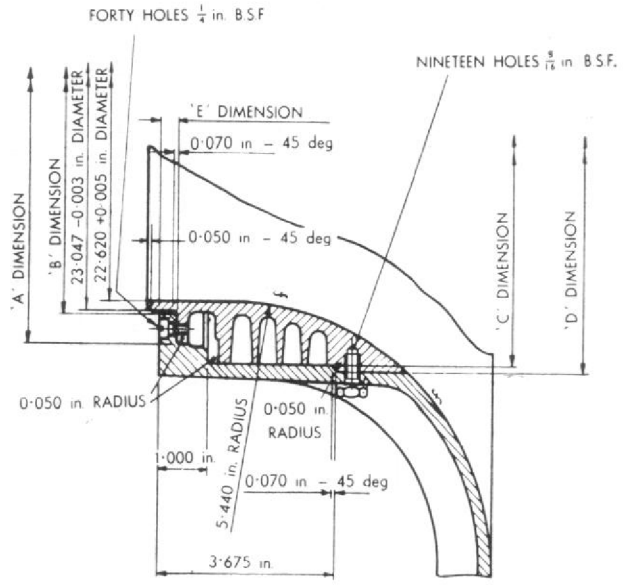
Repair to vane roots

The root of any one or more vanes may be cut back up to a maximum of 0·375 in. as shown. After cutting back, standard vanes, or vanes which have been rectified under repair B, should be tapered from the new root radius to the crest. Vanes which have been rectified under repair 'C' or 'D', and have had their roots cut back, should be blended with a 5·000 in. radius from their new root radius into the 3·500 in. radius.

Final stage of repair

Scurf off metal from all vanes as described in operations 1, 2 and 3 of repair 'C'.

On completion of repairs, lightly stamp T.R.338 adjacent to the existing part number and make an entry in the appropriate record book of the engine.



Oversize in inches	*Diameter 'A' in inches*	*Diameter 'B' in inches*	*Diameter 'C' in inches*	*Diameter 'D' in inches*	*Dimension 'E' in inches*	*Oversize Cooling-Ring Part No.*	*Identification No.*
0·005	24·3025 + ·002	23·105 + ·010	25·1025 + ·002	25·4025 + ·002	0·345	MR.45619-5	T.R.234-1
0·010	24·3075 + ·002	23·110 + ·010	25·1075 + ·002	25·4075 + ·002	0·340	MR.45619-10	T.R.234-2

OVERSIZE COOLING-RING INSERT
T.R. 234 issue 5—Mod. 751

This repair may be applied to all Ghost diffuser casings.

Diffuser casings having an unserviceable cooling-ring insert, may be rectified in accordance with these instructions.

SEQUENCE OF OPERATIONS

1. Remove nineteen bolts Part No. N.3336 and washers Part No. N.2906.

2. Remove forty screws Part No. 26786.

3. Remove the existing cooling-ring by machining the diffuser casing to the applicable dimensions given in the accompanying table.

4. Heat the diffuser casing in boiling water; cool the replacement cooling-ring to a temperature of minus 20 deg. C. and then assemble as shown in the sketch, ensuring that the ports in the cooling-ring align with those in the diffuser casing.

5. Machine to the dimensions shown in the sketch.

6. Drill nineteen holes in the cooling-ring, through from existing holes in diffuser casing 0·257 inch diameter (letter 'F' drill) by 0·725 inch deep; thread ⅝ inch B.S.F. by 0·625 inch deep; counterbore $\frac{21}{64}$ inch diameter by 0·250 inch deep.

7. Drill forty holes $\frac{13}{64}$ inch diameter right through cooling-ring from existing holes in diffuser casing; thread to ¼ inch B.S.F. right through.

8. Fit existing or new bolts, washers, and screws, Part Nos. N.3336, N.2906, and 26786 respectively.

9. Rockhard lacquer to D.H. Process Specification No. 199.

10. If this repair has not been carried out previously, lightly stamp T.R.234 adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

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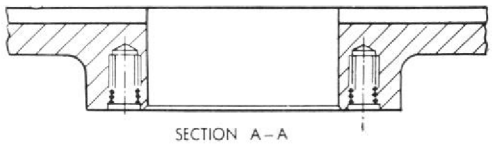
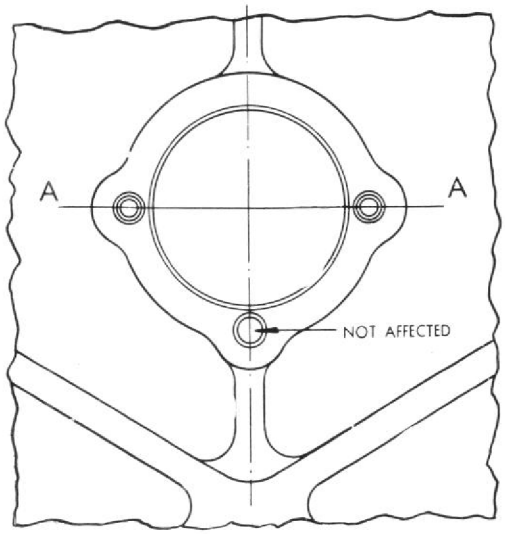
February, 1957





SEALING PLATE, INSPECTION COVER STUD HOLES
T.R. 299 issue 1—Mod. 751

This repair may be applied to Ghost Forty-eight sealing plates, Part No. 29352.

Sealing plates in which any of the two stud holes, indicated in section AA above, in each inspection location have become damaged, may be repaired in accordance with these instructions.

SEQUENCE OF OPERATIONS

1. Remove existing stud.
2. Drill the defective hole to a diameter of 0·257 inch (letter 'F' drill) by 0·600 inch deep.
3. Thread the hole to a diameter of 0·3012 inch by 26 T.P.I. Whitworth thread form to a depth of 0·550 inch. The effective diameter of the thread is to be 0·2766 + ·002 inch, and the minor diameter 0·252 + ·0117 inch. Counterbore the hole to a diameter of $\frac{7}{16}$ inch by 0·050 inch deep.
4. Screw in wire insert Part No. N.4968 and then break off and remove the tang.
5. Re-fit existing stud if serviceable, or a new stud if unserviceable.
6. Lightly stamp T.R.299 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

STUD HOLES IN DIFFUSER VANES
T.R.384 issue 1—Mod. 1114

This repair may be applied to all diffuser casings (Ghost 48 Mk. 1 or 48 Mk. 2) in which mod. 507 has not been embodied.

Diffuser casings pre-mod. 507 in which any of the 2 B.A. stud holes in the vanes, Fig. 6, have become damaged, may be repaired by fitting Cross wire inserts in accordance with these instructions. Reference must be made also to chapter 32, page 2, which specifies the tools required, and contains general information essential to this repair. Subject to the limitations described in the next paragraph, this repair may be applied to any one or more holes as required.

The damaged holes must be inspected for cracks, and for slight bulging of the sides of the vanes adjacent to the holes. No cracks are permissible, but bulging is permitted up to a maximum of 0·010 inch on one side of a vane, and up to a maximum of 0·015 inch across the full width of a vane. If these limits are exceeded, or if cracks exist,

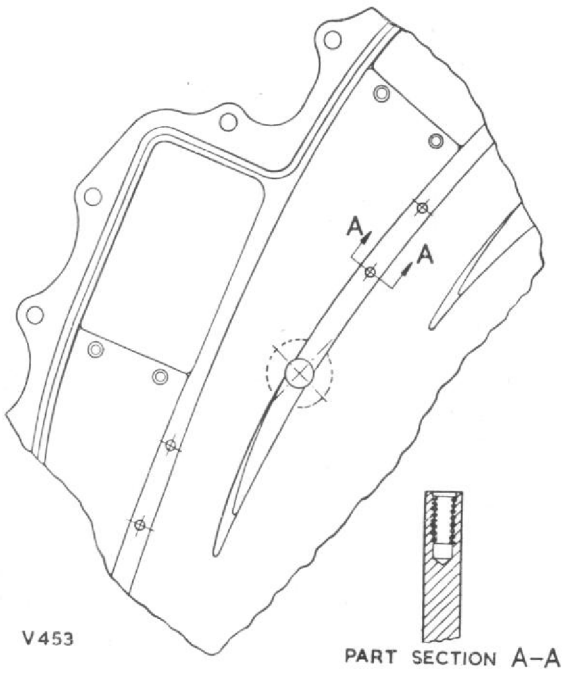


Fig. 6. 2 B.A. stud holes in diffuser casing.

but there is not more than one hole so damaged in each alternate vane, the component can be repaired as described in T.R.313, page 11. If, however, both stud holes in one vane are so damaged, or if adjacent vanes have one hole in each so damaged, the component must be renewed, as no further repair is permissible.

On receipt of the component which is to be repaired, its part number and serial number should be checked against the accompanying documents.

To carry out this repair proceed as follows.

1. With its rear face uppermost, mount the diffuser casing on parallel blocks on the work table of a suitable radial drilling machine. Ensuring that the casing is not distorted in any way, securely clamp it to the table.

2. Using a 0·1935 inch diameter (No. 10) drill, drill out the defective hole to a depth of 0·650 inch.

3. Use a $\frac{15}{64}$ inch diameter flat-bottom drill to counterbore the hole to a depth of 0·025 inch.

4. Blow out the hole with compressed air to remove all traces of swarf, and using the appropriate taper, and plug taps, thread the hole to 0·2252 inch diameter by 31·300 T.P.I., B.A. thread form, and to a depth of 0·525 inch.

5. Remove any burrs from the edge of the tapped hole, blow out the hole and, using the appropriate inserting tool, screw in wire insert Part No. N.5040 to the bottom of the thread. Break off, and remove, the notched tang of the insert.

6. Apply operations 2 to 5 to each one of the other stud holes which has to be repaired.

7. Fit a new stud Part No. N.3509 into each one of the holes which has been repaired.

8. Any resultant bulging on the sides of the vanes must be checked to ensure that it does not exceed the limits quoted. Should these limits be exceeded around any hole, that hole must be regarded as beyond repair, and the diffuser casing must be inspected again, to ascertain whether the limitations described will allow of further repair.

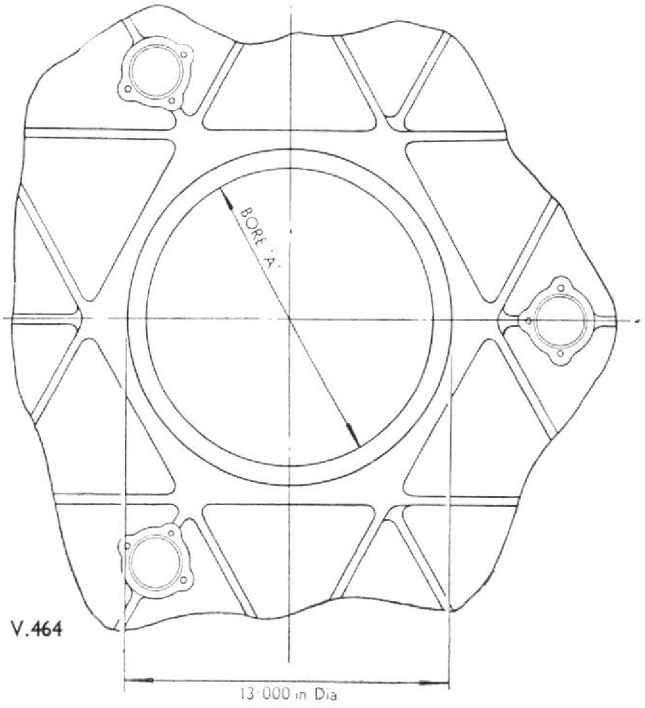
9. If this is the first time that this repair has been applied, lightly stamp T.R.384 adjacent to the existing part number on the diffuser casing. Make the appropriate entry in the engine log book.

SEALING PLATE, CRACKED BORE
T.R. 380 issue 1—Mod. 1114

This repair may be applied to all Ghost Forty-eight sealing plates.

Sealing plates which have developed cracks around the flange of the bore may be repaired by machining bore 'A' (see sketch overleaf) to 13·000 inches diameter.

On completion of this repair, T.R.380 must be lightly stamped adjacent to the existing part number and an entry must be made in the appropriate record book of the engine.



Sketch for T.R. 380

Diffuser casings in which any of the $\frac{1}{4}$ in. B.S.F. holes in the firewall face have become damaged may be rectified in accordance with the instructions given below.

SEQUENCE OF OPERATIONS

1. Drill the affected hole to a diameter of 0·257 inch (letter F drill) to a depth of 0·700 inch.

2. Thread the hole to a diameter of 0·3012 inch by 26 T.P.I. Whitworth thread form to a depth of 0·650 inch. The effective diameter of the thread is to be 0·2766 + ·0020 inch, and the minor diameter 0·2520 + ·0117 inch. Counterbore the hole to a diameter of $\frac{5}{16}$ inch to a depth of 0·050 inch.

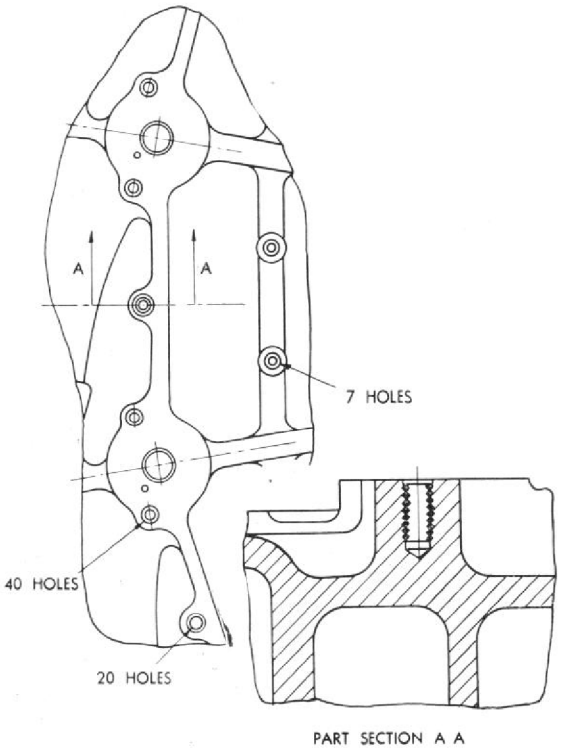
3. Screw in the wire insert Part No. N.4978 and break off and remove the tang.

4. Re-fit the original stud if serviceable, if unserviceable fit a new stud.

5. Lightly stamp T.R.282 adjacent to the existing part number. Make an entry in the appropriate record book of the engine.

DIFFUSER CASING STUD HOLES
T.R. 281 issue 7—Mod. 311

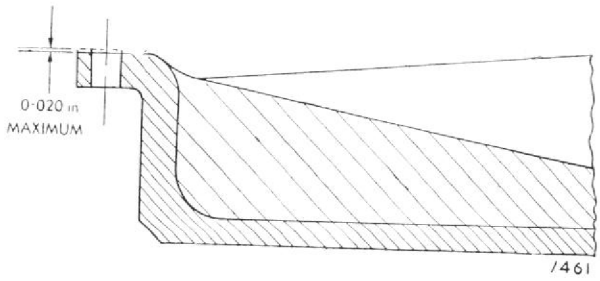
This repair may be applied to all Ghost Forty-eight diffuser casings.



SEALING PLATE, DAMAGED FACE
T.R. 374 issue 2—Mod. 1114

This repair may be applied to all Ghost Forty-eight sealing plates, pre-mod. 897.

Sealing plates on which the use of plain washers has resulted in damage to the face of the metal, may be repaired in accordance with these instructions.



The procedure is to machine off up to 0·020 inch from the damaged face, provided that a minimum flange thickness of 0·350 inch is maintained.

On completion of the repair, lightly stamp T.R.374 adjacent to the existing part number and make an entry in the appropriate record book of the engine.

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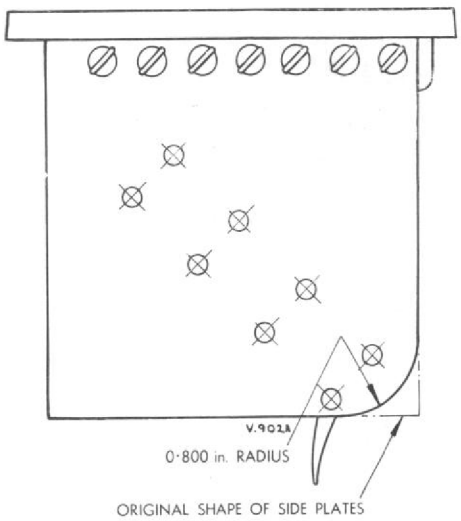
February, 1957



DEFLECTOR, SIDE PLATES
T.R.371 issue 1—Mod. 1078

For Information Only

If the number T.R.371 is found on a Ghost 48 Mk. 1, or 48 Mk. 2 deflector, adjacent to the existing part number, this indicates that the deflector side plates have been radiused on the corners shown, to prevent a tendency to failure.

This does not affect the interchangeability of the component nor does it affect its dismantling, inspection, repair, or reassembly.

FITTING OF NEW DIFFUSER CASING AND REAR COVER
T.R.366 issue 2—Mod. 845

For Information Only

If the number T.R.366B is found on a Ghost 48 Mk. 1 diffuser casing, and on its mating rear cover, adjacent to the existing part numbers, this indicates that the diffuser casing has been renewed. Similarly, if the number T.R.366A is marked adjacent to the existing part numbers, then the rear cover has been renewed.

This does not affect dismantling, repair or re-assembly.

The second part of this repair (the fitting of a new rear cover), may be undertaken by operators who have sufficiently skilled personnel and adequate workshop facilities.

Before attempting this repair, however, operators should consult the Service Department of The de Havilland Engine Company Limited, at the address given in the Foreword to this Handbook.

DIFFUSER CASING
T.R.415 issue 3—Mod. 1337

For Information Only

If the number T.R.415 is found on a diffuser casing, this indicates that this diffuser casing was originally manufactured for Ghost 50, and has been modified to suit the Ghost 48 Mk. 1.