TO: ALL HOLDERS OF TURBINE EXHAUST PLUG ASSEMBLY (CF6-80C2 & PW4000 ENGINES)
COMPONENT MAINTENANCE MANUAL 78-11-15

REVISION NO. 5 DATED NOV 01/05

HIGHLIGHTS

Pages which have been added or revised are outlined below together with the highlights of the revision. Remove and insert the affected pages as listed and enter Revision No. and date on the Record of Revision Sheet.

CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
REPAIR-GEN	Added solid skin weld details.
602	
REPAIR 1-1	
601-602	

COMPONENT
MAINTENANCE MANUAL

TURBINE EXHAUST PLUG ASSEMBLY (CF6-80C2 & PW4000 ENGINES)

PART NUMBERS 314U2200-10,-23,-31
314T4320-1,-11,-13,-19

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

265606

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REVISION RECORD

- Retain this record in front of manual. On receipt of revision, insert revised pages in the manual, and enter revision number, date inserted and initial.

REVISION NUMBER	REVISION DATE	DATE FILED	BY	REVISION NUMBER	REVISION DATE	DATE FILED	BY

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TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR B11480-28	APR 01/88

PAGE	DATE	CODE
78-11-15		
TITLE PAGE		
1	JUL 01/03	01.1
2	BLANK	
REVISION RECORD		
1	JUL 10/87	01
2	BLANK	
TR & SB RECORD		
1	APR 01/88	01.1
2	BLANK	
LIST OF EFFECTIVE PAGES		
*1	NOV 01/05	01
THRU LAST PAGE		
CONTENTS		
1	JUL 10/87	01
2	BLANK	
INTRODUCTION		
1	JUL 10/87	01
2	BLANK	
DESCRIPTION & OPERATION		
1	APR 01/88	01.1
2	BLANK	
DISASSEMBLY		
301	JUN 01/95	01.1
302	BLANK	
CLEANING		
401	JUL 10/87	01
402	BLANK	
CHECK		
501	MAR 01/99	01.1
502	BLANK	

PAGE	DATE	CODE
REPAIR-GENERAL		
601	JUL 01/03	01.1
*602	NOV 01/05	01.1
603	JUN 01/95	01.1
604	BLANK	
REPAIR 1-1		
*601	NOV 01/05	01.1
*602	NOV 01/05	01.1
603	JUL 10/87	01
604	JUL 10/87	01
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607	JUL 10/87	01
608	JUL 10/87	01
609	JUL 10/87	01
610	JUL 01/03	01.1
611	JUL 10/87	01
612	JUL 10/87	01
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624	JUL 10/87	01
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626	JUL 10/87	01
627	JUL 10/87	01
628	JUL 10/87	01
629	JUL 10/87	01
630	JUL 10/87	01
631	JUL 01/03	01.1
632	JUL 01/03	01.1

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PAGE	DATE	CODE
REPAIR 2-1		
601	JUL 01/03	01.1
602	JUL 10/87	01
ILLUSTRATED PARTS LIST		
1001	JUL 10/87	01
1002	JUL 01/03	01.1
1003	JUL 01/03	01.1
1004	JUL 01/03	01.1
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1008	JUL 01/03	01.1
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1011	JUL 01/03	01.1
1012	BLANK	

PAGE	DATE	CODE

* = REVISED, ADDED OR DELETED

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TABLE OF CONTENTS

*[1] Special instructions not required. Use standard industry practices.

INTRODUCTION

The instructions in this manual provide the information necessary to perform maintenance functions ranging from simple checks and replacement to complete shop-type repair.

This manual is divided into separate sections:

1. Title Page
2. Record of Revisions
3. Temporary Revision & Service Bulletin Record
4. List of Effective Pages
5. Table of Contents
6. Introduction
7. Procedures & IPL Sections

Refer to the Table of Contents for the page location of applicable sections. An asterisked flagnote *[ ] in place of the page number indicates that no special instructions are provided since the function can be performed using standard industry practices.

The beginning of the REPAIR section includes a list of the separate repairs, a list of applicable standard Boeing practices, and an explanation of the True Position Dimensioning symbols used.

An explanation of the use of the Illustrated Parts List is provided in the Introduction to that section.

All weights and measurements used in the manual are in English units, unless otherwise stated. When metric equivalents are given they will be in parentheses following the English units.

Design changes, optional parts, configuration differences and Service Bulletin modifications create alternate part numbers. These are identified in the Illustrated Parts List (IPL) by adding an alphabetical character to the basic item number. The resulting item number is called an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless otherwise indicated.

TURBINE EXHAUST PLUG ASSEMBLY
(CF6-80C2 AND PW4000 ENGINES)

DESCRIPTION AND OPERATION

1. Description

   A. The CF6-80C2 turbine exhaust plug assembly is a welded Inconel 625 conical structure consisting of tail ring, forward and aft cones, engine attach ring, and 12 seal assemblies with mounting holes.

   B. The PW4000 turbine exhaust plug assembly consists of a conical weld assembly made from PH15-7M0 CRES sheet and three TRE 3300 honeycomb acoustic panels, with a number seal assemblies with mounting holes.

2. Operation

   A. The turbine exhaust plug assembly together with the primary exhaust sleeve assembly is used to control primary exhaust nozzle area and establish smooth expansion of the power plant exhaust gas.

3. Leading Particulars (approximate)

   A. 314U2200 (CF6-80C2 engine)

      Length -- 59 inches
      Diameter -- 3-29 inches
      Weight -- 46.5 pounds

   B. 314T4320 (PW4000 engine)

      Length -- 47 inches
      Diameter -- 3-32 inches
      Weight -- 46.3 pounds

DISASSEMBLY

1. Use standard industry practices to disassemble this component only as necessary to complete fault isolation, determine the serviceability of parts, perform required repairs, and restore the unit to serviceable condition.

CLEANING

1. PW4000 Plug Assembly - 314T4320

   A. Remove dry flaking contaminants with compressed air operated vacuum.

   B. Spray waterbase alkaline cleaning solution, 1 volume Kelite 28 mixed with 4 volumes water or an equivalent solution per 20-30-03, at 300 psi and 120°F for approximately 2 minutes.

   C. Rinse unit with warm water (approximately 150°F) for 10-15 minutes.

   D. Dry in warm air (approximately 150°F) for 30 minutes.

   CAUTION: TO PREVENT HONEYCOMB CELL CONTAMINATION, DO NOT FILL CELLS WITH SOLUTION UNLESS PART IS RINSED AND DRIED PER STEPS C AND D.

   E. Fill honeycomb cells with cleaning solution by immersing unit in clean solution for 20-30 minutes.

   F. Repeat steps C. and D.

   G. Remove remaining contaminants by swabbing with cleaning solvent, BMS 11-7, and immersing unit in same solvent for 5 minutes.

   H. Repeat steps C. and D.

2. CF6-80C2 Plug Assembly - 314U2200

   A. Special instructions not required. Use standard industry practices.

CHECK

1. Check all parts for obvious defects in accordance with standard industry practices.

2. Check plug assemblies (1, 5 IPL Fig. 1) for dents, nicks, and pitting.

3. Check perforated honeycomb panel section of plug assembly (5) for contour defects, cuts, holes, punctures, cracks, and skin to core delaminations. Delamination can be detected by tapping skin with coin edge or similar object, a change in tone will be noted over delaminated area.

4. Penetrant check plug assemblies (1, 5 IPL Fig. 1) per 20-20-02. On perforated honeycomb panel section, use swab method rather than immersion, this will keep absorbtion of penetrant developer in honeycomb cells to a minimum. Clean plug assemblies after penetrant check per instructions listed in cleaning section.

5. Refer to 767 Structural Repair Manual, 54-42-30 and 54-43-30; 747-400 structural repair manual, 54-40-30 and 54-41-30 for allowable damage and repair data.

REPAIR - GENERAL

1. Contents

A. Repair, refinish and replacement procedures are included in separate repair sections as follows:

P/N	NAME	REPAIR
314T4320	PLUG ASSEMBLY	1-1
314U2200	PLUG ASSEMBLY	2-1

2. Standard Practices and References

A. Refer to the following practices and references, as applicable, for details of procedures in the individual repair.

(1) Standard Practices

SOPM 20-20-02 Penetrant Methods of Inspection
SOPM 20-30-03 General Cleaning Procedures

(2) References

BAC5919 Boeing Process Specification for Radiographic Inspection
BAC5975 Boeing Process Specification for Fusion Welding of Metals

3. Materials

NOTE: Equivalent substitutes may be used.

A. Abrasive Paper -- Silicon-Carbide, 240 grit

B. Abrasive Fabric -- Scotch-Brite, Type S (SOPM 20-60-04)

C. Solvent - O-A-51, or J15-K-1503, Grade 1 (Acetone) (SOPM 20-60-01)

D. Solvent -- TT-M-261, or JIS-K-1524 (MEK) (SOPM 20-60-01)

E. Solvent -- TT-M-268, or JIS-K-8903 (MIBK) (SOPM 20-60-01)

F. Solvent -- Alkaline cleaner, Kelite 28 (SOPM 20-60-01)

G. Tape -- Masking (SOPM 20-60-04)

H. Weld Filler Wire -- WPH 15-7MO

I. Weld Filler Wire -- Inconel 625 (BMS 7-38, Type 7)

J. Compound -- Rust protective, Rust Veto 377 (SOPM 20-60-03)

K. Weld Filler Wire -- PH13-8Mo (AMS 5840)

4. Dimensioning Symbols

A. Standard True Position Dimensioning Symbols used in applicable repair procedures are shown in Fig. 601.

—	STRAIGHTNESS
▱	FLATNESS
⊥	PERPENDICULARITY (OR SQUARENESS)
//	PARALLELISM
○	ROUNDNESS
⌭	CYLINDRICITY
⌒	PROFILE OF A LINE
⌓	PROFILE OF A SURFACE
◎	CONCENTRICITY
≡	SYMMETRY
∠	ANGULARITY
↗	RUNOUT
↗↗	TOTAL RUNOUT
⌴	COUNTERBORE OR SPOTFACE
∨	COUNTERSINK
⌖	THEORETICAL EXACT POSITION OF A FEATURE (TRUE POSITION)
∅	DIAMETER
S ∅	SPHERICAL DIAMETER
R	RADIUS
SR	SPHERICAL RADIUS
()	REFERENCE
BASIC (BSC) OR [DIM]	A THEORETICALLY EXACT DIMENSION USED TO DESCRIBE SIZE, SHAPE OR LOCATION OF A FEATURE FROM WHICH PERMISSIBLE VARIATIONS ARE ESTABLISHED BY TOLERANCES ON OTHER DIMENSIONS OR NOTES.
[-A-]	DATUM
Ⓜ	MAXIMUM MATERIAL CONDITION (MMC)
Ⓛ	LEAST MATERIAL CONDITION (LMC)
Ⓢ	REGARDLESS OF FEATURE SIZE (RFS)
Ⓟ	PROJECTED TOLERANCE ZONE
FIM	FULL INDICATOR MOVEMENT

EXAMPLES

— | 0.002	STRAIGHT WITHIN 0.002
⊥ | 0.002 | B	PERPENDICULAR TO B WITHIN 0.002
// | 0.002 | A	PARALLEL TO A WITHIN 0.002
○ | 0.002	ROUND WITHIN 0.002
⌭ | 0.010	CYLINDRICAL SURFACE MUST LIE BETWEEN TWO CONCENTRIC CYLINDERS, ONE OF WHICH HAS A RADIUS 0.010 INCH GREATER THAN THE OTHER
⌒ | 0.006 | A	EACH LINE ELEMENT OF THE SURFACE AT ANY CROSS SECTION MUST LIE BETWEEN TWO PROFILE BOUNDARIES 0.006 INCH APART RELATIVE TO DATUM PLANE A
⌓ | 0.020 | A	SURFACES MUST LIE WITHIN PARALLEL BOUNDARIES 0.02 INCH APART AND EQUALLY DISPOSED ABOUT TRUE PROFILE
◎ ∅ 0.0005 | C	CONCENTRIC TO C WITHIN 0.0005 DIAMETER
≡ | 0.010 | A	SYMMETRICAL WITH A WITHIN 0.010
∠ | 0.005 | A	ANGULAR TOLERANCE 0.005 WITH A
⌖ ∅ 0.002 Ⓢ | B	LOCATED AT TRUE POSITION WITHIN 0.002 DIA RELATIVE TO DATUM B, REGARDLESS OF FEATURE SIZE
⊥ ∅ 0.010 Ⓜ | A 0.510 Ⓟ	AXIS IS TOTALLY WITHIN A CYLINDER OF 0.010-INCH DIAMETER, PERPENDICULAR TO, AND EXTENDING 0.510-INCH ABOVE, DATUM A, MAXIMUM MATERIAL CONDITION
[2.000] OR 2.000 BSC	THEORETICALLY EXACT DIMENSION IS 2.000

NOTE: DATUM MAY APPEAR AT EITHER SIDE OF TOLERANCE FRAME

0.020 | A

A | 0.020

True Position Dimensioning Symbols
Figure 601

TURBINE EXHAUST PLUG ASSEMBLY - REPAIR 1-1

314T4320-1, -11, -13, -19

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. General Weld Repair Procedures

A. All repair welds must be performed by a highly skilled welder.

B. Solvent clean.

C. Bake out the part before welding at 350F for 2 hours.

D. Fusion weld per BAC 5975 using PH13-8Mo filler metal per AMS 5840.

E. All repair welds must be accomplished using manual gas tungsten arc weld process (GTAW) or (TIG) using argon gas shielding.

F. Lengths of filler wire to be used shall be cleaned by wiping with MIBK, MEK, or acetone.

G. Oxidized filler wire ends from previous use shall be cut off and discarded.

H. Age only at 1075 to 1100F for 90 minutes.

I. Weld Operation

(1) Locate chill blocks as required.

(2) Use minimum amount of filler metal that will provide minimum size weld bead consistent with full weld penetration.

(3) Use minimum weld energy input.

NOTE: Use scrap pieces of material for trial test if available. Excessive amounts of weld filler metal or excessive weld energy input (including excessive number of weld passes) can cause large areas of overheating, skin burn through, panel distortion, and large areas of annealing, or dimpling.

CAUTION: CARE MUST BE EXERCISED WHEN WELDING TURBINE NOZZLE EXHAUST PLUG SKINS BECAUSE OF THIN SKIN GAGE (0.012-0.028 INCH). STRIKING ARC ON CHILL BLOCKS INSTEAD OF SKINS IS RECOMMENDED.

(4) Fill weld crack stop holes or perforated holes in acoustic skin which intersect with repair joint or which will intersect with weld bead before making continuous joint (crack) weld.

(5) Tack weld to hold skin alignment if required; then weld as a continuous weld pass to complete required weld.

(6) Make full penetration (100%) butt weld.

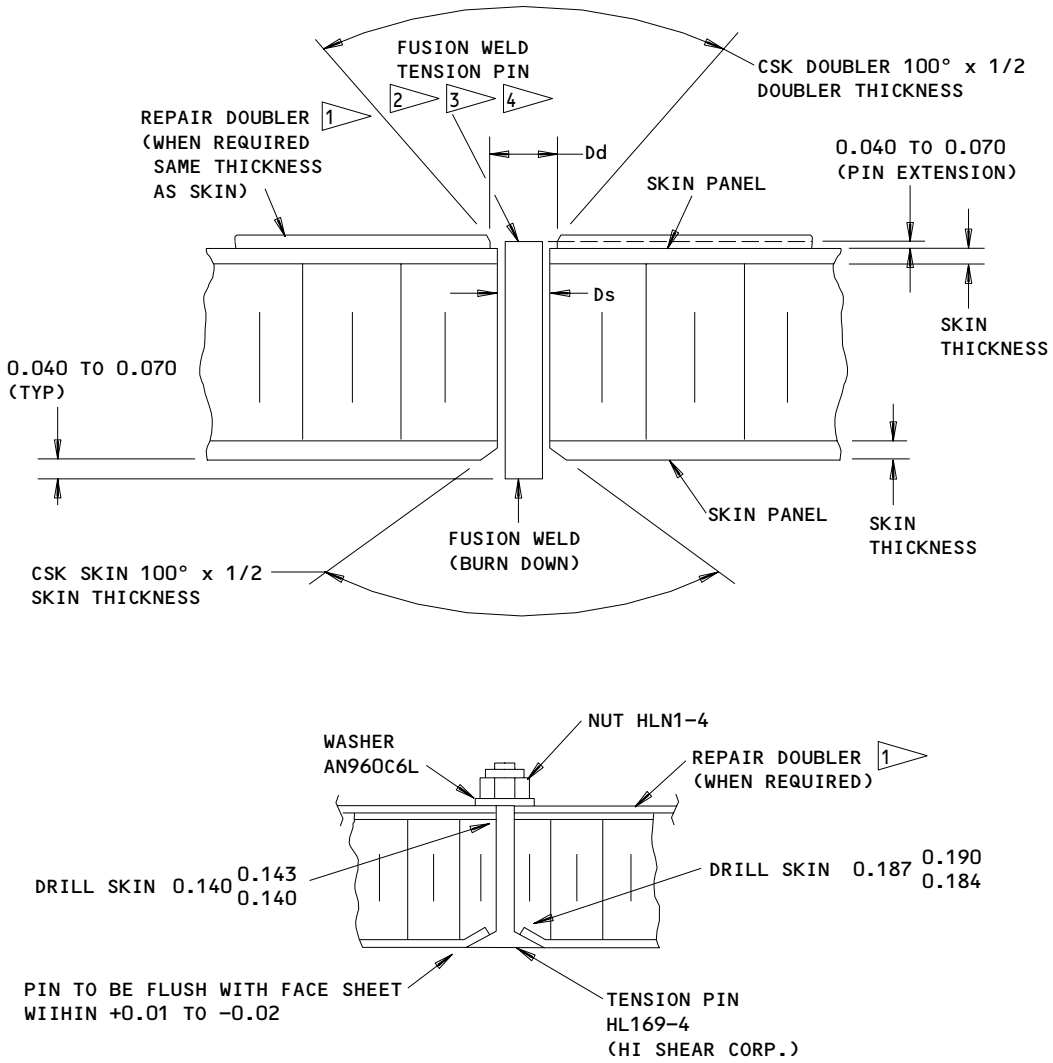
(7) Grind surface flush within .020 inches, surface finish to 32 microinches RA. Do not grind into base metal.

(8) Break sharp edges per BAC5300, 0.030 inch minimum.

(9) Magnetic particle inspect per BAC5424 to verify complete repair of all damages.

(10) Install weld plug or tension pins per Fig. 601.

(11) After weld repair has been determined to be acceptable, weld shut any purge hole that has been drilled.



ALTERNATIVE
(USE WHEN NOT ACCESSIBLE TO WELD)

LEGEND:

Dd (DIAMETER OF HOLE IN DOUBLER): 0.100 TO 0.110 INCH
Ds (DIAMETER OF HOLE THROUGH SKIN PANELS): 0.050 TO 0.054

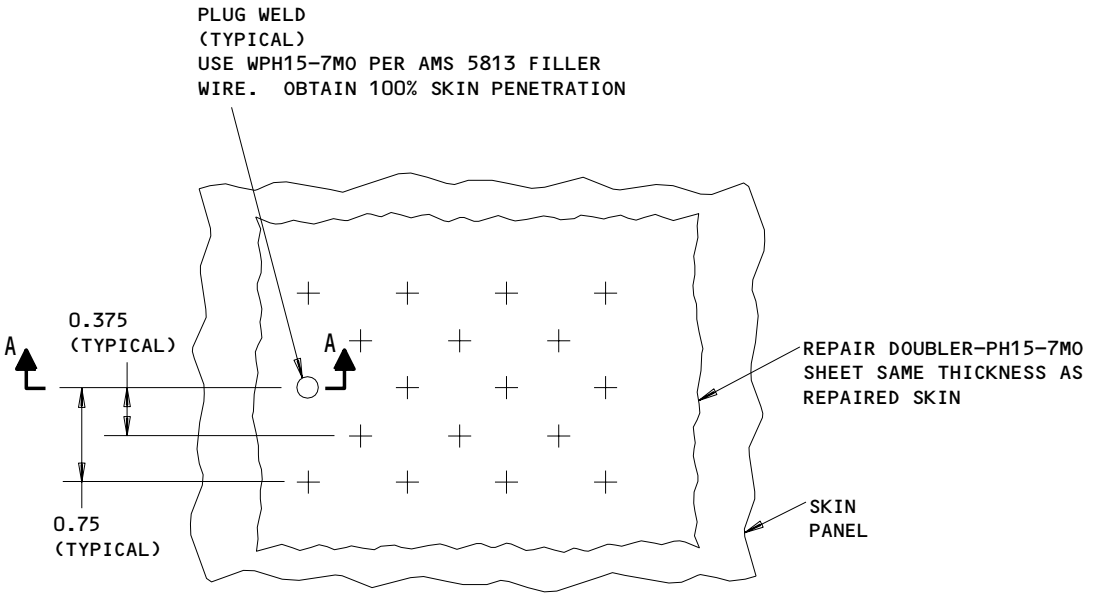
NOTES

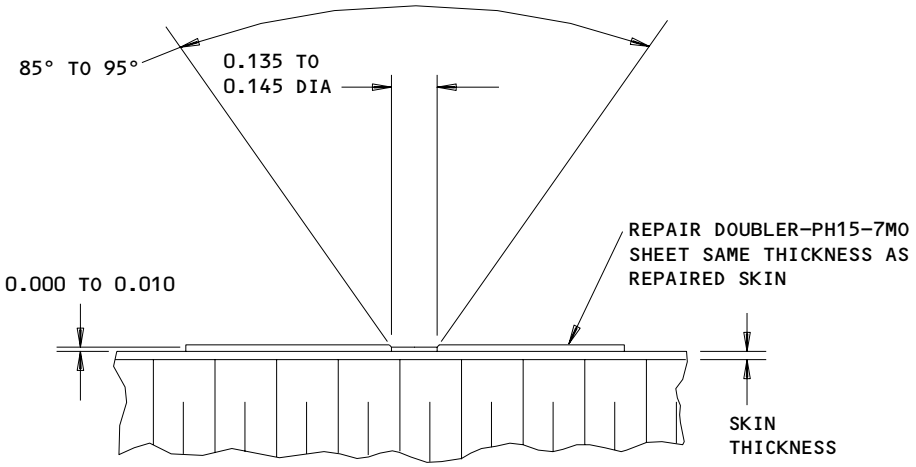
1. PH15-7MO, SHEET
2. PH15-7MO, AMS 5813 WIRE, 0.045 DIAMETER
3. USE WPH15-7MO PER AMS 5813 WELDING WIRE
4. OBTAIN 100% SKIN PENETRATION

ALL DIMENSIONS ARE IN INCHES

Repair Welding Details
Figure 601 (Sheet 1)

265609





A-A

TYPICAL WELD PLUG

ALL DIMENSIONS ARE IN INCHES

Repair Welding Details
Figure 601 (Sheet 2)

J. Dressing of Repair Welds

(1) Grind completed weld within -0.000 to +0.003 of surrounding surface, with a surface finish equivalent to 32 microinches or better.

K. Examination of repair welds

(1) Visually check affected area after welding with 10 power magnification and a strong light. If visual examination discloses a suspected defect, penetrant check weld per 20-20-02 for verification.

(2) The following criteria should be used for weld evaluation.

(a) **** Cracks are not acceptable.

(b) **** Lack of fusion is not acceptable.

(c) **** Weld undercuts are not acceptable.

(d) **** Porosity and inclusions exceeding 0.020 are not acceptable.

(e) **** Porosity and inclusions not exceeding 0.020 that show sharp terminations are not acceptable.

2. Pre-weld Preparation

A. Cleaning

(1) Clean area for a distance of at least 1 inch on each side of damage area to be weld repaired, including exposed core which can be cleaned through the cracks, punctures, or inner skin perforations, using an approved carbon/soot remover.

(2) Remove loose exhaust deposits by wiping surface with MEK, MIBK, or acetone.

(3) Remove surface discoloration for a distance of at least 1 inch from defect area by lightly dry-abrading with 240 grit or finer silicon-carbide paper.

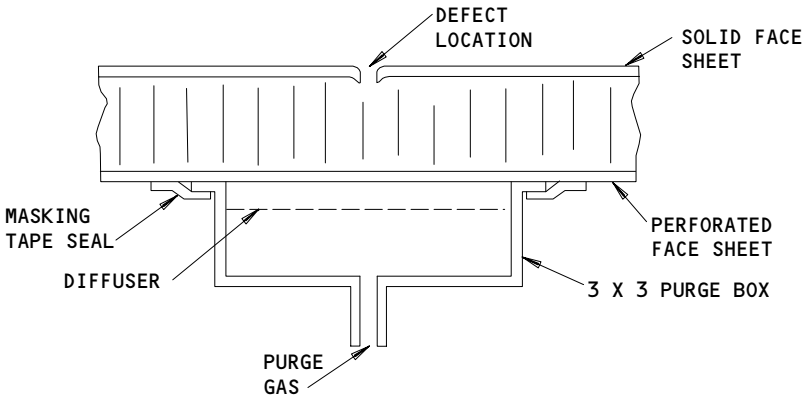
NOTE: Remove the colored oxide film to expose bare parent metal. Wire brushing only polishes the oxide film but does not remove it.

(4) Spot clean as necessary, success of a weld repair is dependent on degree of cleanliness achieved prior to welding.

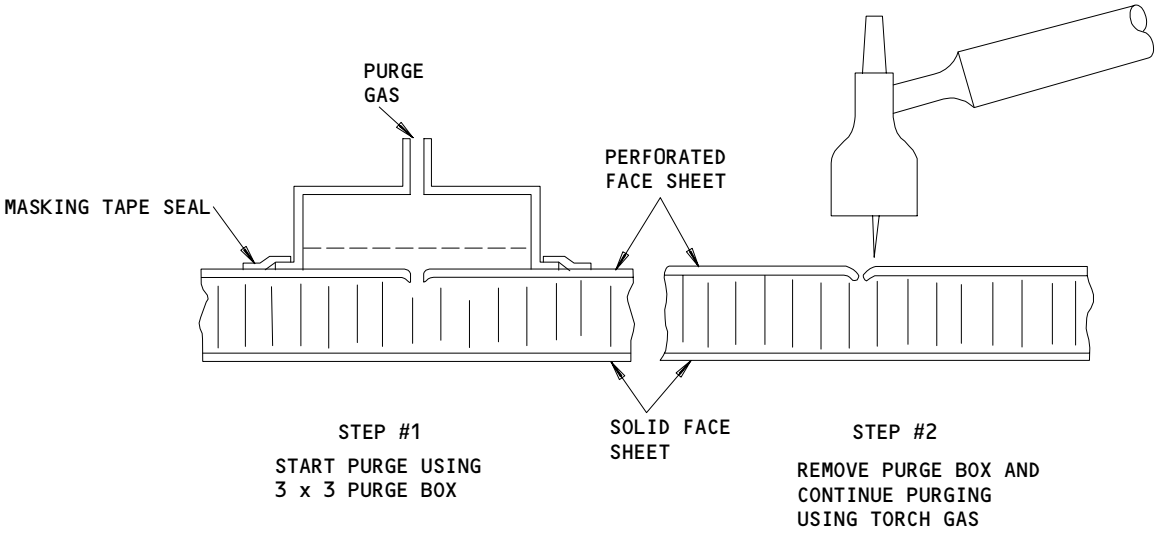
B. Purging (Fig. 602)

(1) Purging is used to provide adequate protection of underbead (root side) weld area from contamination (oxidation). Method of purging is dependent on location and type of repair. Purge gas can be supplied to weld area by use of purge box or drilling purge holes in structure.

(2) Use argon gas for purging. Flow rates and time are specified in each individual repairs.



PURGE SETUP FOR REPAIR
WELD IN SOLID FACE SHEET



PURGE SETUP FOR REPAIR WELD
IN PERFORATED FACE SHEET

Purging Details
Figure 602

265611

C. Grounding

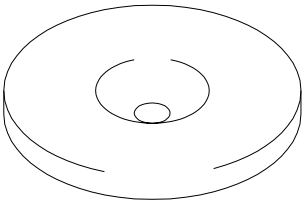
(1) Ground panel to be repaired to prevent arcing on face sheets and minimize resistance heating of the core foil.

(2) Attach ground attachment to the affected area face sheet and as close to weld area as possible.

D. Weld Tooling (Fig. 603)

(1) Copper chill blocks should be used where possible to reduce distortion and minimize the heated area.

NOTE: The turbine exhaust plug assembly has been heat treated during manufacture and it is important to minimize the heated area during welding to reduce the amount of annealing.



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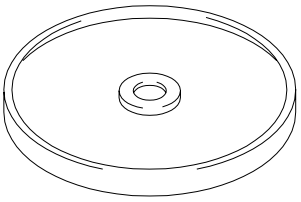

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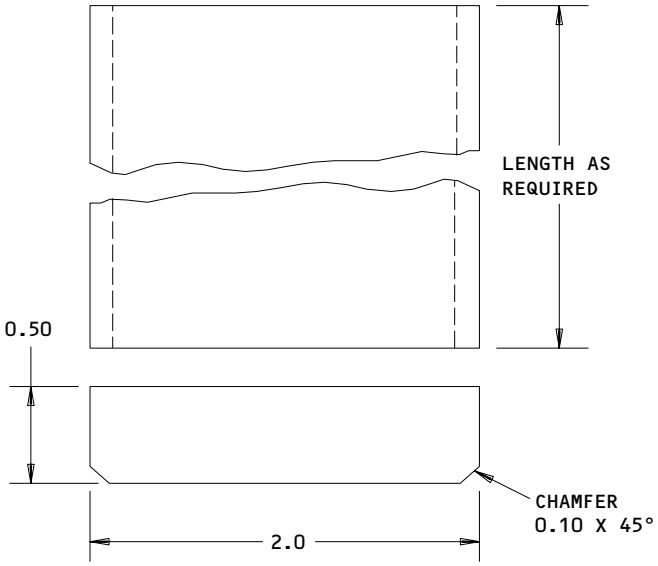
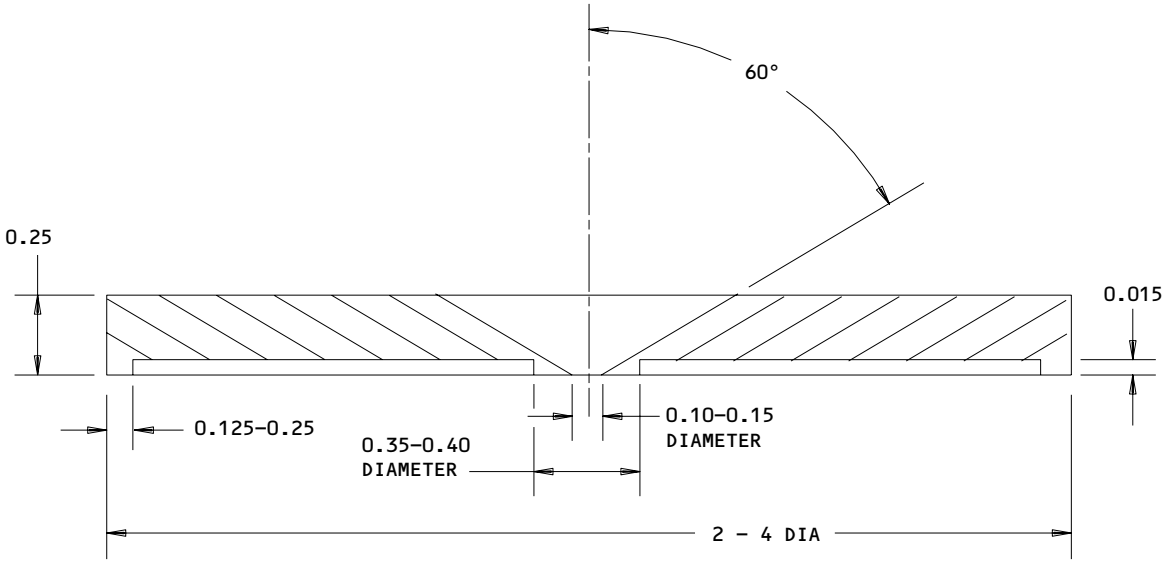


TYPICAL COPPER CHILL BLOCK



SCHEMATIC ILLUSTRATION OF TYPICAL COPPER CHILL TOOLING CONFIGURATIONS
FOR WELDING SMALL DEFECTS, TENSION PIN, AND PLUG WELDING

ALL DIMENSIONS ARE IN INCHES

Copper Chill Tooling Details
Figure 603

E. Crack Damage Preparations

(1) Clean crack damage per par. 2.A.

(2) Drill 0.0625 diameter crack stop holes at crack ends.

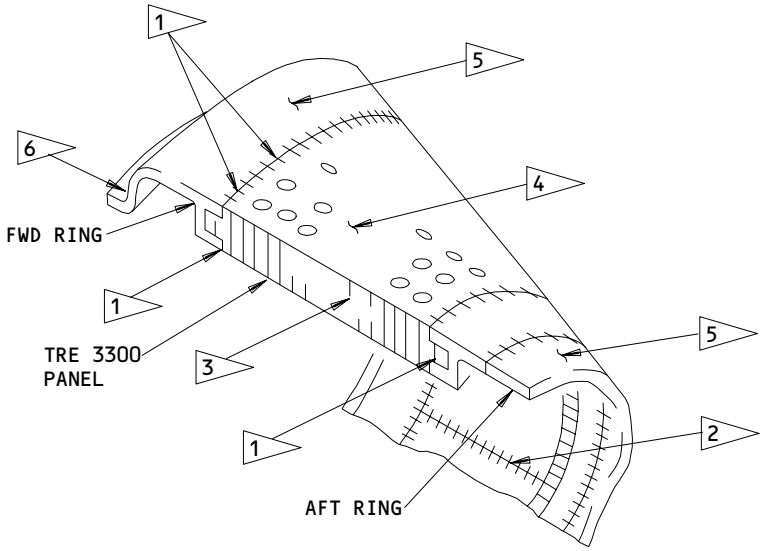
NOTE: Stop holes are not required when crack terminates at perforation.

(3) Make V-groove cut along crack to approximately one half the material thickness.

(4) Flood the crack and adjacent area with MEK, MIBK, or acetone. Vigorously clean area with a wire brush to remove contaminates and carbon soot residue.

F. Damage Analysis

(1) Determine type and extent of damage per Fig. 604, refer to appropriate repair section for specific repair procedure.



POTENTIAL REPAIR LOCATIONS	REPAIR INSTRUCTION PARAGRAPH
1 CIRCUMFERENTIAL WELDS – PERFORATED OR SOLID SKIN TO RING	3
2 LONGITUDINAL WELDS – CRACKS ADJACENT TO EXISTING PANEL TO PANEL WELDS	4
3 SKIN TO CORE PANEL DELAMINATION	5
4 DAMAGES IN PERFORATED SKIN	6
5 DAMAGES IN SOLID SKIN & SHEET	7 THRU 10
6 ELONGATION OR CRACKS IN BOLT HOLES	11

Typical Turbine Exhaust Plug Damage and Weld Repairs
Figure 604

3. Repair of Circumferential Cracks in Perforated or Solid Skin Adjacent to Existing Weld (Fig. 605)

A. Repair Preparation

(1) Clean crack area per par. 2.A.

(2) Drill crack stop holes and make V-groove per par. 2.E.(2), and 2.E.(3).

(3) Mask surface of perforated skin for a width of 4 inches minimum from weld bead around the entire circumference except for the immediate area around the damage per Fig. 605.

(4) Mask periphery of weld repair area so that heat from weld will not burn the masking tape.

NOTE: Burning masking tape contaminates the shielding gas and may affect the weld quality.

(5) Drill 0.125-inch diameter purge gas hole as shown in Fig. 605.

(6) Install copper chill blocks.

(7) Purge weld area thoroughly with argon gas at 10-15 cfh for 30 minutes prior to welding. Continue purging during welding and until weld cools.

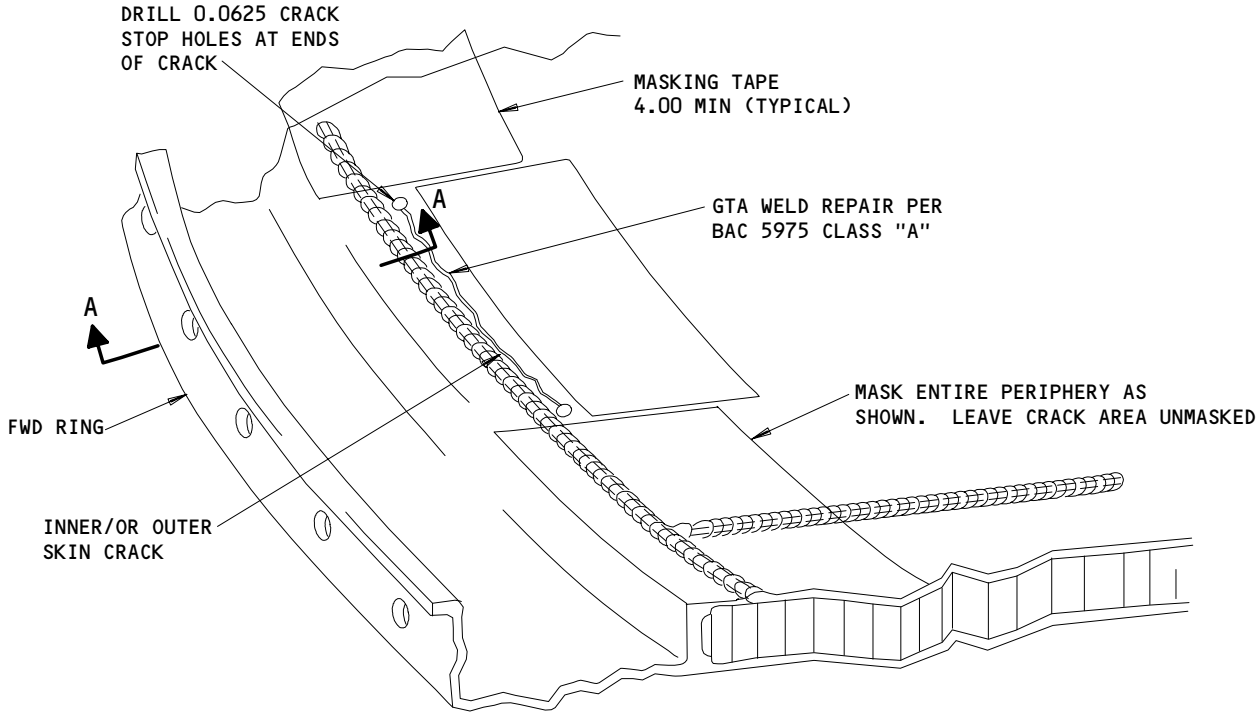
B. Weld Operation

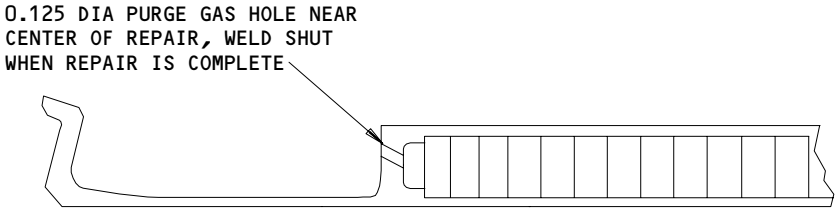
(1) Weld per par. 1 and Fig. 605.

C. Post-Weld Operation

(1) Dress weld per par. 1.F.

(2) Examine weld per par. 1.G.





A-A

ALL DIMENSIONS ARE IN INCHES

CIRCUMFERENTIAL CRACKS ADJACENT TO EXISTING WELDS

Weld Repair
Figure 605

265614

4. Longitudinal Cracks Adjacent to Existing Welds (Perforated Skin, Panel to Panel Welds) (Fig. 606)

A. Repair Preparation

(1) Clean crack area per para. 2.A.

(2) Drill crack stop holes and make V-groove in crack per par. 2.E.(2).

(3) Mask surface of perforated area for a width of 4 inches minimum from the original weld for the entire length (circumference) of the weld joint per Fig. 606.

(4) Mask periphery of weld repair area so that heat from weld will not burn the masking tape.

NOTE: Burning masking tape contaminates the shielding gas and may affect the weld quality.

(5) Drill 0.125-inch diameter purge gas hole on side of shear strip where crack is located as shown in Fig. 606.

(6) Install copper chill blocks.

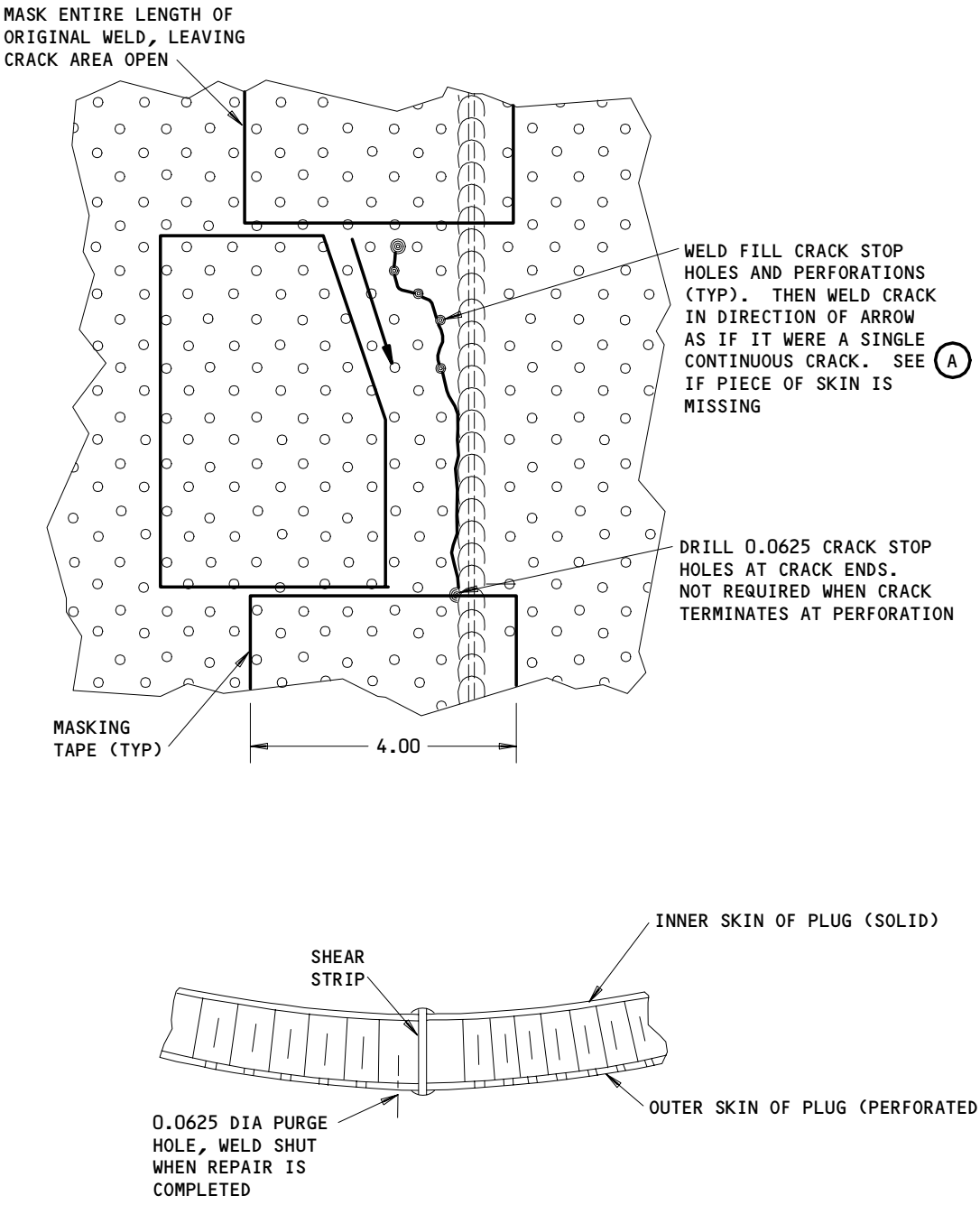
(7) Purge thoroughly with argon gas at 10-15 cfh for 30 minutes prior to welding. Continue purging during welding and until weld cools.

B. Weld Operation

(1) Weld per par. 1 and Fig. 606.

(2) Refer to Fig. 606 if a piece of skin is missing.

(3) Grind and examine repair welds per par. 1.F. and 1.G.

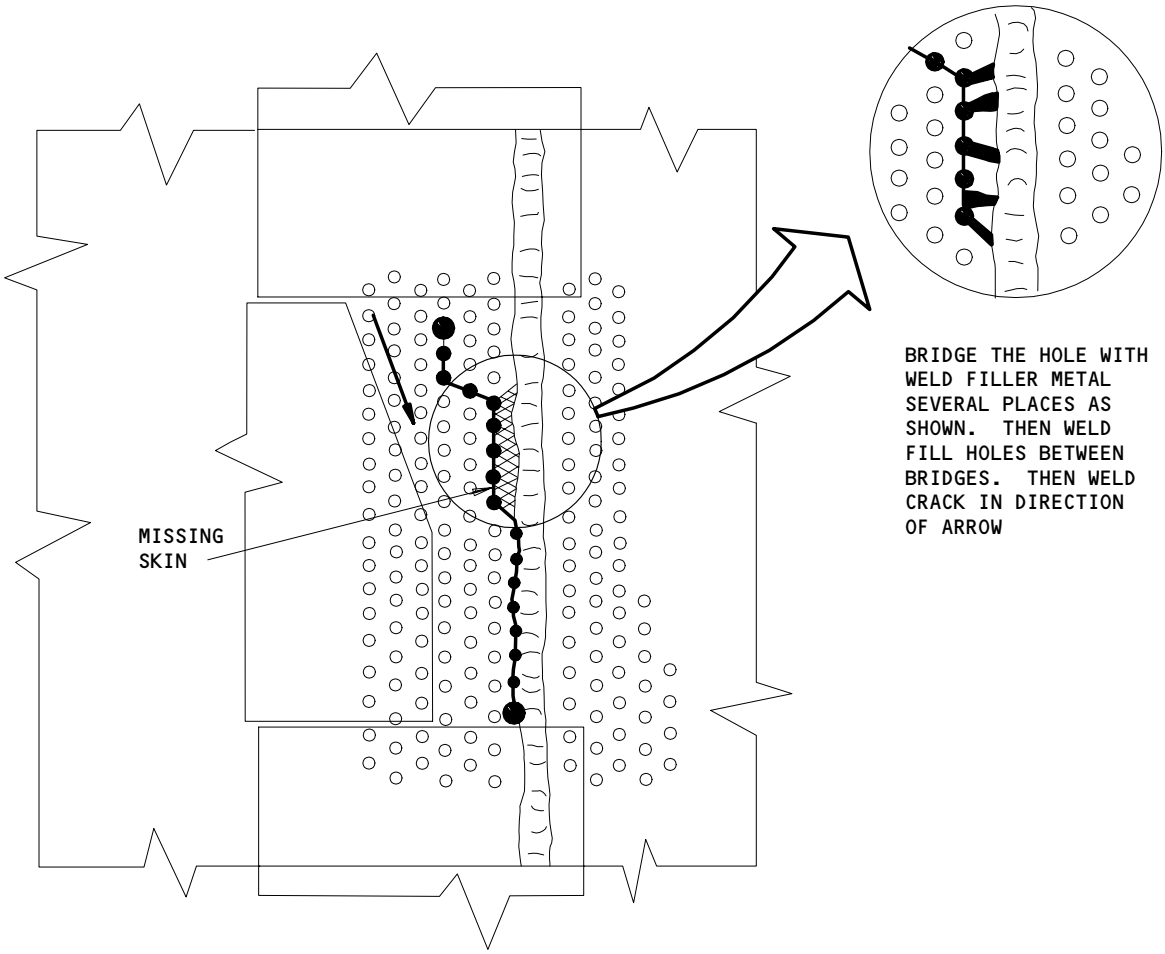


LONGITUDINAL CRACKS ADJACENT TO EXISTING WELDS – PERFORATED SKIN

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 606 (Sheet 1)

265615



LONGITUDINAL CRACKS ADJACENT TO EXISTING WELDS – PERFORATED SKIN
(PIECE OF SKIN MISSING)

Weld Repair
Figure 606 (Sheet 2)

265617

5. Skin to Core Panel Delamination (Fig. 607)

A. Repair Preparation

(1) Clean both upper and lower skins in area of delamination per par. 2.A.

(2) Drill tension pin holes and prepare panel for tension pin weld installation according to Fig. 601. Where welded tension pins cannot be installed, use bolted tension pins and nuts as an alternative. Locate holes at approximately 0.75 inch spacing over the delaminated area and at approximately 1.25 inches spacing around the delaminated area. Use inner skin perforations as a guide for drilling.

(3) Cut tension pins from 0.045 inch diameter WPH15-7M0 filler wire as shown in Fig. 601, and 607.

(4) Place copper chill blocks and tooling around defect area and tension pins.

(5) Purge during welding of tension pins as follows:

(a) **** Welding on solid face sheets.

1) The rootside of the repair weld shall be protected from contamination by purging through the perforated face with a 3 by 3 purge box using argon gas as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding and approximately one-half minute after welding using an argon flow rate of 40 cfh.

(b) **** Welding on perforated face sheets.

1) The repair area shall be purged through the perforated sheet using the 3 by 3 purge box as shown in Fig. 602. Purge for minimum of three minutes using an argon flow rate of 40 cfh.

2) Prior to welding, remove purge box and continue purging with the welding torch using a number 10 torch cup for an additional 2 minutes. Continue purging after welding until weld cools.

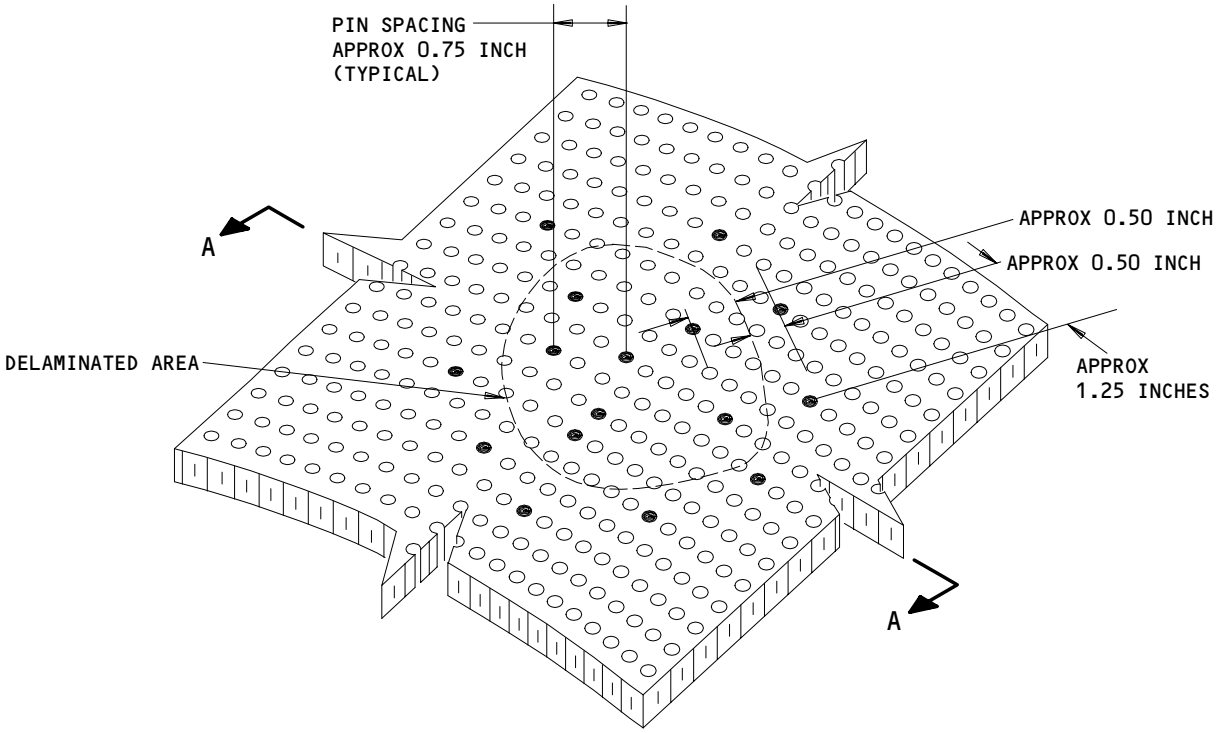
B. Weld Operation

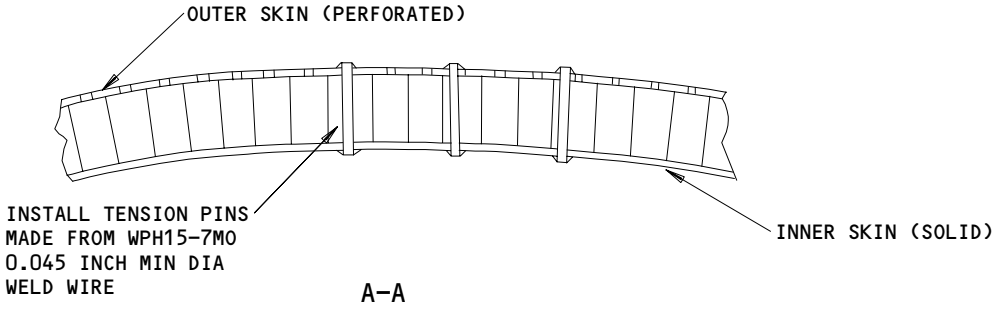
(1) Weld pin ends to skin pressing skin against core per par. 1. or install bolts being careful not to crush core (Fig. 601).

C. Post Weld Operation

(1) Dress pin welds per par. 1.F.

(2) Examine weld per par. 1.G.





DELAMINATED SKIN REPAIR

Weld Repair
Figure 607

6. Large Cuts or Holes in Perforated Skin and Core (Not to Exceed 25 square inch and 8 Inches Maximum Dimension) (Fig. 608)

A. Repair Preparation

(1) Trim out damaged skin and core remnants to unaffected area per Fig. 608.

(2) Cut out and fit a replacement plug from a section of a scrapped panel, consisting of same inner and outer skin with core. Crush plug core as required to achieve skin alignment for butt welding. Push core back 0.10 inch from weld line on both repair plug and damaged assembly (Fig. 608).

(3) Clean weld area on plug and damaged assembly per par. 2.A.

(4) Fit plug in position and tack weld plug in place.

(5) Install copper chill blocks.

(6) Purge through the perforated skin in two stages as follows:

(a) **** The plug area shall be purged by using a 3 by 3 purge box as shown in Fig. 602. Purge for a minimum of 3 minutes using an argon flow rate of 40 cfh.

(b) **** Prior to welding remove the purge box and continue purging with the welding torch using a number 10 torch cup for an additional 2 minutes. Continue purging after welding until weld cools.

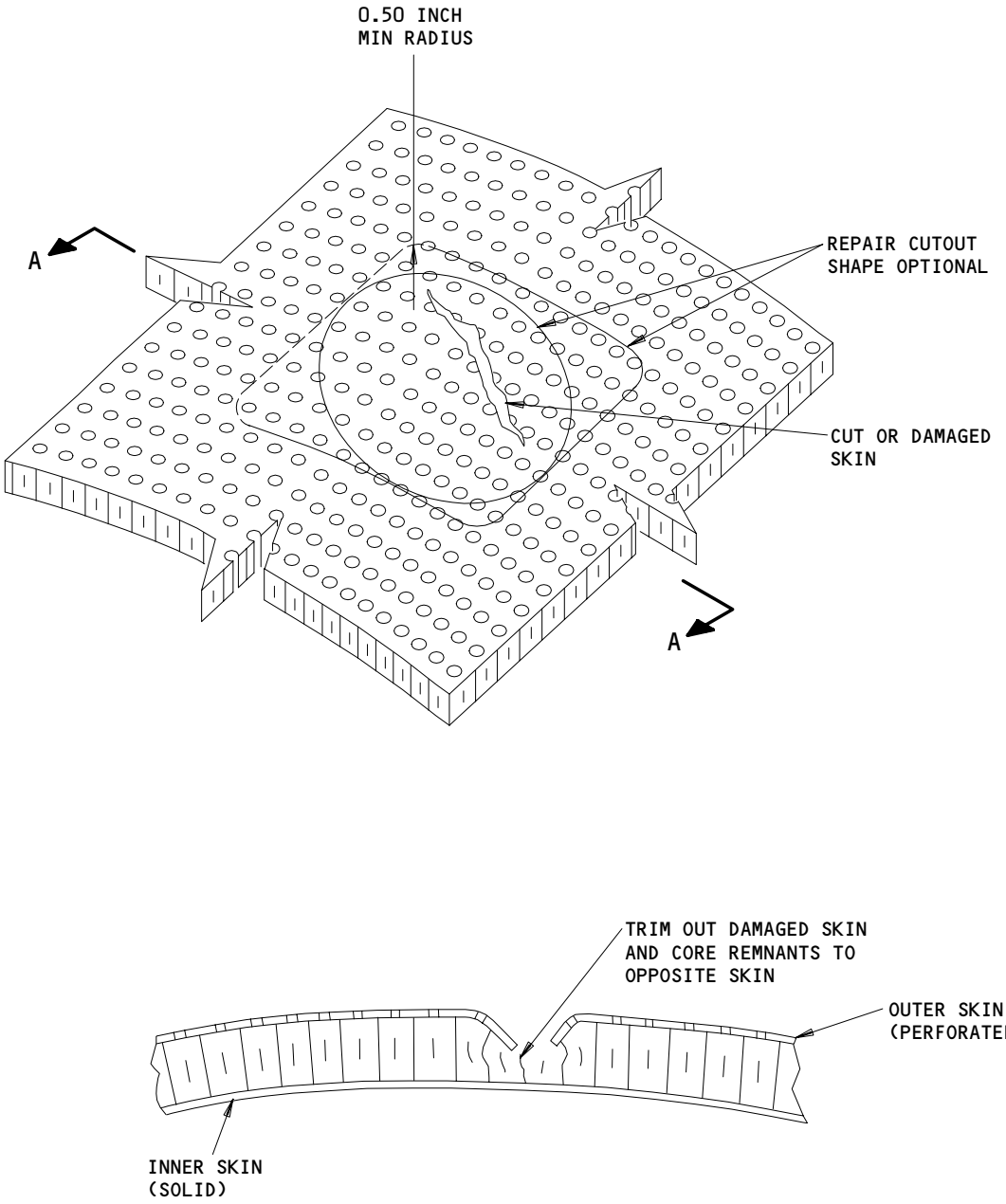
B. Weld Operation

(1) Butt weld entire joint per par. 1.

C. Post-Weld Operation

(1) Dress weld per par. 1.F.

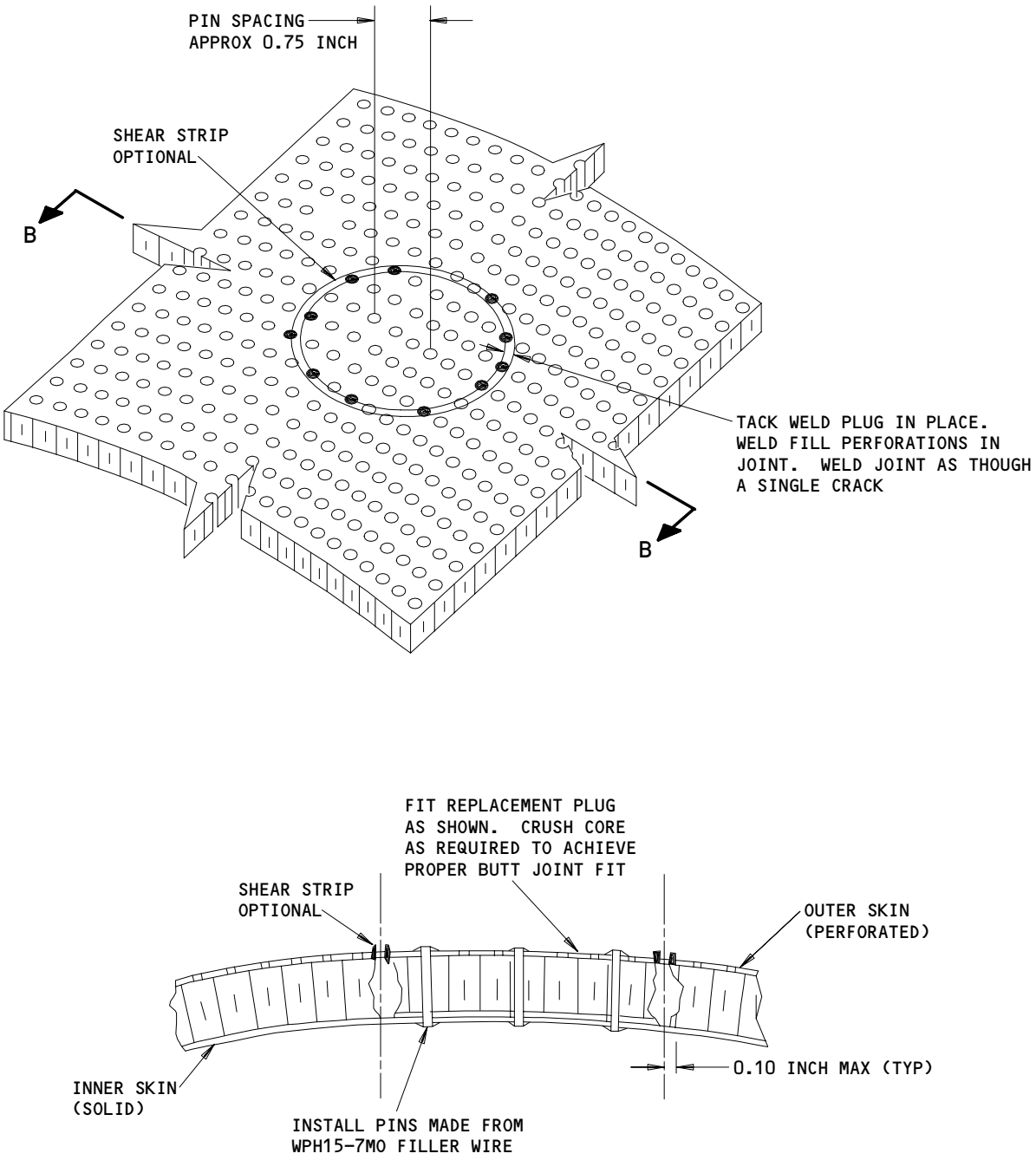
(2) Examine weld per par. 1.G.



A–A

CUT OR DAMAGED PERFORATED SKIN REPAIR (PREPARATION)

Weld Repair
Figure 608 (Sheet 1)



B-B

CUT OR DAMAGED PERFORATED SKIN REPAIR

Weld Repair
Figure 608 (Sheet 2)

265621

7. Circular Dents Up to One Inch Diameter in Solid Skin (Fig. 609)

A. Repair Preparation

(1) Fabricate washer from PH15-7M0 material of required thickness. Drill plug hole in center and grind to conform to the shape of the dent as shown in Fig. 609.

(2) Clean dent area per par. 2.A.

(3) Examine for cracks. If a crack appears, drill crack stop holes and make V-groove in crack per par. 2.E.(3).

(4) Install copper chill blocks.

(5) Purge through the perforated face, in the area of the dent with a 3 by 3 purge box, using argon gas as shown in Fig. 602. Purging shall be done for a minimum of 3 minutes prior to welding, during welding and approximately 1/2 minute after welding using an argon flow rate of 40 cfh.

B. Weld Operation

(1) If crack in dent area exists, weld crack per par. 1.

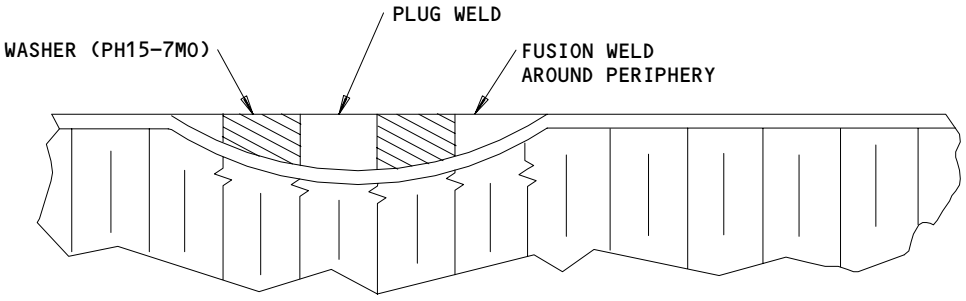
(2) Dress weld bead so washer will properly mate with dent.

(3) Weld center and periphery of washer per par. 1.

C. Post-Weld Operation

(1) Dress welds and washers per par. 1.F. to be flush with skin contour.

(2) Examine weld per par. 1.G.



CIRCULAR DENT REPAIR IN SOLID SKIN

CLEAN AND POLISH AREA WITH CLEAN CORROSION RESISTANT STEEL WIRE BRUSH OR NO. 600 ABRASIVE PAPER. EXAMINE FOR CRACKS. IF A CRACK APPEARS, REPAIR PER PAR. 7. ADD A SPACER WASHER TO FILL DENT DEPRESSION. WELD CENTER OF WASHER THROUGH HOLE IN CENTER. WELD AROUND PERIPHERY OF WASHER. GRIND FLUSH TO SURFACE REQUIREMENTS OF PAR. 1.F. INSPECT FOR CRACKS PER PAR. 1.G.

CIRCULAR DENT REPAIR

Weld Repair
Figure 609

8. Repair of Holes of Punctures Up to One Inch Maximum Length of Solid Skin (Fig. 610)

A. Repair Preparation

(1) Fabricate repair doubler from 0.012 inch thick (or same thickness as skin) PH15-7M0 material to fit over defect. Doubler shall be at least twice the length and width of defect area per Fig. 601.

(2) Drill plug weld holes through doubler per Fig. 601 and hole pattern shown in Fig. 610.

(3) Clean area and doubler per par. 2.A.

(4) Install copper chill blocks.

(5) Purge through the perforated face, in the area of the damage with a 3 by 3 purge box, using argon gas as shown in Fig. 602. Purging shall be done for a minimum of 3 minutes prior to welding, during welding and approximately 1/2 minute after welding using an argon flow rate of 4 cfh.

B. Weld Operation

(1) Weld repair doubler per par. 1.E. plug weld doubler per Fig. 601.

C. Post-Weld Operation

(1) Dress welds per par. 1.F.

(2) Examine welds per par. 1.G.

9. Repair of Cracks Up to 6-Inch Length in Solid Skin, Not Adjacent to Panel Welds (Fig. 610)

A. Repair Preparation

(1) Fabricate repair doubler from 0.012 inch (or skin thickness) PH15-7M0 sheet to fit overcrack. Doubler shall extend a minimum of 1 inch beyond crack in all directions.

(2) Drill plug weld holes through doubler per Fig. 601 using hole pattern shown in Fig. 610.

(3) Clean damaged area and doubler per par. 2.A.

(4) Install copper chill blocks.

(5) Purge through the perforated face in the area of the damage with a 3 by 3 purge box using argon gas as shown in Fig. 602. Purging shall be done for a minimum of 3 minutes prior to welding, during welding, and approximately 1/2 minute after welding, using an argon flow rate of 40 cfh.

B. Weld Operation

(1) Weld repair crack per par. 1.

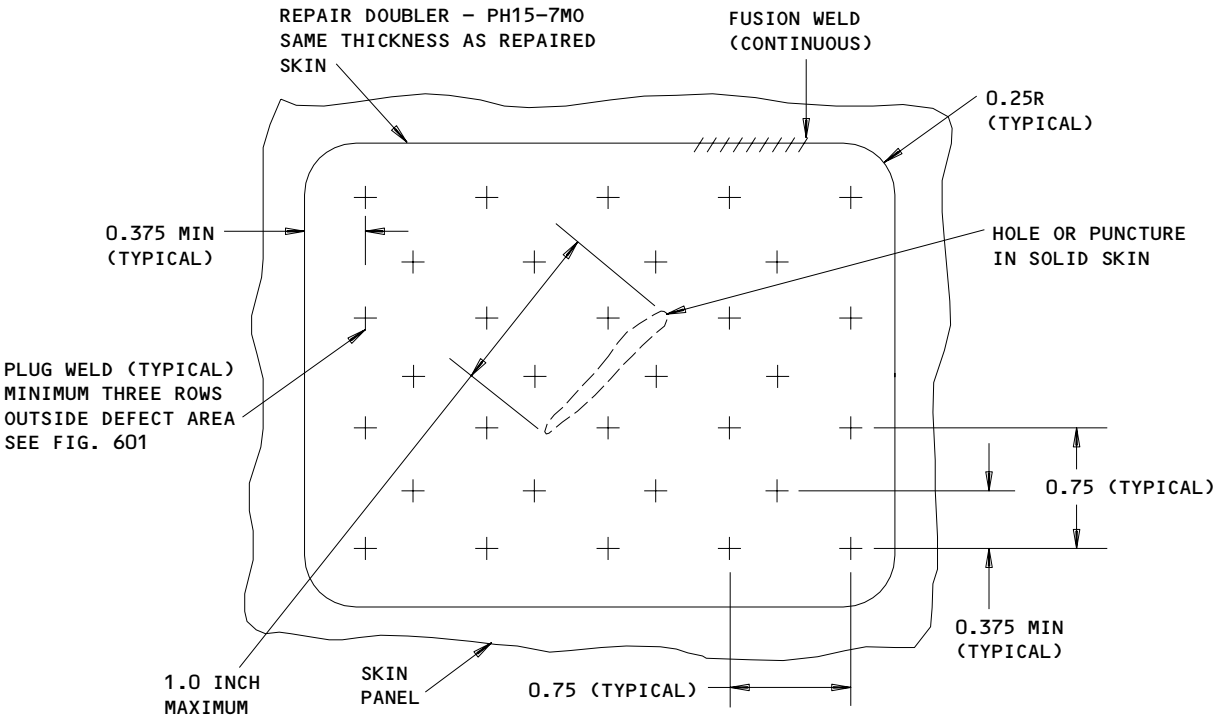
(2) Dress (grind) weld bead flush to skin and inspect weld per par. 1.F. and 1.G. before welding doubler.

(3) Weld doubler over crack per par. 1. and plug weld per Fig. 601.

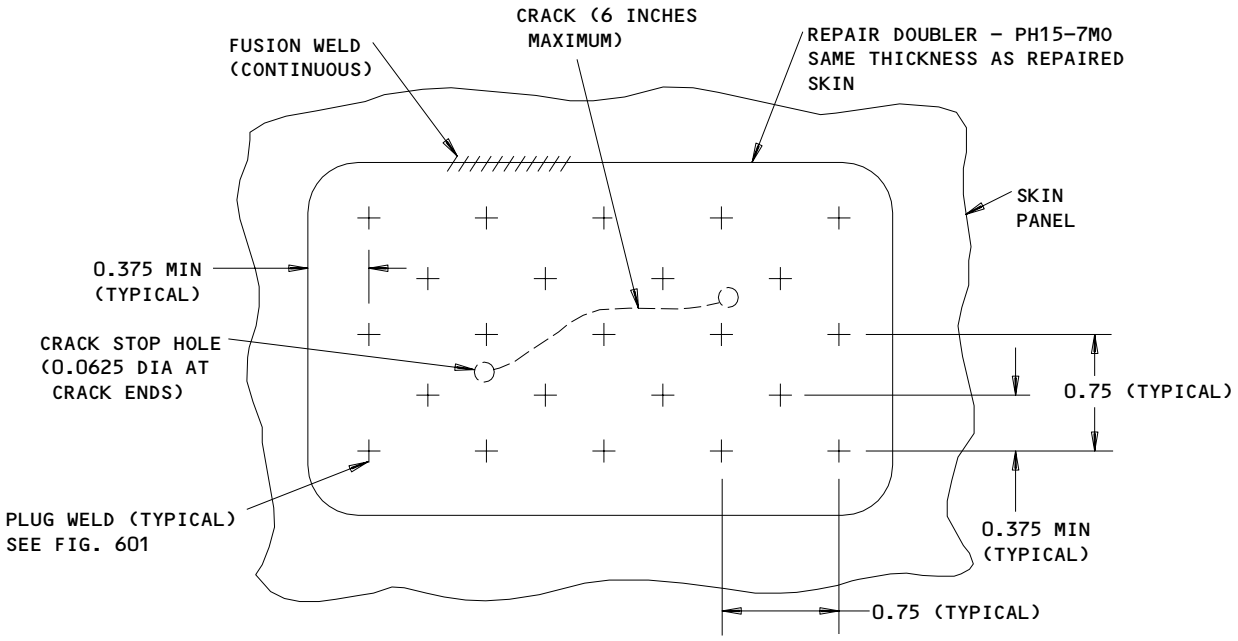
C. Post-Weld Operation

(1) Dress welds per par. 1.F.

(2) Inspect welds per par. 1.G.



REPAIR OF HOLE OR PUNCTURE IN SOLID SKIN



REPAIR OF 2– TO 6–INCH CRACK IN SOLID SKIN

DAMAGED SKIN REPAIR

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 610

265623

10. Repair of Skin Delamination and Thermal Buckle in Solid Skin (Fig. 611)

A. Repair Preparation

(1) Clean area per par. 2.A.

(2) Tap test around buckle to outline skin delamination area.

(3) Slit buckle down centerline and drill 0.0625-inch stop holes at ends of slit.

(4) Push slit edges down against core and tack weld edge to skin.

(5) Fabricate repair doubler from 0.012 inch (or skin thickness PH15-7M0) sheet to fit over delaminated area. Doubler shall extend at least 1 inch beyond skin delamination in all directions.

(6) Install copper chill blocks.

(7) Purge through the perforated face with argon gas in the area of the damage using a 3 by 3 purge box as shown in Fig. 602. Purging shall be done for a minimum of 3 minutes piror to welding, during welding and approximately 1/2 minute after welding using an argon flow rate of 40 cfh.

B. Weld Operation

(1) Weld slit per par. 1.

(2) Grind weld flush to skin.

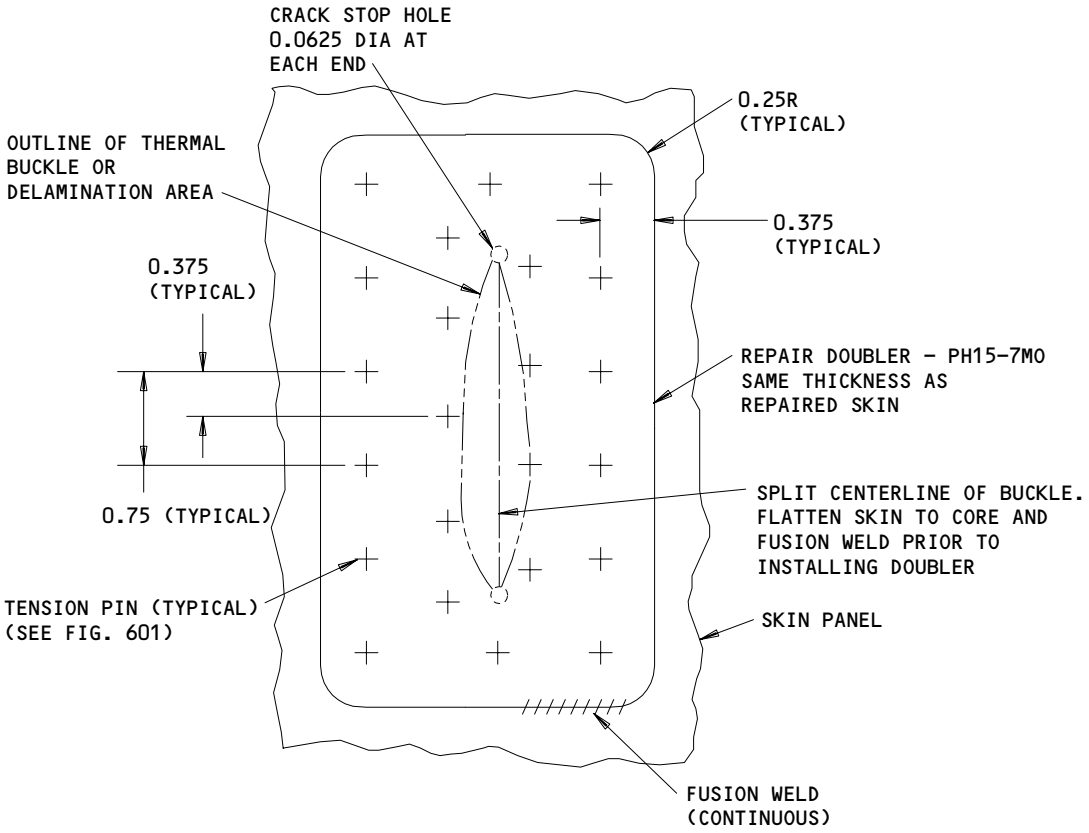
(3) Fusion weld repair doubler over delaminated area per par. 1.

(4) Install and weld tension pins according to Fig. 601 and using the hole pattern of Fig. 611.

C. Post-Weld Operation

(1) Dress pin welds per par. 1.F.

(2) Examine welds per par. 1.G.



REPAIR OF SKIN DELAMINATION OR BUCKLE IN SOLID SKIN

DAMAGED SKIN REPAIR

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 611

265624

11. Repair of Elongated or Cracked Bolt Holes (Fig. 612)

A. Repair Preparation

(1) Clean crack and hole area per par. 2.A.

(2) Clamp copper chill blocks under and around hole area to prevent buckling.

B. Weld Operation

(1) For small cracks with no hole elongation, weld crack only per par. 1. Do not fill weld bolt hole.

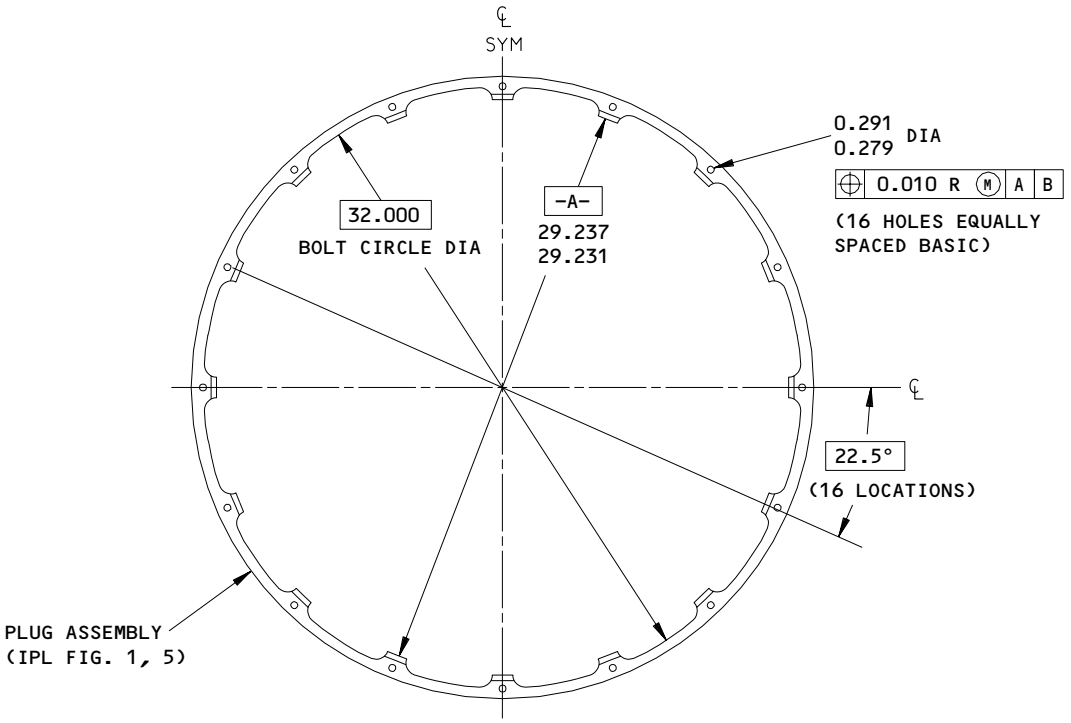
(2) For large crack with hole elongation, weld crack and fill weld hole per par. 1.

C. Post-Weld Operation

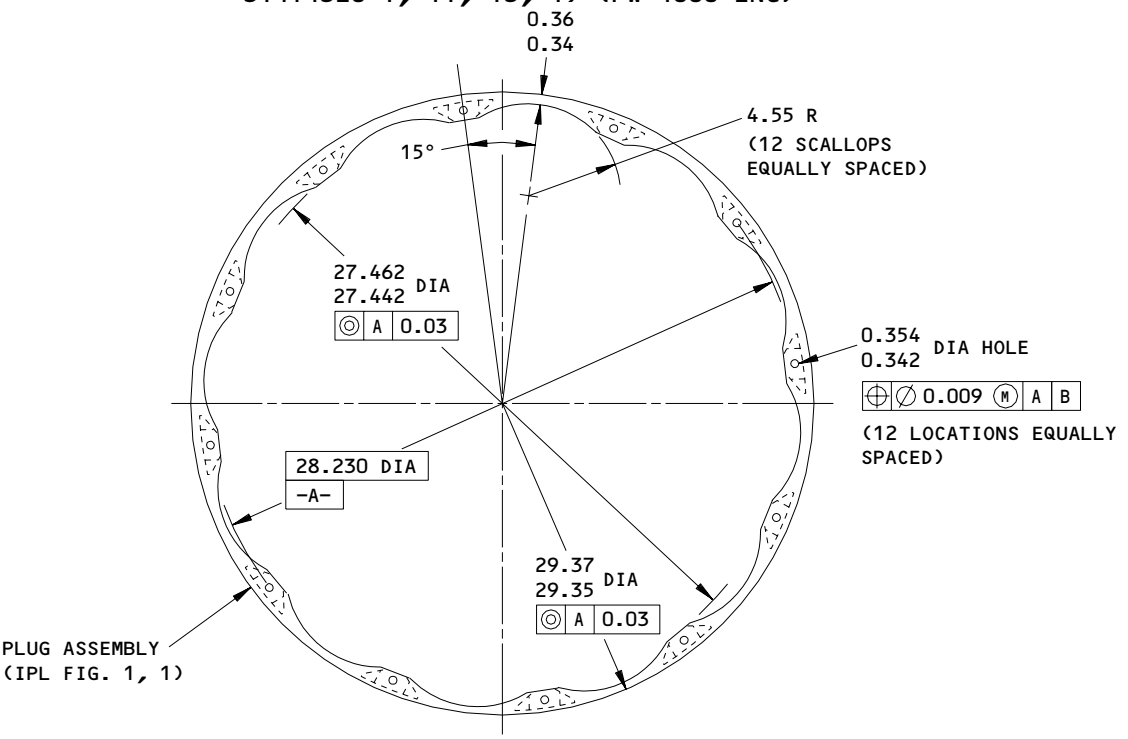
(1) Dress repair welds per par. 1.F.

(2) Clean up or redrill holes per Fig. 612.

(3) Examine weld per par. 1.G.



314T4320-1,-11,-13,-19 (PW 4000 ENG)



314U2200-10,-23,-31 (CF6-80C2 ENG) ALL DIMENSIONS ARE IN INCHES

Bolt Hole Repair
Figure 612

265625

12. Refinish

A. After completion of repairs, apply temporary protective finish to inner and outer surfaces of plug assembly per SOPM 20-44-02, except use Rust Veto 377.

PLUG ASSEMBLY - REPAIR 2-1

314U2200-10, -23, -31

NOTE: Refer to REPAIR-GEN for list of applicable standard practices.

1. Repair of Cracked Plug Assemblies

A. Prepare crack area for weld repair.

(1) Clean damaged area for a distance of at least 1 inch on each side of the area to be weld repaired using an approved carbon/soot remover.

(2) Repeat step 1.A.(1) using live steam.

(3) Drill 0.125-inch diameter stop holes at ends of crack.

(4) Remove discoloration (colored oxide film) from crack and area for a distance of at least 1 inch from crack using Scotch-Brite Type S abrasive cleaner.

NOTE: Do not substitute wire brushing or any other abrasive cleaner for Scotch-Brite type S. Wire brushing only polishes the oxide film but does not remove it.

(5) Remove all residue by wiping or rinsing with water.

(6) Flood crack and adjacent area with methyl ethyl ketone (MEK) or acetone. Vigorously clean using a stiff-bristle brush in order to remove carbon/soot residue remaining in crack.

NOTE: The likelihood of successful weld repair is enhanced by degree of cleanliness achieved prior to welding.

(7) Rinse thoroughly with cold water and dry completely with clean, filtered air or clean, lint-free cloth.

NOTE: Parts to be welded should be kept clean, dry, free from oil, grease, fingerprints and other surface contamination and should be handled with clean, oil-free gloves.

(8) GTA weld crack using argon or helium gas and Inconel 625 filler wire as follows:

NOTE: Length of crack that may be weld repaired is not limited.

(a) Use copper chill blocks to reduce warpage.

(b) Weld bead must be kept to minimum size.

(c) A 100% penetration is required.

(d) Grind welds flush to skin within -0.000 to 0.010 inch with 32 microinch or less finish. Use care not to grind into base metal.

(e) Stress relieving after weld repair is not required.

(f) Visually check repair using 10 power magnification.

(g) Penetrant or radiographically check weld zone. Cracks are not acceptable. Porosity and inclusions should not exceed 0.020 inch and must not have sharp terminations.

ILLUSTRATED PARTS LIST

1. This section lists and illustrates replaceable or repairable component parts. The Illustrated Parts Catalog contains a complete explanation of the Boeing part numbering system.

2. Indentures show parts relationships as follows:

    Assembly
      Detail Parts for Assembly
      Subassembly
      Attaching Parts for Subassembly
        Detail Parts for Subassembly

    Detail Installation Parts (Included only if installation parts may be returned to shop as part of assembly)

3. One use code letter (A, B, C, etc.) is assigned in the EFF CODE column for each variation of top assembly. All listed parts are used on all top assemblies except when limitations are shown by use code letter opposite individual part entries.

4. Letter suffixes (alpha-variants) are added to item numbers for optional parts, Service Bulletin modification parts, configuration differences (Except left- and right-hand parts), product improvement parts, and parts added between two sequential item numbers. The alpha-variant is not shown on illustrations when appearance and location of all variants of the part is the same.

5. Service Bulletin modifications are shown by the notations PRE SB XXXX and POST SB XXXX.

    A. When a new top assembly part number is assigned by Service Bulletin, the notations appear at the top assembly level only. The configuration differences at detail part level are then shown by use code letter.

    B. When the top assembly part number is not changed by the Service Bulletin, the notations appear at the detail part level.

6. Parts Interchangeability

Optional (OPT)	The parts are optional to and interchangeable with other parts having the same item number.
Supersedes, Superseded By (SUPSDS, SUPSD BY)	The part supersedes and is not interchangeable with the original part.
Replaces, Replaced By (REPLS, REPLD BY)	The part replaces and is interchangeable with, or is an alternate to, the original part.

VENDORS

08524 DEUTSCH FASTENER CORP SEE CODE V97928

5M902 FAIRCHILD IND INC FAIRCHILD AEROSPACE FASTENER DIV
3016 W LOMITA BLVD
TORRANCE, CALIFORNIA 90505-5103
FMLY IN REDONDO BEACH, CALIF

56878 SPS TECHNOLOGIES INC AEROSPACE AND INDUSTRIAL PRODUCTS DIV
HIGHLAND AVENUE
JENKINTOWN, PENNSYLVANIA 19046
FORMERLY STANDARD PRESSED STEEL

60516 WEST COAST AEROSPACE INC
812 MIRAFLORES STREET
SAN PEDRO, CALIFORNIA 90731-1439

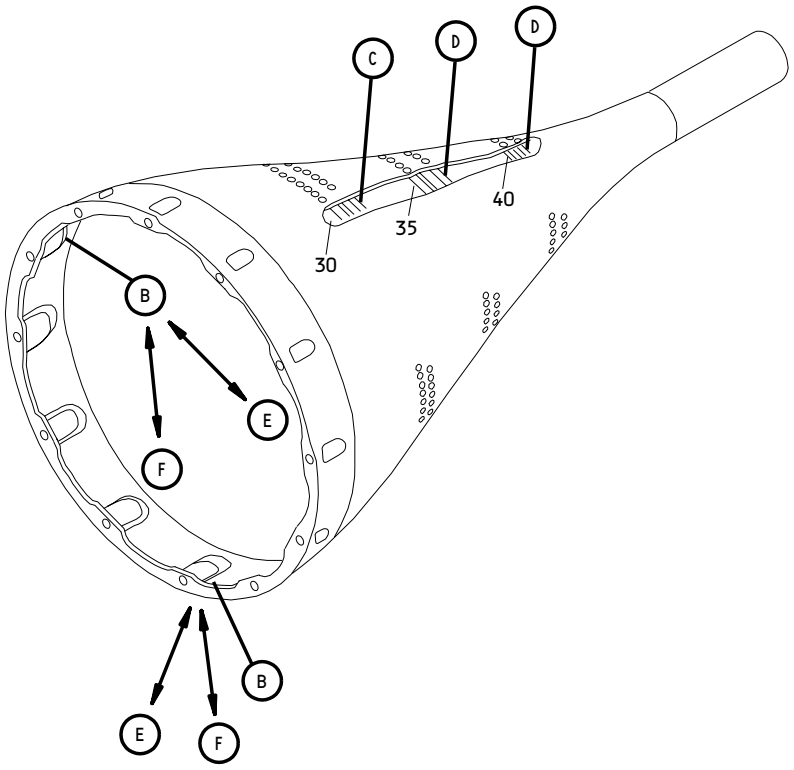
73197 HI-SHEAR TECHNOLOGY CORP
2600 SKYPARK DRIVE
TORRANCE, CALIFORNIA 90509

80539 SPS TECHNOLOGIES INC AEROSPACE PRODUCTS DIV
2701 SOUTH HARBOR BOULEVARD PO BOX 1259
SANTA ANA, CALIFORNIA 92702-1259
FORMERLY NUTT-SHEL DIV OF SPC WESTERN CO V80539
AND STANDARD PRESSED STEEL WESTERN DIV V17279

92215 FAIRCHILD IND INC FAIRCHILD AEROSPACE FASTENER DIV
3010 W LOMITA BLVD
TORRANCE, CALIFORNIA 90505-5102
FORMERLY VOI-SHAN IN CULVER CITY, CALIF

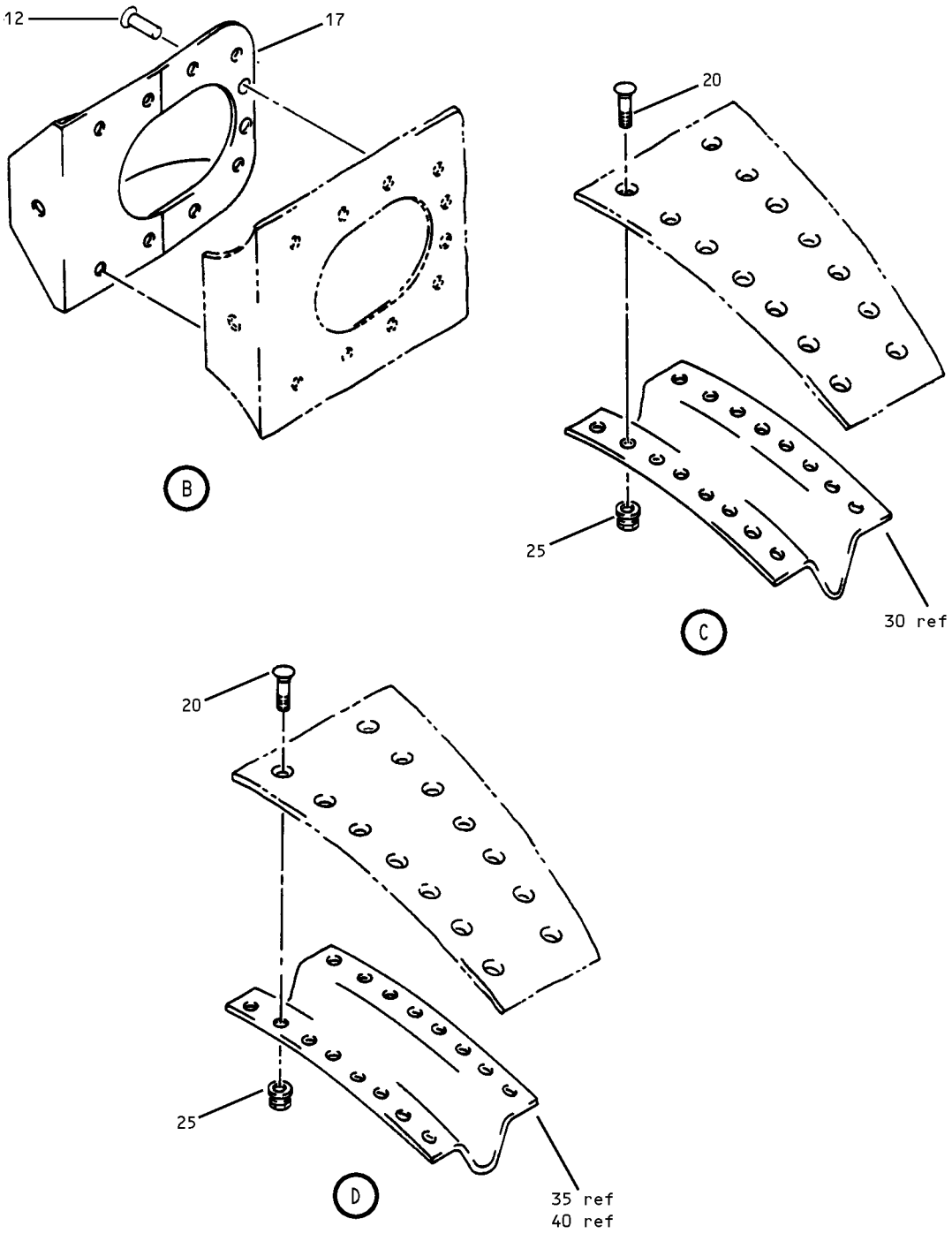
97928 HUCK INTL SEE V17446 HUCK INTL
SEE V17446 HUCK INTL
SEE V17446 HUCK INTL

PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
BACB30FN5A25U		1	20B	348
BACC30AB5S		1	25B	348
BACR15CE4M		1	10	96
		1	12	120
		1	13	132
HL41-5-25		1	20B	348
HL88-5		1	25A	348
HL88TB5		1	25	348
HL97DU5		1	25B	348
NAS1200-5-4		2	5A	112
122578-4-4		2	5	112
314T4320-1		1	5	RF
		2	1A	RF
314T4320-11		1	5A	RF
		2	1B	RF
314T4320-13		1	5B	RF
		2	1C	RF
314T4320-19		1	5C	RF
		2	1D	RF
314T4320-6		2	10	16
314U2200-10		1	1	RF
314U2200-14		1	30	1
314U2200-23		1	1A	RF
314U2200-31		1	1B	RF
314U2200-8		1	35	1
314U2200-9		1	40	1
314U2202-10		1	18	12
314U2202-5		1	15A	12
314U2202-9		1	17	12
67068-5A25U		1	20B	348



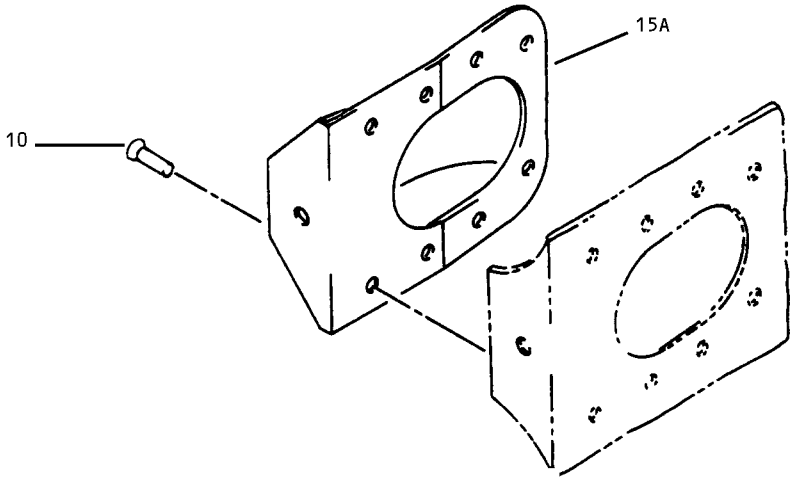
314U2200-10,-23,-31
CF6-80C2 Engine Plug Assembly
Figure 1 (Sheet 1)

U20634

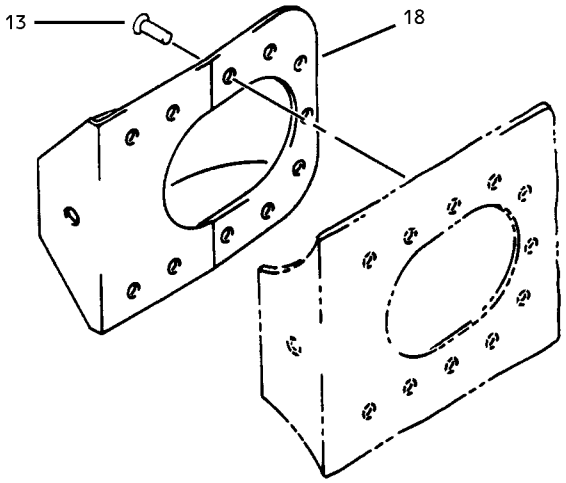


314U2200-10,-23,-31
CF6-80C2 Engine Plug Assembly
Figure 1 (Sheet 2)

U20635



E



F

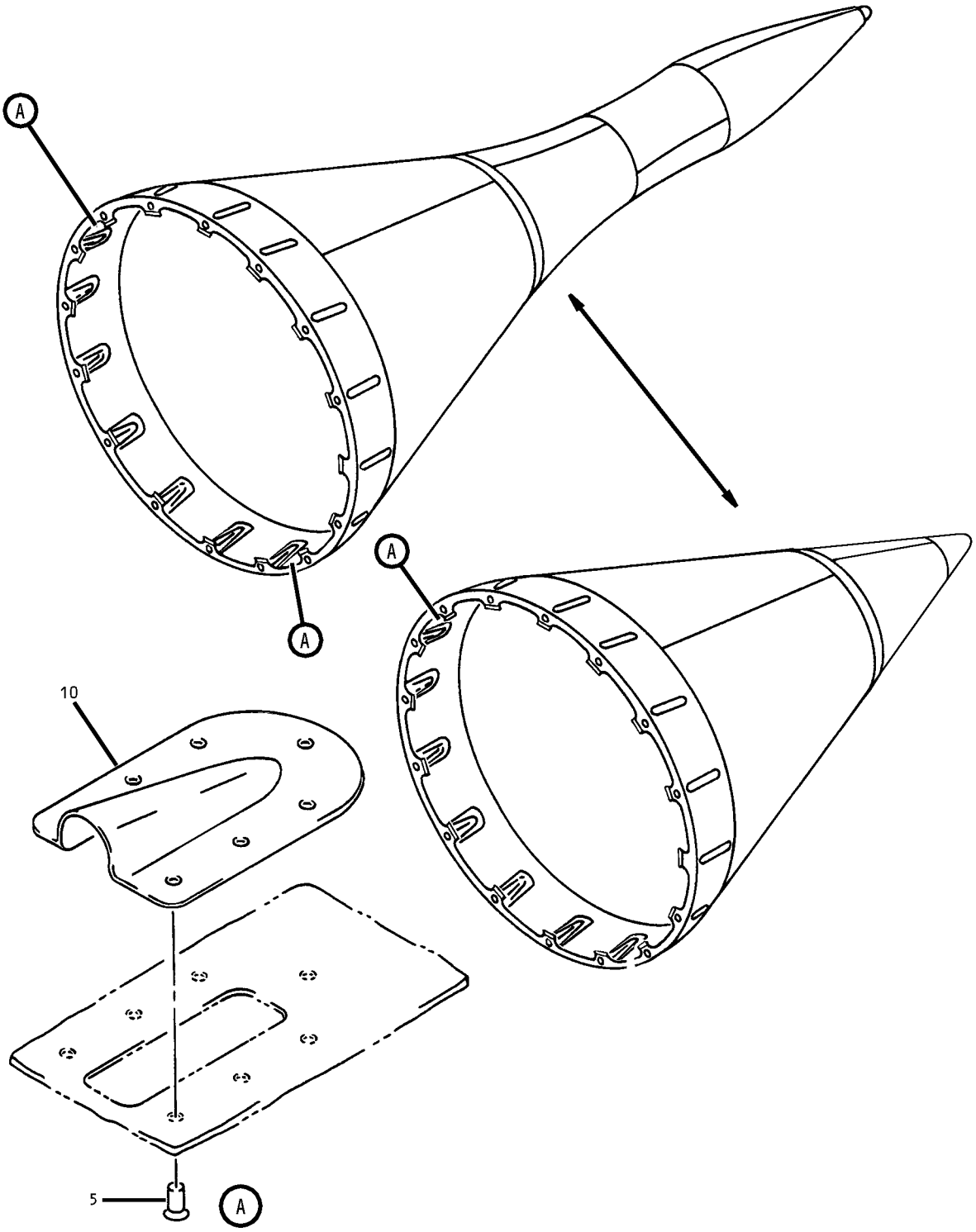
314U2200-10,-23,-31
CF6-80C2 Engine Plug Assembly
Figure 1 (Sheet 3)

W06745

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-1	314U2200-10		PLUG ASSY-CF6-80C2 ENG	A	RF
-1A	314U2200-23		PLUG ASSY-CF6-80C2 ENG	E	RF
-1B	314U2200-31		PLUG ASSY-CF6-80C2 ENG	F	RF
-5	314T4320-1		PLUG ASSY-TURB EXH SYS (FOR DETAILS SEE FIG. 2)	B	RF
-5A	314T4320-11		PLUG ASSY-TURB EXH SYS (REWORK) (FOR DETAILS SEE FIG. 2)	C	RF
-5B	314T4320-13		PLUG ASSY-TURB EXH SYS (FOR DETAILS SEE FIG. 2)	D	RF
-5C	314T4320-19		PLUG ASSY-TURB EXH SYS (FOR DETAILS SEE FIG. 2)	G	RF
10	BACR15CE4M		.RIVET- (SIZE DETERMINE ON INST) (USED WITH ITEM 15A)	A	96
12	BACR15CE4M		.RIVET- (SIZE DETERMINE ON INST) (USED WITH ITEM 17)	A	120
13	BACR15CE4M		.RIVET- (SIZE DETERMINE ON INST)	E,F	132
15	314U2200-5		DELETED		
15A	314U2202-5		.SEAL ASSY-TURB EXH (OPT ITEM 17)	A	12
-15B	314U2202-10		DELETED		
17	314U2202-9		.SEAL ASSY-TURB EXH (OPT ITEM 15A)	A	12
18	314U2202-10		.SEAL ASSY-TURB EXH	E,F	12
20	HL657-5-2		.BOLT- (V73197) (OPT ITEM 20A)	A,E	348
-20A	HL421-5-2		.BOLT- (V73197) (OPT ITEM 20)	A,E	348

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-20B	HL41-5-25		.BOLT- (V60516) (SPEC BACB30FN5A25U) (OPT HL41-5-25 (V73197)) (OPT HL41-5-25 (V92215)) (OPT 67068-5A25U (V56878)) (OPT HL41-5-25 (V80539)) (OPT HL41-5-25 (V08524)) (OPT HL41-5-25 (V97928)) (OPT HL41-5-25 (V56878))	F	348
25	HL88TB5		.COLLAR- (V73197) (OPT ITEM 25A)	A,E	348
-25A	HL88-5		.COLLAR- (V73197) (OPT ITEM 25)	A,E	348
-25B	HL97DU5		.COLLAR- (V73197) (SPEC BACC30AB5S) (OPT HL97DU5 (V56878)) (OPT HL97DU5 (V5M902))	F	348
30	314U2200-14		.STIFFENER	A,E,F	1
35	314U2200-8		.STIFFENER	A,E,F	1
40	314U2200-9		.STIFFENER	A,E,F	1
60	122578-4-4		DELETED		
-60A	NAS1200-5-4		DELETED		
65	314T4320-6		DELETED		

- Item Not Illustrated



Turbine Exhaust System Plug Assembly
Figure 2

	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
	02-					
R	-1A	314T4320-1		PLUG ASSY-TURB EXH SYS	B	RF
R	-1B	314T4320-11		PLUG ASSY-TURB EXH SYS (REWORK)	C	RF
R	-1C	314T4320-13		PLUG ASSY-TURB EXH SYS	D	RF
R	-1D	314T4320-19		PLUG ASSY-TURB EXH SYS	G	RF
R	5	122578-4-4		.RIVET- (V80539)	B-D	112
R	-5A	NAS1200-5-4		.RIVET	G	112
R	10	314T4320-6		.SEAL	B-D,G	16

- Item Not Illustrated