TO: ALL HOLDERS OF ENGINE TAILPIPE ASSEMBLY OVERHAUL MANUAL, 78-38-43

REVISION NO. 15, DATED MAR 1/03

HIGHLIGHTS

DESCRIPTION OF CHANGE	TOPICS AFFECTED												
	D & O	D / Assy	Cleaning	Insp/Chk	Repair	Assy	F/C	Test	T/Shooting	S/Tools	Storage	IPL	L/Overhaul
Updated page 407 to show the Dye Penetrant as an optional inspection procedure					X								

ENGINE TAILPIPE ASSEMBLY

78-38-43

BOEING P/N 65-70190-1
65-82788-1, -6, -16

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT
		PRR 31030-12	Sep 10/70
		PRR 33670	Dec 5/84
		MC 3461-1	Mar 5/86
71-1256			Jun 5/91
71-1221		MC 5460MK3003	Mar 5/92

LIST OF EFFECTIVE PAGES

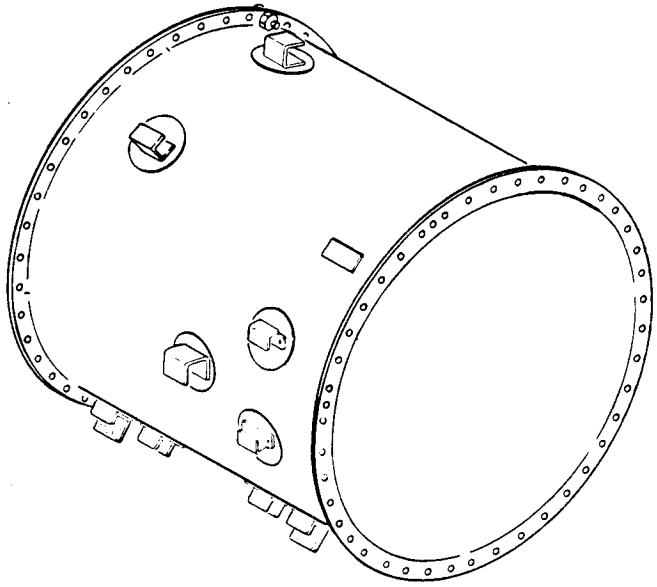
* Indicates pages revised, added or deleted in latest revision
F Indicates foldout pages - print one side only

	PAGE	DATE		PAGE	DATE		PAGE	DATE
	78-38-43			425	Jan 5/82			
	T-1	Mar 5/92		426	Jul 5/82			
	T-2	BLANK		427	Jul 5/82			
*	LEP-1	Mar 1/03		428	Mar 5/86			
	LEP-2	BLANK		601	Mar 5/86			
	T/C-1	Jun 5/85		602	BLANK			
	T/C-2	BLANK		901	Jun 25/74			
	1	Jun 5/85		902	BLANK			
	2	Jun 25/74		1101	Jul 5/79			
	201	Dec 25/74		1102	Dec 5/84			
	202	BLANK		1103	Mar 5/92			
	301	Jun 5/85		1104	Jun 5/85			
	302	BLANK	*	1105	Mar 1/03			
	401	Jun 5/85		1106	BLANK			
	402	Jun 5/85						
	403	Jun 25/74						
	404	Jun 25/74						
	405	Sep 5/88						
	406	Jan 5/82						
*	407	Mar 1/03						
	408	Jul 5/82						
	408A	Jul 5/82						
	408B	Jan 5/82						
	408C	Jan 5/82						
	408D	Dec 1/95						
	409	Jun 1/94						
	410	Dec 5/84						
	410A	Jun 1/94						
	410B	Jun 1/94						
	411	BLANK						
	412	Jun 5/85						
	413	Jun 25/74						
	414	Jun 5/85						
	415	Nov 1/00						
	416	Mar 5/92						
	417	Jan 5/82						
	418	Jun 25/74						
	419	Jul 5/82						
	420	Jul 5/82						
	421	Jun 25/74						
	422	Mar 5/86						
	423	Jan 5/82						
	424	Jan 5/82						

TABLE OF CONTENTS

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

ENGINE TAILPIPE ASSEMBLY



Engine Tailpipe Assembly
Figure 1

DESCRIPTION AND OPERATION

1. Description

   A. The engine tailpipe assembly (65-70190) is a welded titanium cylinder with an attachment ring on each end. The forward ring is offset 3 degrees from the vertical. Brackets are either bonded or riveted to the outer surface for securing the thrust reverser control cable, fire detection device and wiring.

   B. The engine tailpipe assembly (65-82788) is a welded Inconel 625 acoustic honeycomb cylinder with an attachment ring at each end. The forward ring is offset 3 degrees from the vertical. Brackets are attached to the outer surface for securing the thrust reverser control cable, fire detection device, and wiring.

2. Operation

A. The tailpipe assembly carries exhaust gases and by-pass air from the engine to the thrust reverser section.

3. Leading Particulars

Length -- 44.20 inches at top (approx)
46.20 inches at bottom (approx)
Diameter -- 36.00 inches (inside, approx)
Weight: 65-70190-1 assembly -- 53 pounds (approx)
65-82788-1 assembly -- 106 pounds (approx)

CLEANING

1. Except as noted in par. A and B, clean tailpipes assemblies using procedures in 20-30-03 and standard industry practices.

A. Tailpipe Assembly 65-70190

CAUTION: CLEANING TITANIUM TAILPIPES WITH CHLORINATED SOLVENTS OR METHYL ALCOHOL IS PROHIBITED.

(1) Remove excessive dirt, oil and grease deposits by vapor degreasing, emulsion solvent cleaning or by manual solvent cleaning. For titanium tailpipes, use only nonchlorinated solvents BMS 3-2, types 1 or 2, toluene, acetone, methyl ethyl ketone or xylene.

CAUTION: WHEN USING CEE BEE ALKO OR MAJOR CLEAN, BE SURE TO REMOVE ALL TRACES OF CLEANER. RESIDUE ON TITANIUM CAN CAUSE SEVERE ETCHING OR PITTING AT TEMPERATURES ABOVE 1000°F.

(2) Alkaline clean and rinse thoroughly. Approved cleaners for titanium parts are Bon Ami, Cee Bee Alko, and Cee Bee Major Clean per 20-60-01.

(3) Remove stubborn accumulations of dirt and foreign materials by using AISI 300 stainless steel hand brush, by sanding, or by liquid abrasive blasting (vapor blast).

(a) Use vapor blast equipment similar to Pangborn Hydro-Finish Machine, Type EZ, Pangborn Corporation, Hagerstown, Maryland. Use water and grit (aluminum oxide or silicone carbide abrasive, 180 mesh or finer) mixture.

CAUTION: DO NOT VAPOR BLAST THREADED AREAS OR CONCENTRATE THE BLAST IN ANY ONE AREA.

(b) Use only clean wire brushes to clean titanium tailpipes with alkaline cleaner and mark brushes "for use on titanium only."

B. Tailpipe Assembly 65-82788

(1) Prior to washing, remove dry contaminants with a vacuum cleaner.

(2) Apply water base alkaline solution by swabbing and spraying until the core cells are filled with the cleaning solution. If needed, immerse the tailpipe in the cleaning solution for 20 to 30 minutes.

(3) Remove water base alkaline solution by spraying with warm water for 10 to 15 minutes and dry in 150°F air for 30 minutes.

INSPECTION/CHECK

1. Check tailpipe assemblies per par. A, and as required in par. B or C.

   A. General

      (1) Check for obvious defects in accordance with standard industry practices.

      (2) Check inside diameter at both ends by measuring at four diameters approximately 45 degrees apart. The average of these diameters should be 35.975 to 36.025 inches. The maximum allowed out-of-round condition is 35.94 to 36.06 inches.

      (3) Check attachment rings for flatness. Flange surfaces are to be flat within 0.020 total indicator reading (TIR).

      (4) Examine end rings for distinct blue color at mating surfaces of flanges, indicating overheat condition.

   B. Tailpipe Assembly 65-70190

      (1) Check brackets, if applicable, for security of bonding by use of a 0.005 inch or less feeler gage around periphery of doubler.

      CAUTION: DO NOT USE EXCESSIVE FORCE OR DAMAGE SURFACE FINISH.

      (2) If visual examination reveals suspected defects, perform penetrant check per 20-20-02.

   C. Tailpipe Assembly 65-82788

      (1) Check for skin-to-core delamination by noting any change in tone while tapping with a coin or similar metal object.

      (2) If visual check reveals suspected defects, perform penetrant examination per 20-20-02, or radiographic inspection.

REPAIR

1. Materials

A. Abrasive Cleaner -- Scotch-Brite, Types A and S (Ref 20-60-04)

B. Abrasive Cloth -- Aluminum oxide, 600 or finer grit

C. Adhesive -- BMS 5-42, types 1 and 2 (Ref 20-60-04)

D. Aluminum Oxide -- 100 and 320 grit

E. Argon or Helium gas

F. Coating, High Temperature -- B-2000, Koppers Co. Inc., V71191

G. Coating, Low Emissivity Gold -- BMS 10-82

H. Repair Filler for Acoustic Tailpipe -- Inconel 625 Sheet per AMS5599 annealed (thickness as required)

I. Rivets -- Blind CRES rivet, type CR, Textron Inc., Cherry Div., V11815

J. Solvent -- BMS 3-2 (Ref 20-60-01)

K. Solvent -- Aliphatic Naphtha (Ref 20-60-01)

L. Solvent -- Isopropyl alcohol (Ref 20-60-01)

M. Solvent -- Acetone, Technical (Ref 20-60-01)

N. Solvent -- Methyl Ethyl Ketone (MEK) (Ref 20-60-01)

O. Stripper -- Kelite K58C, Witco Chemical Corp., V81031

P. Tension Pins -- Hi-Shear Technology Corp., V73197

Q. Tension Pins -- 69-53709-1, or -2, or -3, V81205

R Tension Pins (burn down) -- 69-29857-3, V81205

S. Tension Pin Washers -- 69-53710-1, V81205

T. Tension Pin Washers -- AN970C6L

U. Tension Pin Nuts -- HLN1-4, Hi-Shear Technology Corp., V73197

V. Tension Pin Nuts -- 70LH1660-60, Amerace Corp., ESNA Div., V72962

W. Weld Filler Wire for Acoustic Tailpipe -- Inconel 625 per BMS 7-38, type 7 or AMS 5837

2. Repair

A. Tailpipe assembly 65-70190

NOTE: Material is titanium.

(1) Damage classification

(a) Acceptable damage - dents which do not require repair.

(b) Damage requiring minor repair - scratches, gouges, dents, cracks or punctures that may be made acceptable by limited hand repair. Limited repair normally can be accomplished without removal of part from aircraft.

(c) Damage requiring major repair - scratches, gouges, dents, wrinkles, cracks or punctures that require considerable forming, machining or welding. Stress relief is required after repair.

NOTE: Removal of circular doubler or bracket shall be considered a major repair.

(2) Damage limitations

(a) Acceptable damage - dents which do not exceed the following limitations:

1) Depth of 0.05 inch maximum in area above horizontal centerline.

2) Depth of 0.02 inch maximum in area below horizontal centerline.

3) Ratio of radial span (distance from center to edge) to depth shall not be less than 4 to 1.

4) Edge of a dent shall not be less than 2.00 inches from flanges or weld beads.

5) Minimum distance between edges of dents shall not be less than 5.00 inches.

6) All dents must be examined to ensure that no scratches, cracks or gouges are present.

(b) Damage requiring minor repair.

1) Dents that do not exceed 0.25-inch depth and have radial span to depth ratio greater than 4 to 1 can be repaired by carefully forming material back to within 0.020 inch of contour.

2) Scratches and gouges may be blended out at 20 to 1 by hand sanding with 600 grit (or finer) wet or dry aluminum oxide abrasive cloth provided depth, length or location are within following limitations.

a) Material removal to eliminate scratches or gouges shall not exceed 0.005 inch in flanges, welds or within 1.00 inch of welds. Material removal in all other areas shall not exceed 0.010 inch.

b) Surface blending for scratches or gouges in flanges, welds or within 1.0 inch of welds shall be limited to 2.00 inches of length longitudinally and 1.00 inch of length circumferentially. Surface blending for scratches or gouges in other locations shall be limited to 6.00 inches of length longitudinally and 2.00 inches of length circumferentially. There shall be a minimum distance between parallel longitudinal or circumferential scratches of 2.00 inches and minimum distance between ends of in-line scratches of 4.00 inches.

3) Minor punctures or cracks may be repaired by drilling transition fit hole, not to exceed 5/16-inch diameter, and plugging with titanium fastener. Area surrounding puncture or crack is subject to limitations for dents. Punctures or cracks in flanges, welds or within 1.00 inch of welds are excluded from this type of repair.

NOTE: Use of lead, lead base alloys, zinc, tin or cadmium plated tools, fixtures, or temporary fasteners is prohibited.

Do not machine grind any reworked areas. Fatigue life will be reduced.

(c) Damage requiring major repair.

1) Damage exceeding limitations set forth in (a) and (b) above, is in major repair category. Repairs in this category should be coordinated with Service Support Group of The Boeing Company, Renton, Washington, U.S.A. as there are limitations due to processing, metallurgical and economic considerations. This is particularly applicable when extreme overheat has been experienced.

(3) Restore finish on reworked dents, scratches, minor punctures or cracks as follows:

(a) Smooth exterior surface of damaged areas by hand sanding with 600 grit (or finer) wet or dry aluminum-oxide abrasive cloth. Feather edge areas for spot painting.

(b) Mask area so that no stripper can contact any faying surface. Strip area of BMS 5-42 primer with Kelite K58C.

NOTE: Limit total stripping time to 1 hour.

(c) Remove stripper thoroughly with an isopropyl alcohol and distilled or deionized water mixture (four parts alcohol to one part water by volume). Wipe dry with clean, soft cloth.

(d) Use one of the following high temperature coatings.

1) Apply BMS 10-82 coating (F-17.14).

NOTE: Refer to 20-30-02 for stripping of protective finishes and to 20-41-01 for explanation of F and SRF codes.

2) Apply B-2000 high temperature coating.

a) Apply coating with a good quality natural bristle brush, stroking in one direction. Avoid repeated brushing.

b) Use sufficient coating to obtain a dry film thickness of 0.001 ±0.0002 inch.

c) Allow to dry for 1 hour (minimum) at 70 to 90°F. Force dry entire part at 325 to 375°F for 1 hour (minimum).

CAUTION: DO NOT APPLY B-2000 IN AN ATMOSPHERE CONTAINING OTHER SOLVENTS OR WHEN TEMPERATURE IS BELOW 50°F AND RELATIVE HUMIDITY ABOVE 85%. APPLICATION OF COATING UNDER SUCH CONDITIONS WILL CAUSE CRATERING AND POOR ADHESION.

B. Tailpipe Assembly 65-82788

CAUTION: MATERIAL IS INCONEL 625. TOTAL REDUCTION OF INNER SKIN PERFORATED AREA, DUE TO REPAIRS, SHALL NOT EXCEED 300 SQUARE INCHES.

(1) Fusion welding repairs.

(a) Clean -- Clean damaged area for a distance of at least 1 inch on each side of the area to be weld repaired. This includes cleaning of the honeycomb core, which could be cleaned through the crack and inner skin perforations.

1) Use an approved carbon/soot remover.

2) Repeat using live steam.

3) Stop drill crack ends.

4) Vee out the crack to approximately one half the material thickness.

5) Remove discoloration from the crack and area for a distance of at least 1 inch from the crack using Scotch bright type S abrasive cleaner.

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

6) Just prior to welding, flood the 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 the crack.

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

(b) Purge -- Drill a purge gas hole as shown in the applicable repair sketch. Thoroughly purge with Argon or Helium gas at approximately 10-15 CFH for 1/2 hour prior to welding and continue purging during welding and until weld cools.

(c) Weld -- GTA weld repair using Argon or Helium gas and Inconel 625 filler wire per AMS 5837 or BMS 7-38, Type VII as follows:

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

1) A 100% penetration butt weld is required.

2) Weld bead shall be the minimum size, consistent with full penetration.

3) Tack weld to hold skin alignment.

4) If the perforated skin is to be repaired, weld fill perforation holes which are intersected by the joint and all holes which will be intersected by the weld bead. Then weld the joint as if it were a single, continuous crack.

5) Weld the purge hole shut, where used.

6) Stress relief not required.

7 If repair doublers are to be welded to skin panels, copper chill blocks shall be used in addition to argon gas backup in area of doubler to prevent skin buckling (Fig. 403).

8 If repair doubler adjoins an existing doubler, eliminate any gap by extending repair doubler and fusion weld the doublers together along the line of contact (Fig. 403).

(d) Check -- Check weld and repair area by following methods:

1) Visually check the repair using a 10-power magnification.

2) Do a dye penetrant inspection per SOPM 20-20-02 or a radiographic inspection per BSS7041 to the weld zone.

(2) Nicks, dents, pitting or corrosion on doublers and mount angles.

(a) Clean and polish area per par. B.(1).

(b) Examine for cracks, holes, and tears.

(c) For small holes, cracks or tears, clean hole and adjacent area with methyl ethyl ketone or equivalent to remove all oxides and foreign material. Weld from ends of crack toward center.

(3) Holes not exceeding 3/16-inch diameter in inner or outer skin are repaired by welding per par. B.(2)(c).

(4) Cracks up to 1-inch length in inner or outer skin.

(a) Stop drill, using No. 30 drill.

(b) Weld per par. B.(2)(c).

(5) Pitting holes in panel skins, not exceeding the following groupings, shall be repaired by welding per par. B.(2)(c).

(a) Five holes in 2- by 2-inch area.

(b) Eight holes in 6- by 2-inch area.

NOTE: If pitting exceeds these limits, repair by adding doubler per par. B.(6) following.

(6) Repair hole or puncture up to 3-inch maximum dimension in inner or outer honeycomb skin (Fig. 405).

(a) Install repair doubler over damage. Doubler shall be at least twice width and length of repair area.

(b) Use a minimum of 3 rows of alternating tension pins and plug welds in the undamaged area, installed per Fig. 408. As an option, all tension pins may be used.

(7) Repair cracks up to 6-inch length in inner or outer honeycomb skin (Fig. 406).

(a) Stop drill, using No. 30 drill.

(b) Fusion weld the crack, per B.(1).

(c) Install repair doubler over crack. Doubler shall surround crack area to allow 2 rows, minimum, of alternating tension pins and plug welds installed per Fig. 408.

(8) Repair dents up to 3-inch maximum dimension in inner or outer skin (Fig. 407).

NOTE: Repair is not required for smooth dents which do not exceed 0.04 inch deep and 2 inches across the major dimension.

(a) Clean and polish area per par. B.(1)(a).

(b) Examine for cracks. If cracks appear, repair per B.(1).

(c) Add filler in dent depression to restore original surface level of skin.

(d) Install doubler per Fig. 407. Doubler shall surround damaged area to allow 3 rows, minimum, of alternating tension pins and plug welds, installed per Fig. 408. As an option, all tension pins may be used.

(9) Repair honeycomb inner or outer skin buckling (Fig. 409).

(a) Clean and polish area per par. B.(1)(a).

(b) Tap-test around buckle to determine delaminated area. Mark outline of area.

(c) Slit buckle centerline and drill No. 30 stop holes at ends of slit.

(d) Push slit edges down against core and tack weld together. Edges must not overlap.

(e) Fusion weld slit per B.(1).

(f) Grind welds flush with skin.

(g) Attach repair doubler not exceeding 135 square inches. Use pattern of tension pins in damage area. Outside damage area use 3 rows, minimum, of alternating tension pins and plug welds installed per Fig. 408.

(h) An optional method of attaching the doubler is to fusion weld the edges, using adequate chill blocks. Outside the damage area use 2 rows, minimum, of alternating tension pins and plug welds.

(10) Repair sections of missing inner skin (Fig. 410).

(a) Clean and polish area per par. B.(1)(a).

(b) Tap-test around missing skin section to detect skin delamination. Mark outline of area.

(c) Examine area for cracks. Cut out additional skin to remove small cracks and to facilitate fit-up of filler section.

(d) Radius corners of cutout 0.06 inch minimum and remove burrs. If cracks extend beyond cutout, stop drill, using a No. 30 drill, and weld per B.(1).

(e) Insert filler in place within cutout and fusion weld per B.(1). Grind welds flush.

(f) Attach doubler not exceeding 135 square inches over filler. Use pattern of tension pins in delaminated or missing skin area. Outside damaged area use 2 rows, minimum, of alternating tension pins and plug welds installed per Fig. 408. As an option, all tension pins may be used.

(g) An optional method of attaching the doubler is to fusion weld the edges per B.(1), using adequate chill blocks. Outside the damage area use 2 rows, minimum, of alternating tension pins and plug welds.

(11) Repair tailpipe with missing or damaged honeycomb core (Fig. 411).

(a) Trim damaged area per Fig. 411.

(b) Using method 1, 2 or 3, Fig. 411, cut plug to fit trimmed area. Make from scrap panel of equal or greater thickness. If necessary, crush to required thickness.

(c) Install plug, using type 1, 2 or 3 fasteners (Fig. 408). Type 1 or 2 fasteners are optional for use outside the trimmed area.

(12) Repair circumferential cracks adjacent to existing weld (Fig. 412).

(a) Clean crack area per B.(1)(a).

(b) Leaving crack exposed, mask I.D. of perforated area for a width of 4 inches (min.) from the flange or weld bead for the entire length of the existing weld or circumference.

(c) Purge, weld, and check per B.(1)(b) thru B.(1)(d).

(13) Repair longitudinal cracks adjacent to existing weld.

(a) Clean crack area per B.(1)(a).

(b) Leaving crack exposed, mask I.D. of perforated area for a width of 4 inches from original weld for the entire length of original longitudinal joint (Fig. 413).

(c) Purge per B.(1)(b).

(d) Weld repair missing skin per Fig. 413, and 414.

(e) Weld repair crack per B.(1)(c) and Fig. 413, and 414.

(f) Check weld per B.(1)(d).

(14) Repair skin to core delamination.

(a) Drill holes for pins at approximately 0.75 inches spacing over delaminated area through both skins and at approximately 1.25-inch spacing around delaminated areas. Use inner skin perforations as a guide (Fig. 415).

(b) Clean both skins per B.(1)(a).

(c) Cut and insert pins made from Inconel 625 filler wire per AMS 5837 or BMS 7-38, Type VII, 0.045-inch minimum diameter and extending 0.04 to 0.07 beyond skins.

(d) Purge through perforated skin per B.(1)(b).

(e) Weld pin ends to skins, pressing skin against core.

(f) Visually check per B.(1)(d)1).

(15) Repair damage to inner or outer skin.

(a) Indentations that do not exhibit a sharp crease or crack in the dent, or skin to core delamination, nor exceed 0.10 inch deep and not less than 20 to 1 width to depth ratio, do not require repair.

(b) Cracks and small cuts in the skin that do not exceed 0.09 inch wide (Fig. 413, 414):

1) Clean, purge, and weld per B.(1)(a) thru B.(1)(c).

2) Add pins per B.(14) as required.

3) Check per B.(1)(d).

(16) Repair larger cuts or holes in the skin and honeycomb not to exceed 25 $in.^2$ and 8 in. maximum dimension.

(a) Trim out damaged skin and core remnants to unaffected material (Fig. 416).

(b) Cut and fit a replacement plug made from a formed panel (scrap panel) consisting of both inner and outer skin and core. Crush plug core as required to achieve skin alignment for butt welding.

Push core back 0.10-0.15 inch from weld line on both plug and tailpipe (Fig. 417).

(c) Clean weld area and plug per B.(1)(a).

(d) Fit plug in position.

(e) Purge with Argon or Helium gas and weld as follows:

1) For inner skin repair, purge with Argon or Helium gas through a purge box 2-3 minutes at 40 CFH, then weld using a #10 or larger torch cup at 40 CFH for 2 minutes prior to welding, during welding, and until weld cools.

2) For outer skin repair, purge with Argon or Helium gas through inner skin perforations, using purge box at 40 CFH for 2-3 minutes prior to weld and during weld.

(f) Tack weld plug in place.

(g) Butt weld entire joint per B.(1)(c).

(h) Visually and radiographically check the weld area per B.(1)(d).

(i) Visually check the pins per B.(1)(d)1).

3. Refinish

A. Tailpipe Assembly 65-70190

(1) B-2000 Skydrol (hydraulic fluid) resistant coating

NOTE: The most likely area of B-2000 coating deterioration is in the highest critical temperature location of the tailpipe which is located in an area 20 inches wide on the aft 19 inches of the tailpipe, centered slightly above the 9-o'clock position looking aft to forward on either engine. The high temperature may cause the B-2000 coating to separate from the tailpipe.

(a) Smooth surface of worn or damaged areas by hand sanding with fine grit wet or dry aluminum oxide abrasive cloth. Smooth edges of blend areas.

(b) Wipe with cloth saturated with water. Wipe dry with dry cloth.

(c) Apply high temperature coating per par. 2.A.(3)(d).

B. Tailpipe Assembly 65-82788

(1) No refinish required.

4. Replacement

A. Bracket (65-70190) (3 thru 7), Plate (13)

(1) Replacement of bonded parts by bonding

(a) Heat part to be removed and cylinder contact area to temperature of 350°F.

(b) Pry part loose with suitable tool taking care not to dent or scratch cylinder.

(c) Mask areas adjacent to rework to prevent damage by precleaning.

(d) Remove bonding residue by abrasive cleaning per 20-30-03, Type II, Class 1, Class 3 or Class 5.

(e) Abrade contact surfaces of cylinder and new part with Scotch-Brite, aluminum-oxide, cleaning-finishing material, very fine, Type A, or hydro-blast with 100 grit aluminum oxide, or vacu-blast with 320 grit aluminum oxide. Wipe off any loose contamination with clean dry gauze. Use rubber gloves when hydro-blasting or vacu-blasting.

(f) Drill holes per Fig. 402.

(g) Manually apply phosphate-fluoride treatment.

1) Solvent clean manually per 20-30-03.

2) Alkaline clean manually per 20-30-03.

3) Rinse thoroughly in cold water by flushing or swabbing with wet cheesecloth. Discard cheesecloth after each use.

4) Apply phosphate-flouride solution (Fig. 401) to surface using new, soft, nylon-bristle brush.

5) Rinse thoroughly in cold water by gently flushing or by very gently swabbing with wet cheesecloth. Discard cheesecloth after each use.

NOTE: Fresh incoming water used to prepare the phosphate-fluoride solution shall not contain more than 120 ppm (wt) dissolved solids.

Prepare and maintain solution as follows:

Solution Component	Make-up per 100 Gallons	Control
Water	50 gallons	
Sodium Phosphate ($Na_3PO_4 \cdot 12H_2O$)	41 pounds	
Potassium Fluoride ($KF \cdot 2H_2O$) or	17 pounds	
Potassium Fluoride (KF)	10.5 pounds	
Hydrofluoric Acid, 70 percent	2.1 gallons	
Water	Balance required	
Phosphate (PO_4-3)		1.56-1.68 oz/gal
Active Fluoride (F-) *[1]		0.50-0.81 oz/gal
Active Acidity (H+) *[2]		0.10-0.14 oz/gal
Temperature		60-100°F

NOTE: The solution shall be periodically evaluated, using suitable test panels, to determine the maximum time parts may be immersed before light powder forms. The maximum immersion time for each alloy processed shall be posted on the tank.

*[1] Active fluoride is total fluoride less fluoride equivalent of total acidity to phenolphthalein end point.

*[2] Active acidity is total acidity to phenolphthalein end point plus one-third of phosphate ion normality.

Phosphate-Fluoride Solution
Figure 401

(h) Spray rinse with warm water (minimum temperature 110°F).

(i) Remove masking.

(j) Force dry below 105°F.

NOTE: Wear rubber gloves during rinsing and drying. Wear clean, white gloves when handling parts during all subsequent operations until parts are assembled for bonding.

(k) Apply one brush coat, BMS 5-42, Type 1 liquid adhesive to faying surfaces. Allow coat to air dry at room temperature for 2 hours minimum.

NOTE: Apply BMS 5-42, Type 1, liquid adhesive to parts within 16 hours after drying operation, or parts must be recleaned.

(l) Insert BMS 5-42, Type 2 tape between faying surfaces.

NOTE: BMS 5-42, Type 1 and Type 2 both must be from lots in current use.

(m) Place thermocouples at the edge of the bond line.

(n) Install the fasteners to hold the assembly together.

(o) Apply parting film (FEP) in areas where adhesive squeeze out or flash may occur.

(p) Place heat blanket (capable of 350°F) on the interior surface of the tailpipe. The blanket size must exceed the repair edges by at least 6 inches.

(q) Place 4 to 6 layers of fiberglass (thermal) insulation over the heat blanket. Secure the heat blanket and insulation with pressure sensitive tape capable of withstanding 375°F.

NOTE: If possible: place the heat blanket over the bonding surface (on top of the FEP).

Place 4 to 6 layers of fiberglass (thermal) insulation over the heat blanket and secure with high temperature tape.

(r) Cure by locally heating bonded area 325 - 375°F for a minimum of 1 hour. Use heat blankets listed in the 737 Structural Repair Manual 51-20-6. Temperature measured at bond line.

(s) Refinish reworked area per par. 2.A.(3)(d).

(2) Replacement of bonded parts using bolts

(a) Remove parts per steps (1)(a) thru (1)(i) preceding.

(b) Position replacement bracket and doubler on tailpipe. Drill holes per Fig. 402.

(c) Install parts with lockbolts (heads inside tailpipe).

(3) Replacement of riveted channel without removing bonded doubler

(a) Drill out rivets and remove defective channel from doubler (7B). (Do not remove bonded doubler from tailpipe.)

(b) Drill holes for lockbolts through channel, doubler, and tailpipe at existing rivet hole locations. Hole diameter shall not exceed 0.187 inch at channel attach holes.

(c) Install replacement channel using titanium or unplated A-286 CRES protruding shear head lockbolts (heads inside tailpipe).

B. Bracket Assembly (65-84112) (Fig. 402)

(1) Install replacement bracket assembly using pins, washers, and nuts (14, 15, 16) with head of pins on inside of tailpipe. Tighten nuts (15) to 15-30 lb-in. Head of pins must be flush with surface of tailpipe within +0.015 to -0.020 inch.

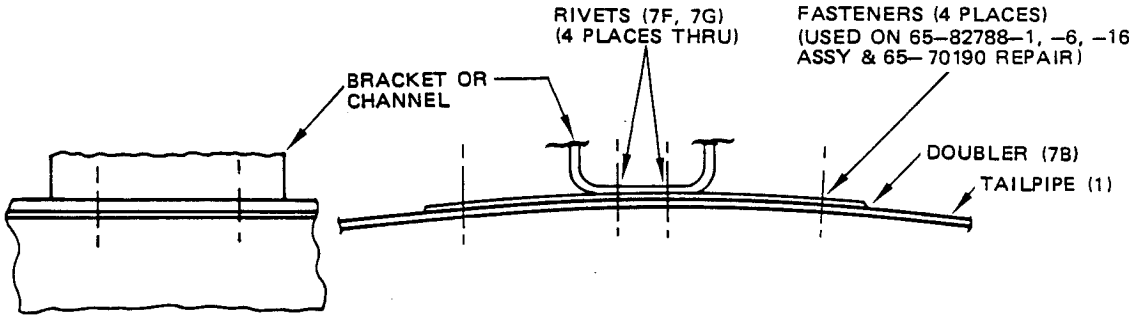
(2) Replacement of riveted bracket (channel) (7A)

(a) Remove fasteners (14, 15, 16) and remove bracket assembly from tailpipe.

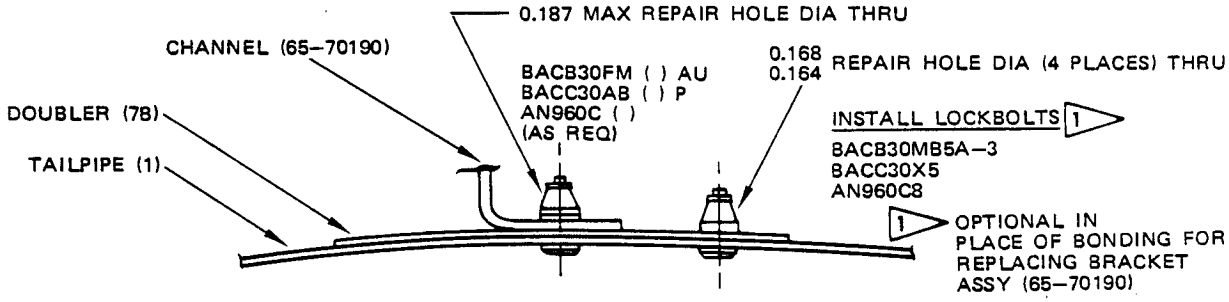
(b) Remove defective bracket (7A) from doubler (7B).

(c) Drill oversize rivet holes (0.187 dia max) as required and install replacement bracket on doubler using MS20427MC or BACR15DY rivets.

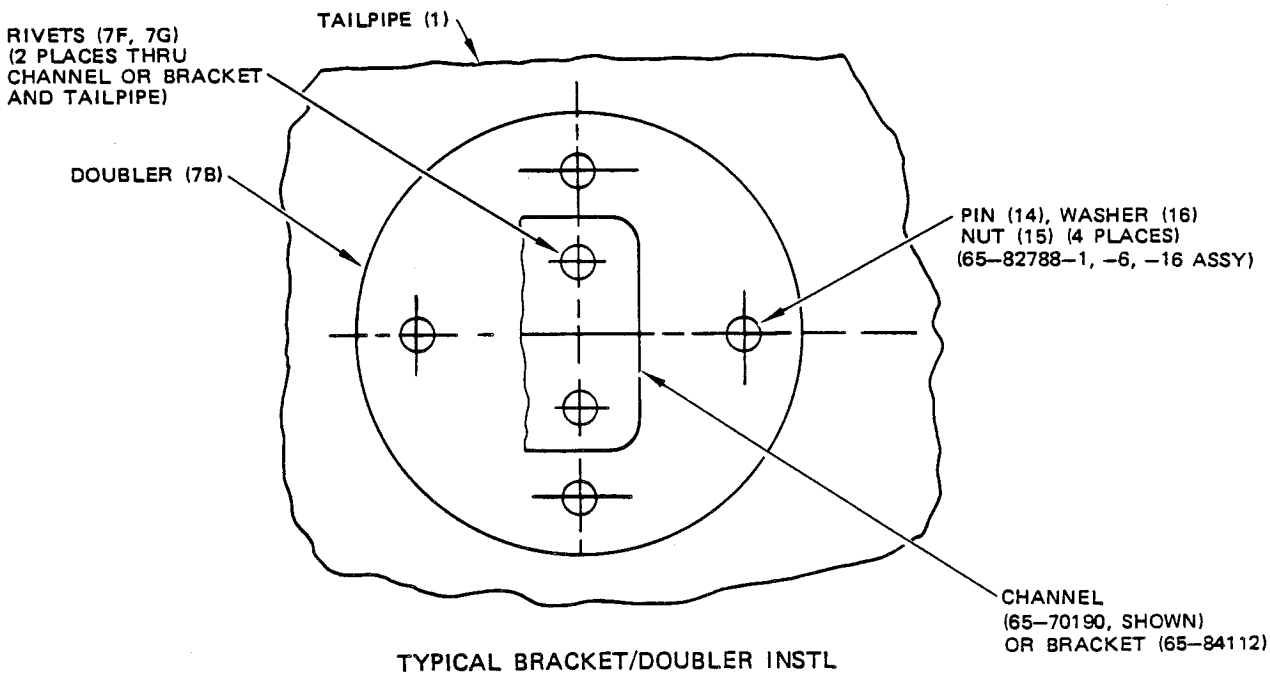
(d) Install bracket assembly on tailpipe with fasteners (14, 15, 16) per step (1) preceding.



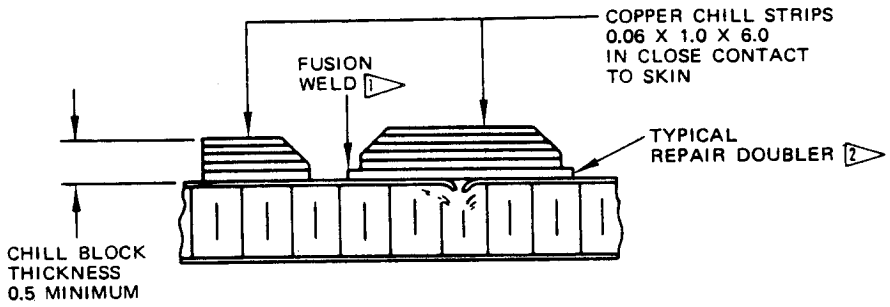
BRACKET ASSY (65–84112–1,–2,–14,–15; 65–70190–506, –507)

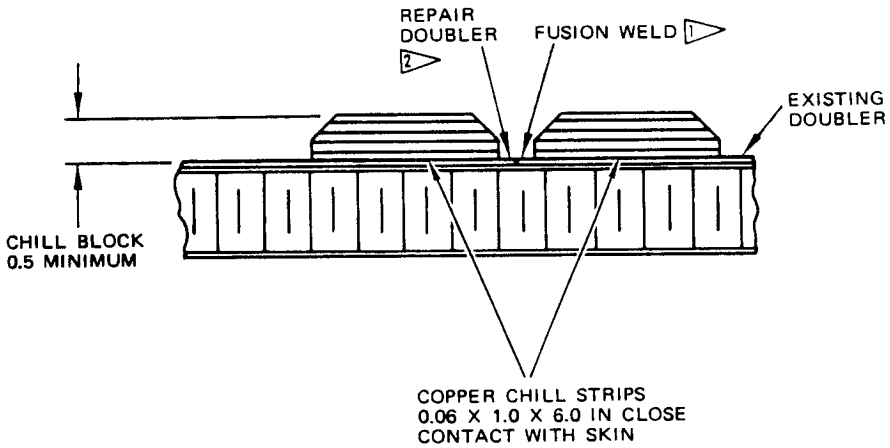


BRACKET ASSY (65–70190)



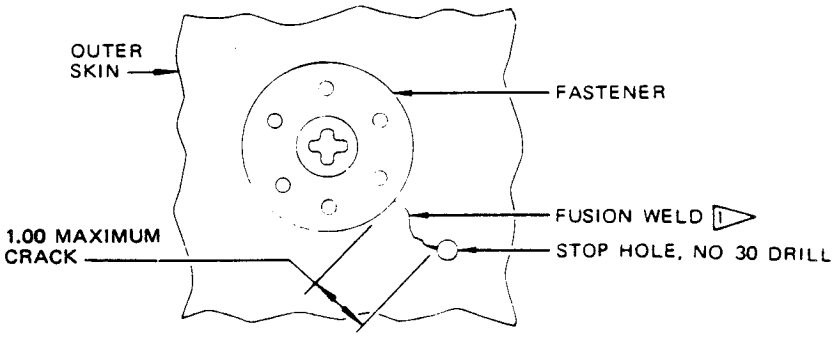
TYPICAL BRACKET/DOUBLER INSTL





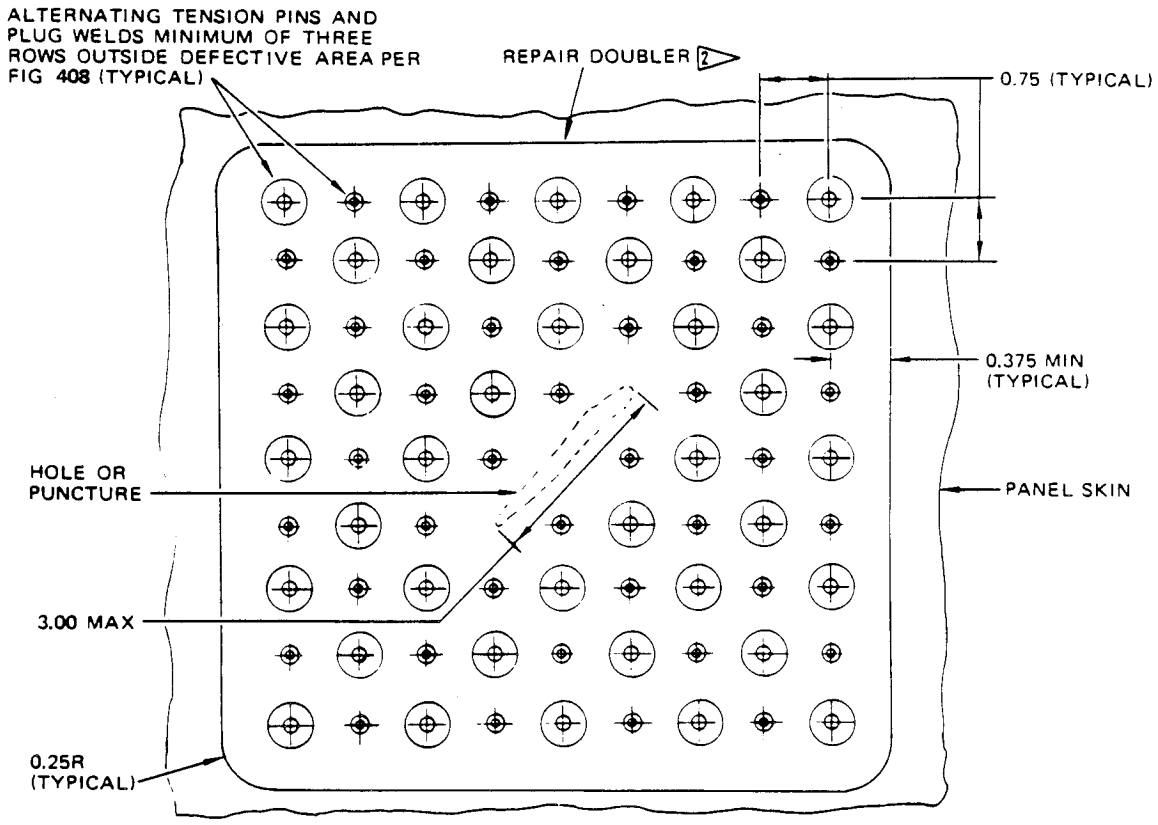
1 2 SEE FIG. 411 (SHEET 2)

ALL DIMENSIONS ARE IN INCHES



REPAIR OF CRACK AT FASTENER

Tailpipe 65-82788 Repair Procedures
Figure 404

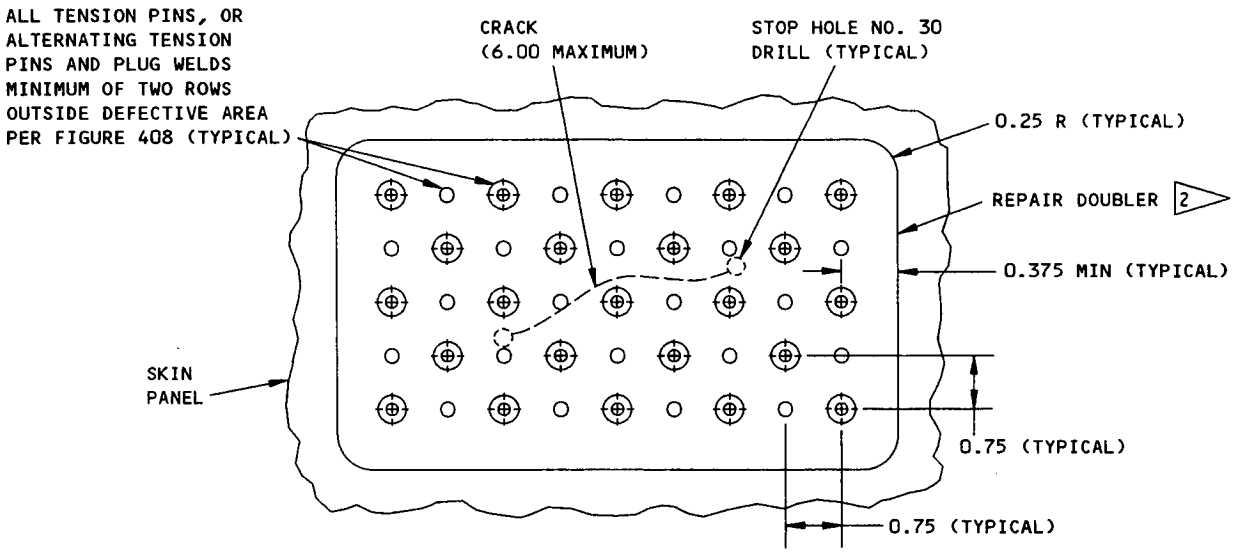


REPAIR OF 3-INCH MAXIMUM HOLE OR PUNCTURE IN INNER OR OUTER HONEYCOMB SKIN

1 2 SEE FIG. 411 (SHEET 2)

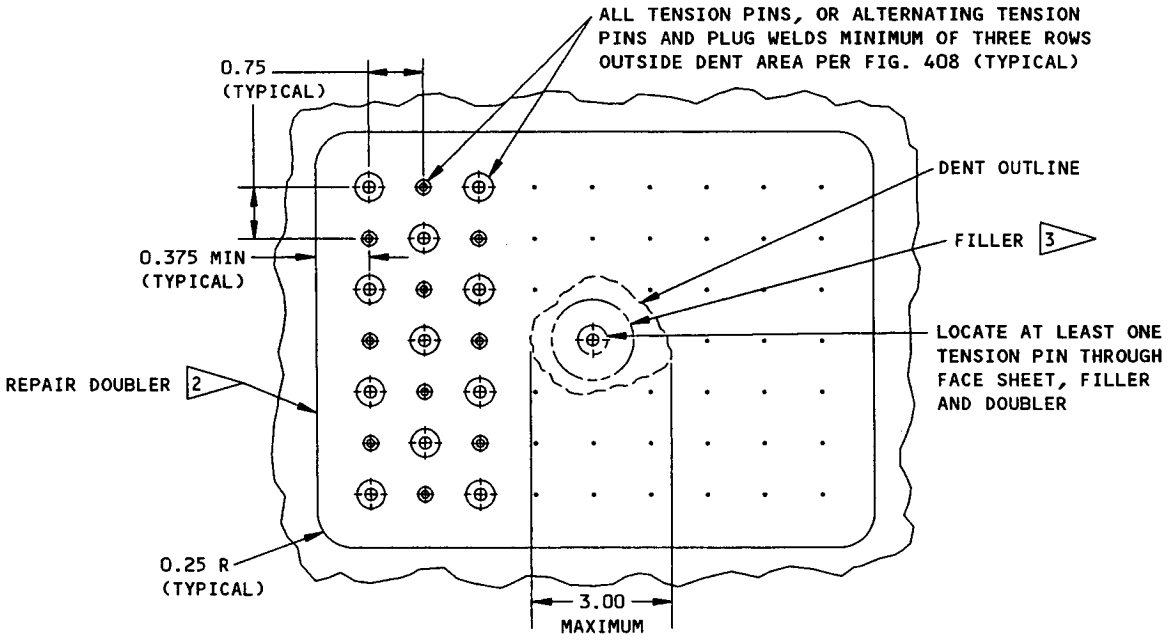
ALL DIMENSIONS ARE IN INCHES

Tailpipe 65-82788 Repair Procedures
Figure 405



REPAIR OF 6-INCH MAXIMUM CRACK IN INNER OR OUTER HONEYCOMB SKIN

Tailpipe 65-82788 Repair Procedures
Figure 406

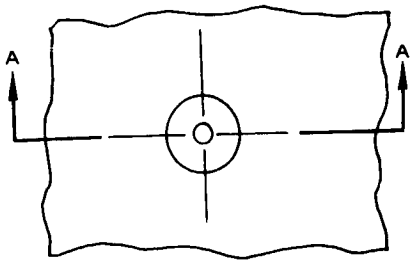


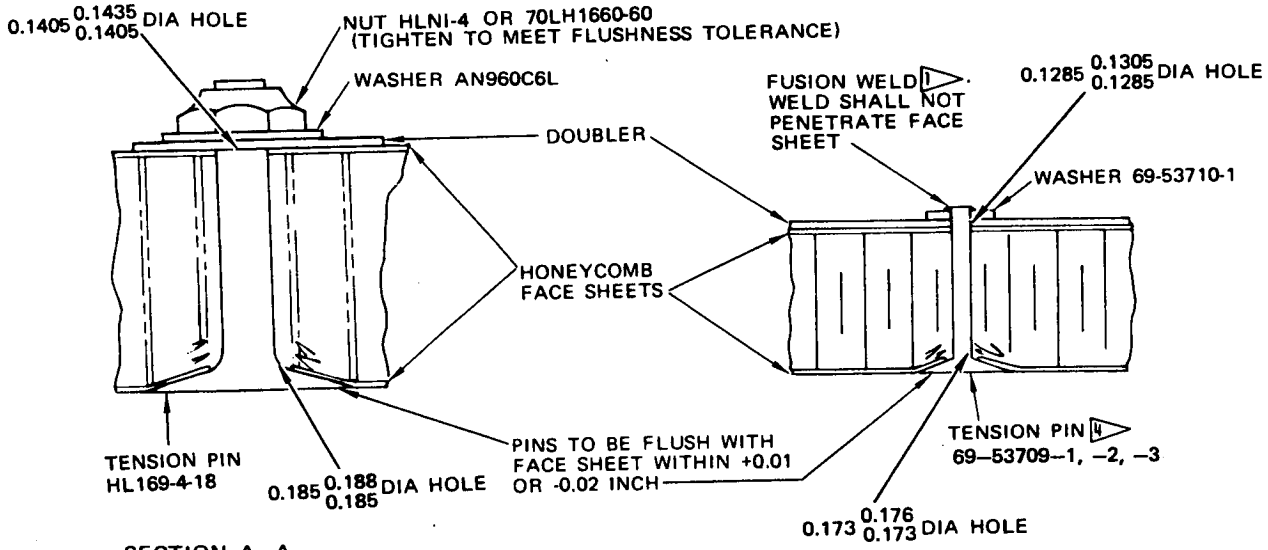
REPAIR OF 3-INCH MAXIMUM DENT IN INNER OR OUTER HONEYCOMB SKIN

1 2 3 SEE FIG. 411 (SHEET 2)

ALL DIMENSIONS ARE IN INCHES

Tailpipe 65-82788 Repair Procedures
Figure 407





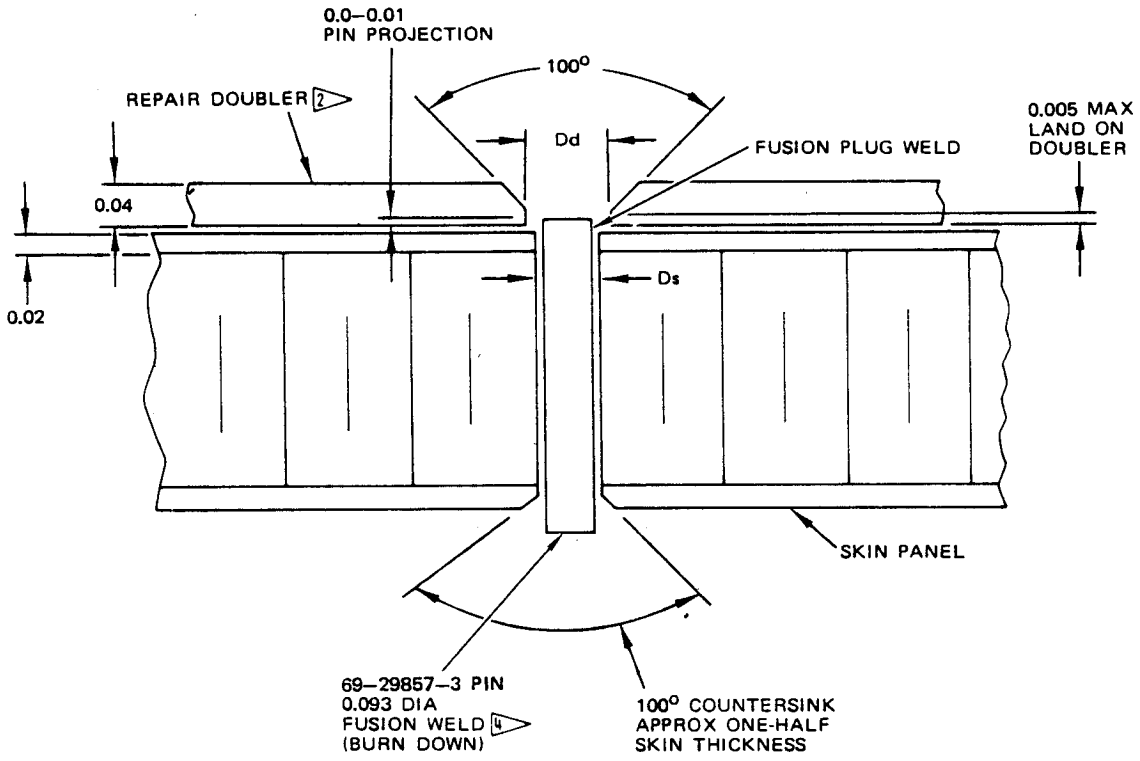
SECTION A-A
(USE FOR OUTER DOUBLER ONLY)
(TYPE 1)

OPTIONAL SECTION A-A
(TYPE 2)

TENSION PIN INSTALLATION
(NON BURN-DOWN TYPE)

SKIN AND DOUBLER ATTACHMENT METHODS

1 4 SEE FIG. 411 (SHEET 2)

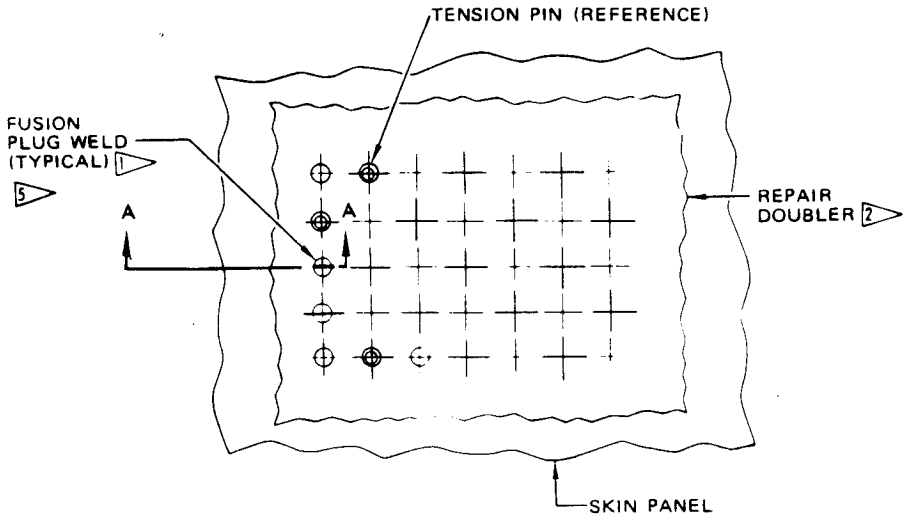


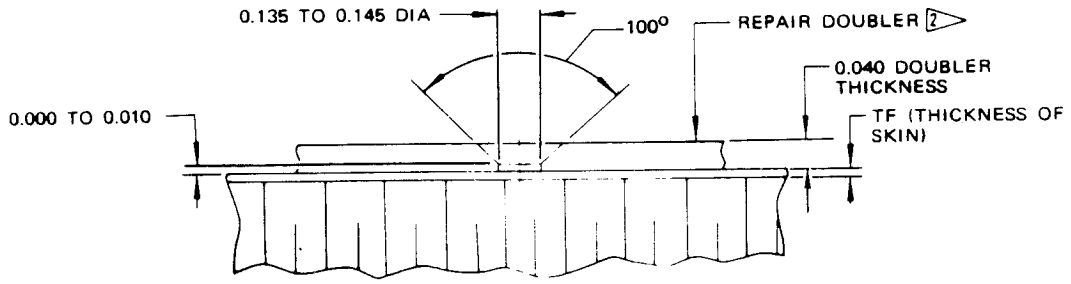
Dd: DIAMETER OF HOLE IN DOUBLER (0.135 TO 0.145 INCH)

Ds: DIAMETER OF HOLE THROUGH SKIN PANELS (0.093 TO 0.097 INCH)

2 4 SEE FIG. 411 (SHEET 2)

FUSION WELDING OF BURN–DOWN TYPE TENSION PIN
(TYPE 3)



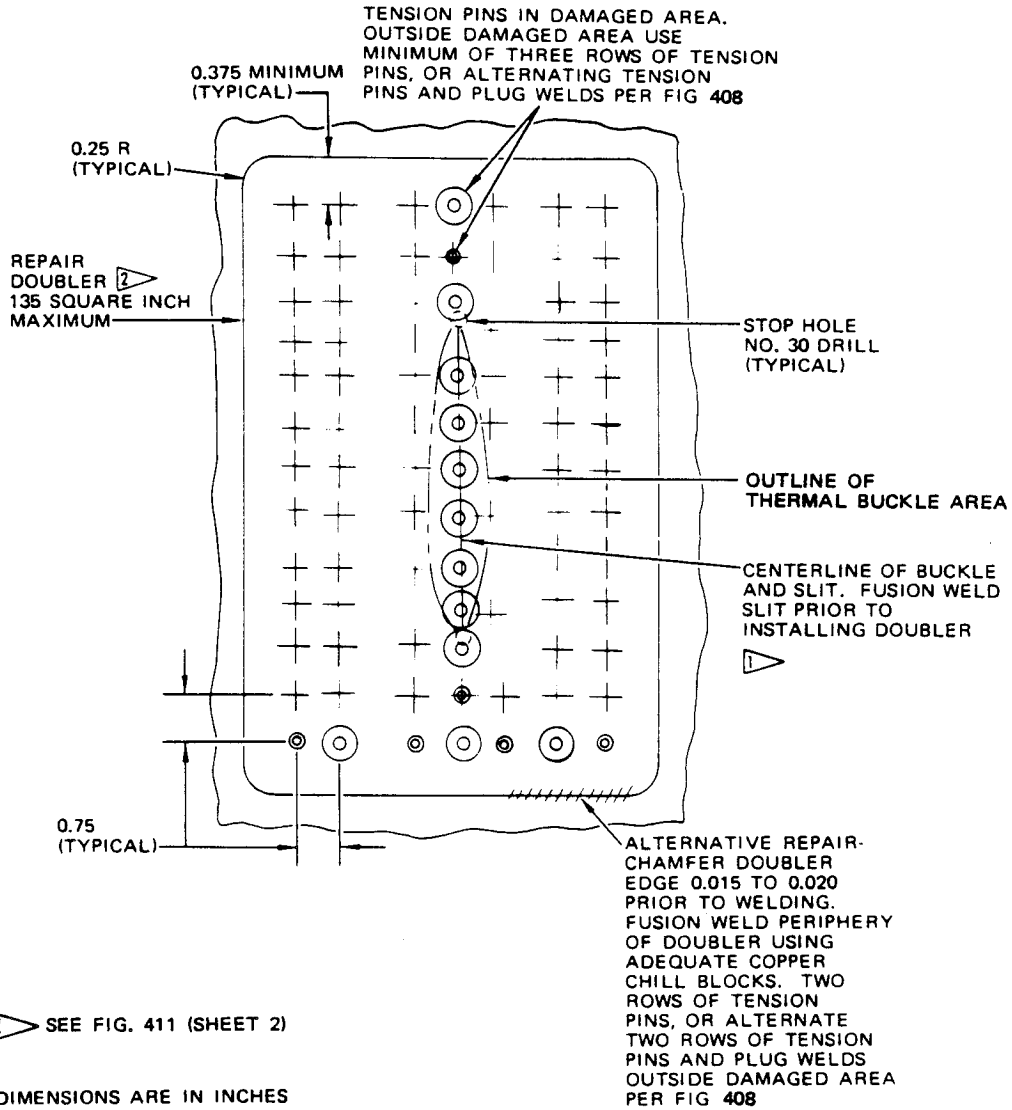


SECTION A-A

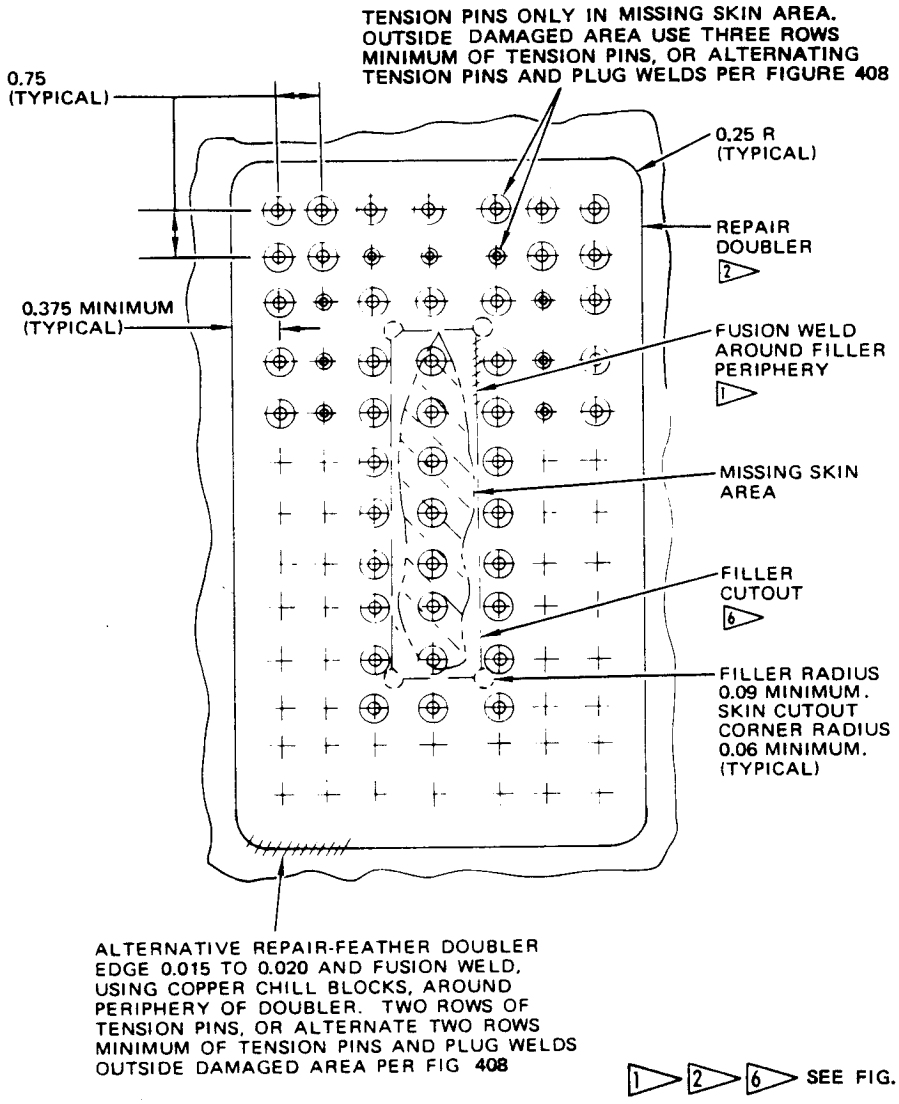
PLUG WELDING

2 5 SEE FIG. 411 (SHEET 2)

ALL DIMENSIONS ARE IN INCHES

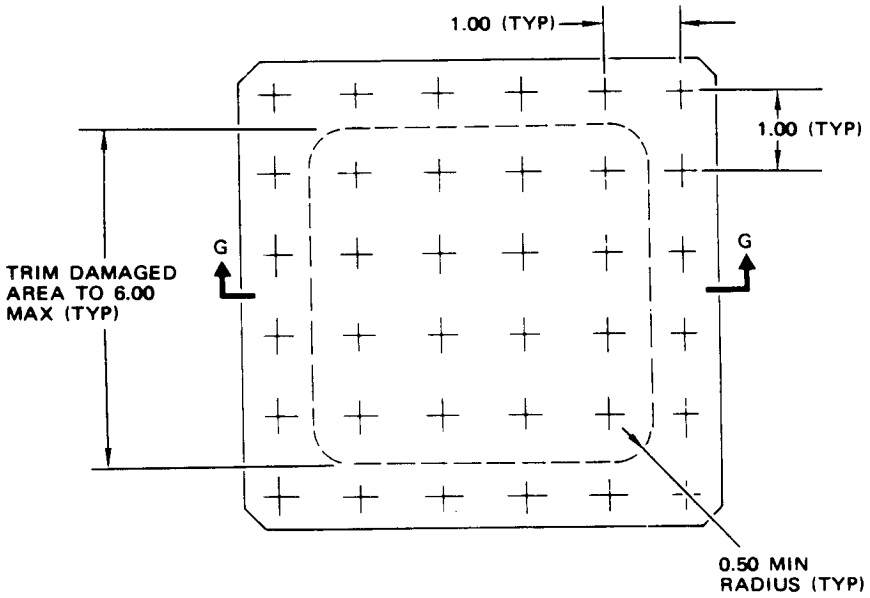


REPAIR OF THERMAL BUCKLE IN INNER OR OUTER HONEYCOMB SKIN WITH 135 SQUARE INCH MAXIMUM DOUBLER

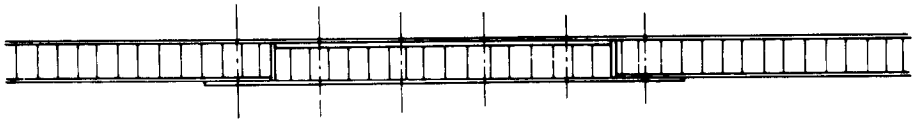


REPAIR OF MISSING INNER OR OUTER HONEYCOMB SKIN SECTION USING 135 SQUARE INCH MAXIMUM DOUBLER

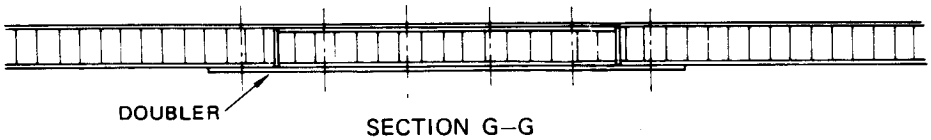
ALL DIMENSIONS ARE IN INCHES



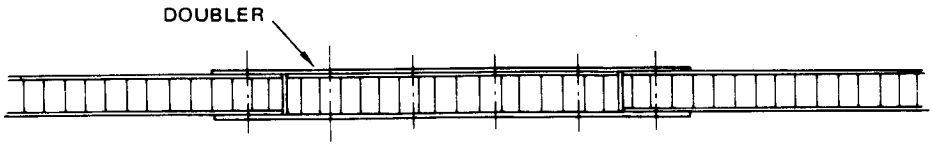
REPAIR OF TAILPIPE WITH MISSING OR DAMAGED HONEYCOMB CORE



SECTION G–G
METHOD 1
STRESS-SKIN PLUG THROUGH ONE FACE SHEET 7



SECTION G–G
METHOD 2
STRESS-SKIN PLUG
WITH DOUBLER 7



SECTION G–G
METHOD 3
STRESS-SKIN PLUG
THROUGH BOTH
FACE SHEETS 7

1 USE INCONEL 625 FILLER ROD PER BMS7-38 TYPE VIII

2 INCONEL 625 SHEET PER AMS 5599, 0-04 THICK

3 INCONEL 625 SHEET PER AMS 5599, THICKNESS AS REQUIRED

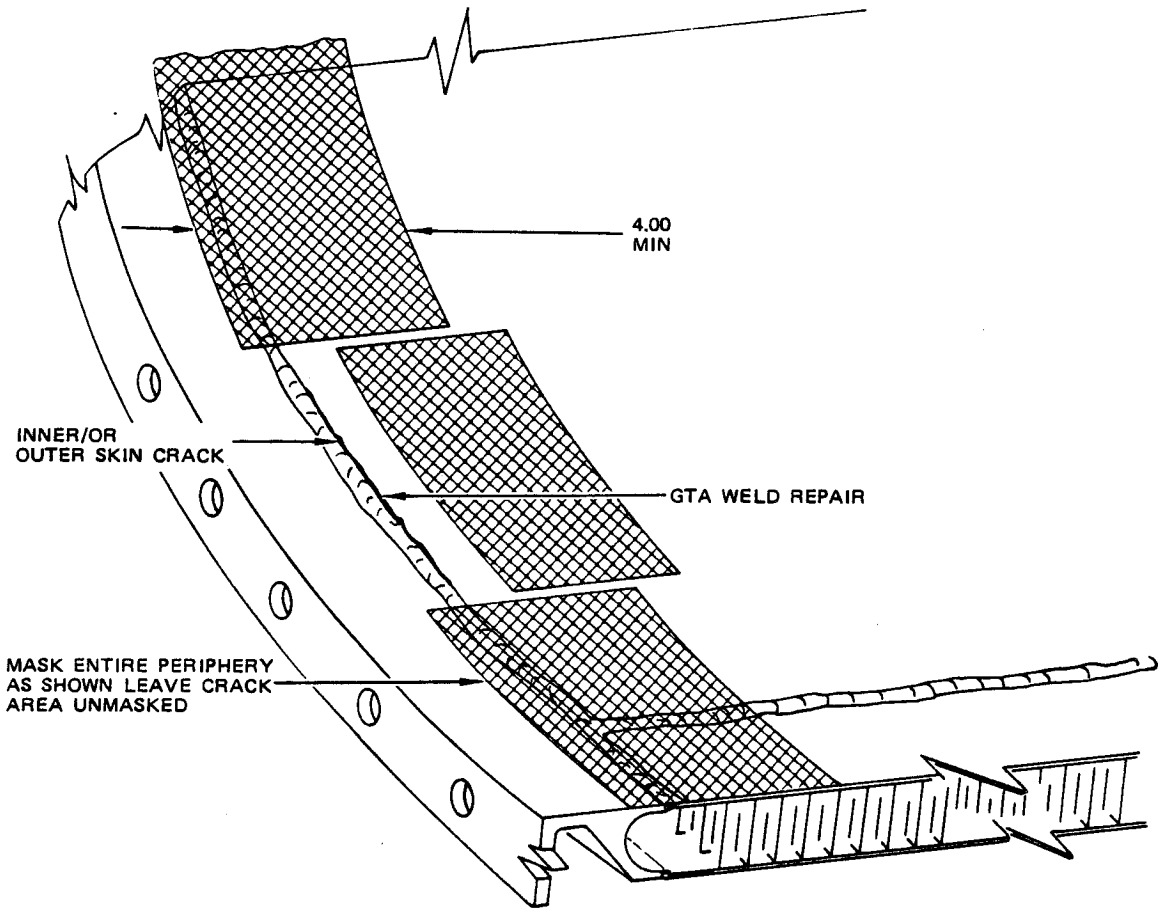
4 REMOVE PIN TIP BEFORE WELDING

5 OBTAIN 100% PENETRATION OF SKIN

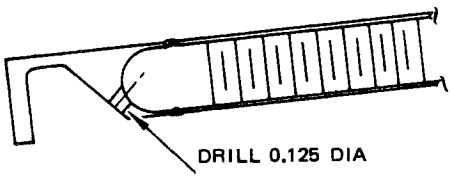
6 INCONEL 625 SHEET PER AMS 5599, 0-02 THICK

7 LOCATE FROM EXISTING RIVET PATTERN AND CORE CELL PATTERN SO BURN-DOWN TYPE TENSION PIN WILL PASS THROUGH OPEN CELL AS SHOWN. DRILL 0.0935 TO 0.0985 DIA HOLES THROUGH PANEL FROM INNER FACE DOUBLER. INSTALL 0.093 DIA PINS TO PROJECT 0.03 INCH OUT FROM DOUBLERS AND BURN DOWN WELD AS SHOWN IN FIGURE 408

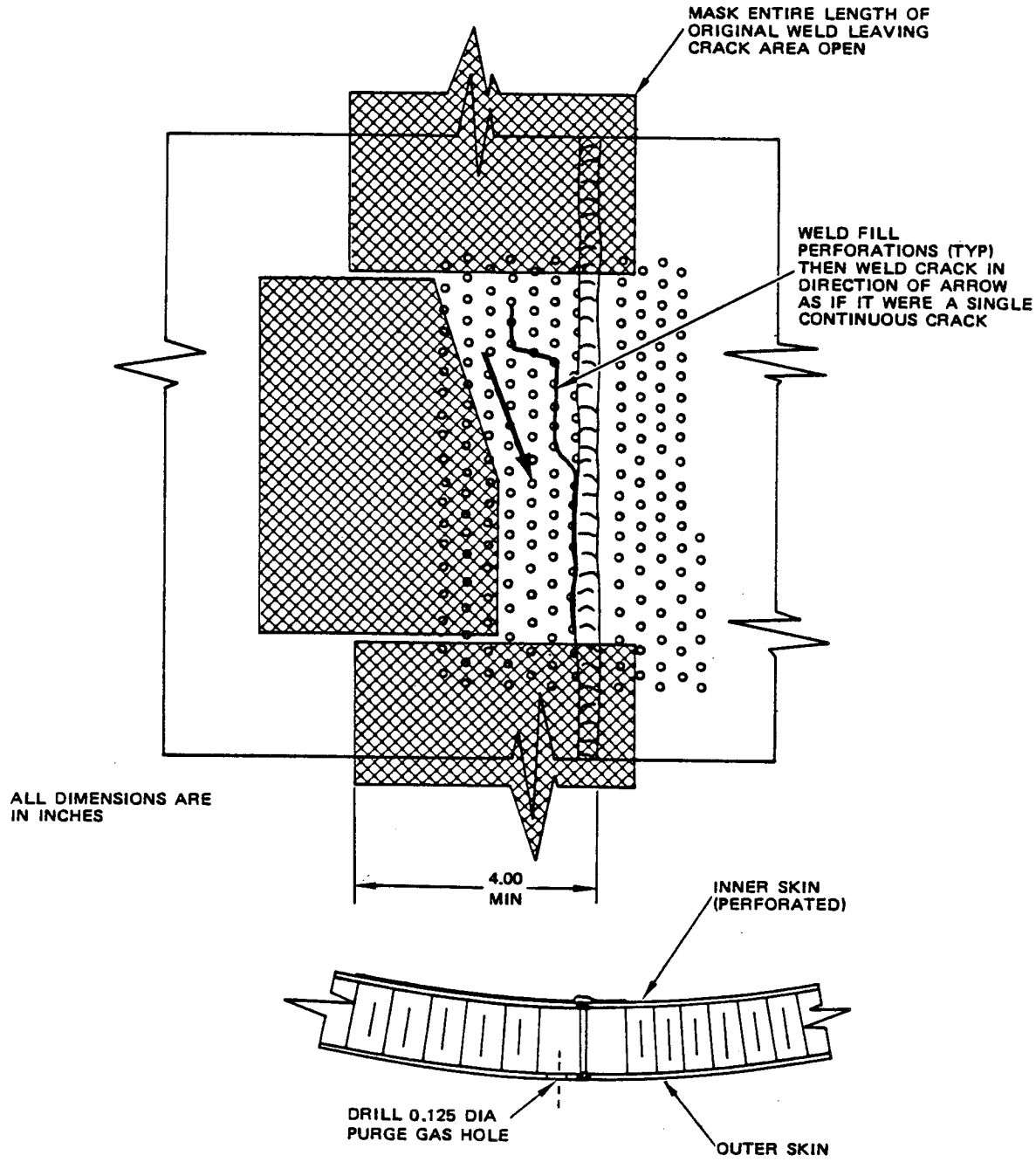
ALL DIMENSIONS ARE IN INCHES



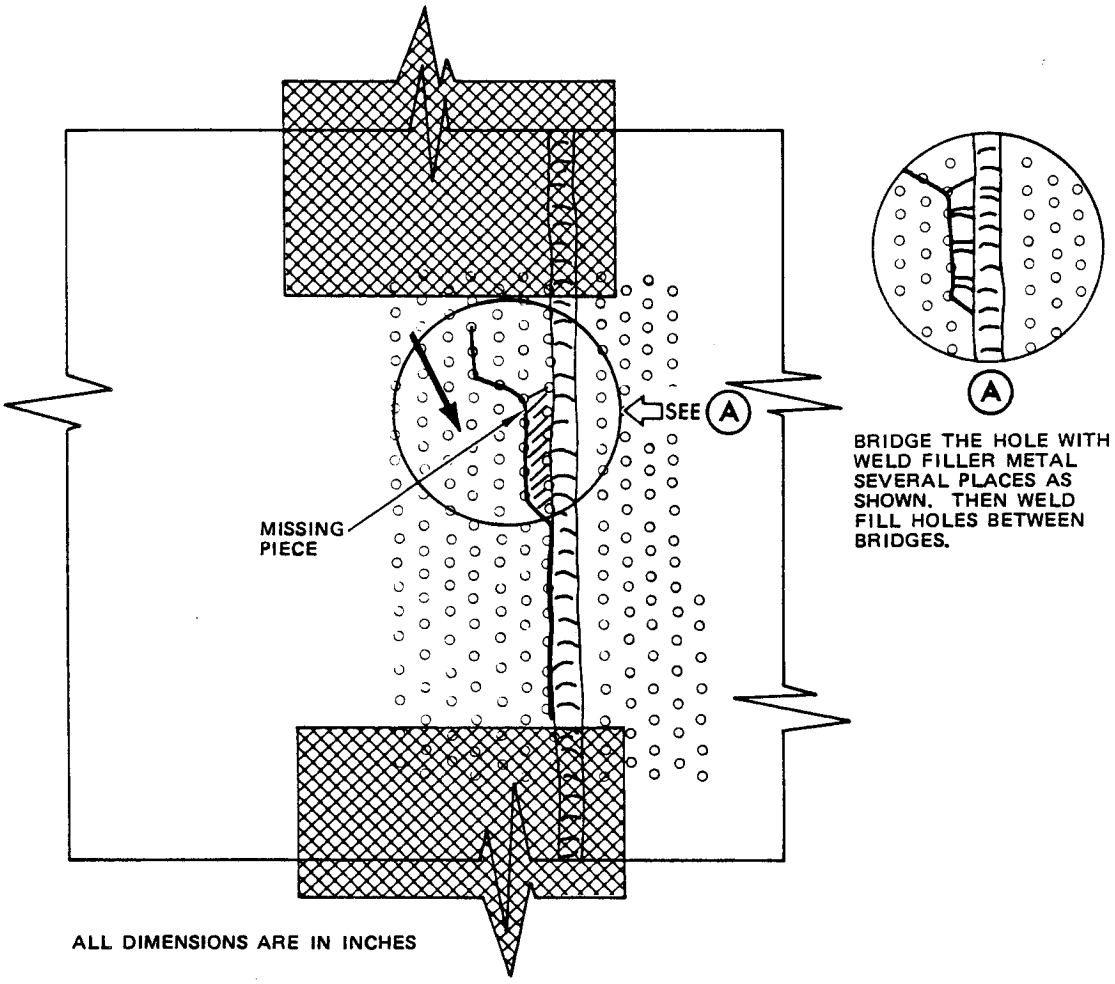
ALL DIMENSIONS ARE IN INCHES

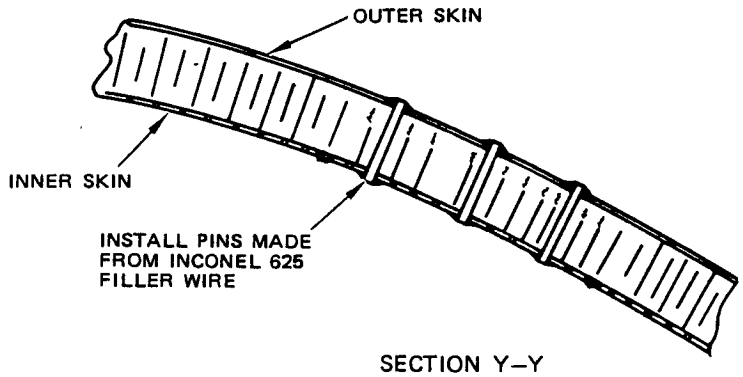


CIRCUMFERENTIAL CRACKS
ADJACENT TO EXISTING WELD

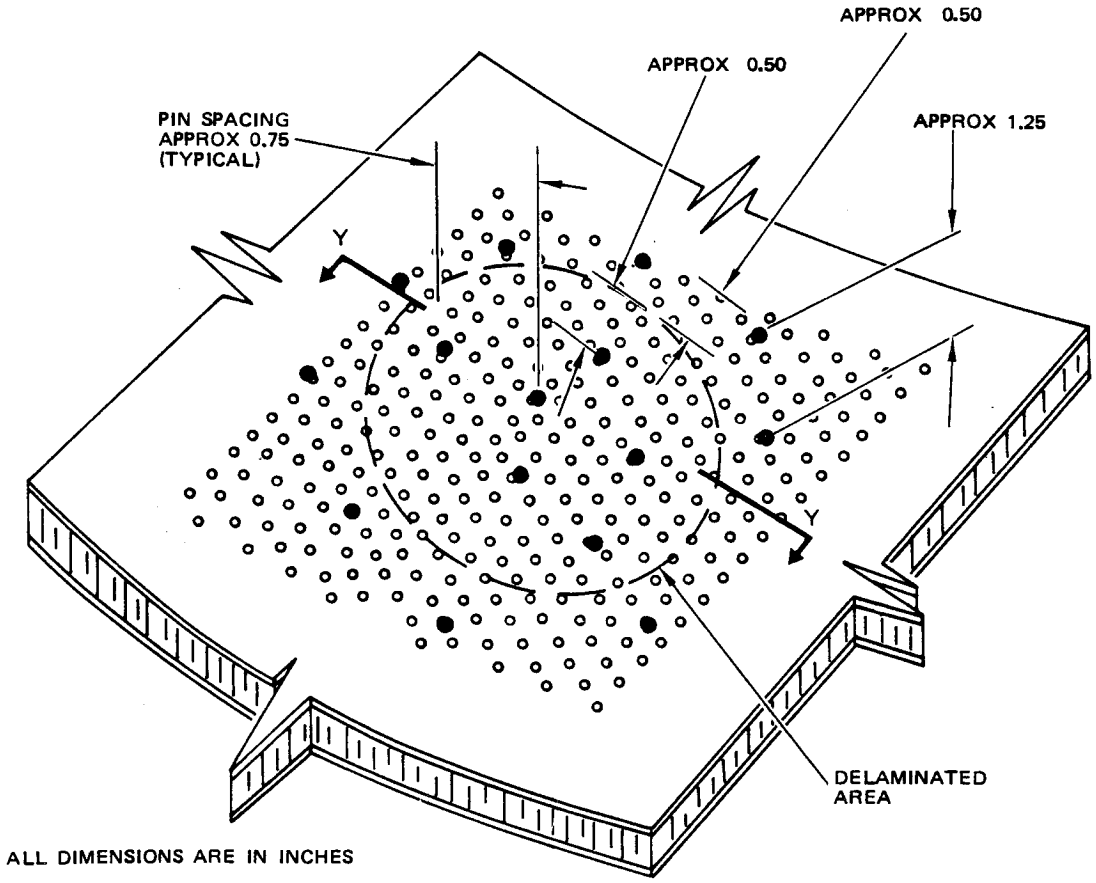


LONGITUDINAL CRACKS
ADJACENT TO EXISTING WELD

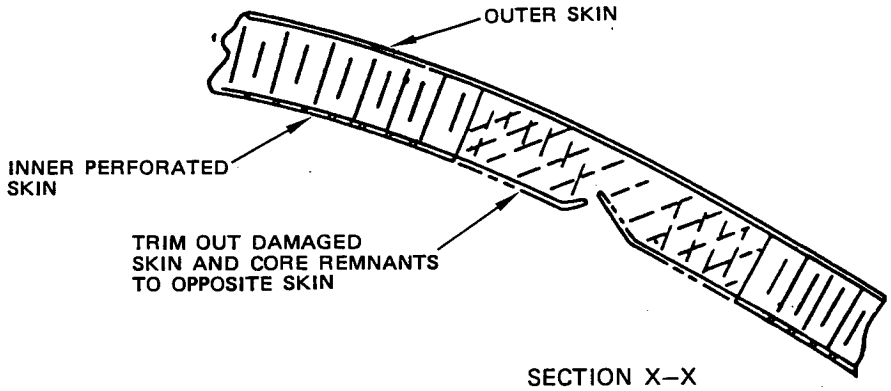

SEE (A)
MISSING PIECE
(A)
BRIDGE THE HOLE WITH WELD FILLER METAL SEVERAL PLACES AS SHOWN. THEN WELD FILL HOLES BETWEEN BRIDGES.
ALL DIMENSIONS ARE IN INCHES



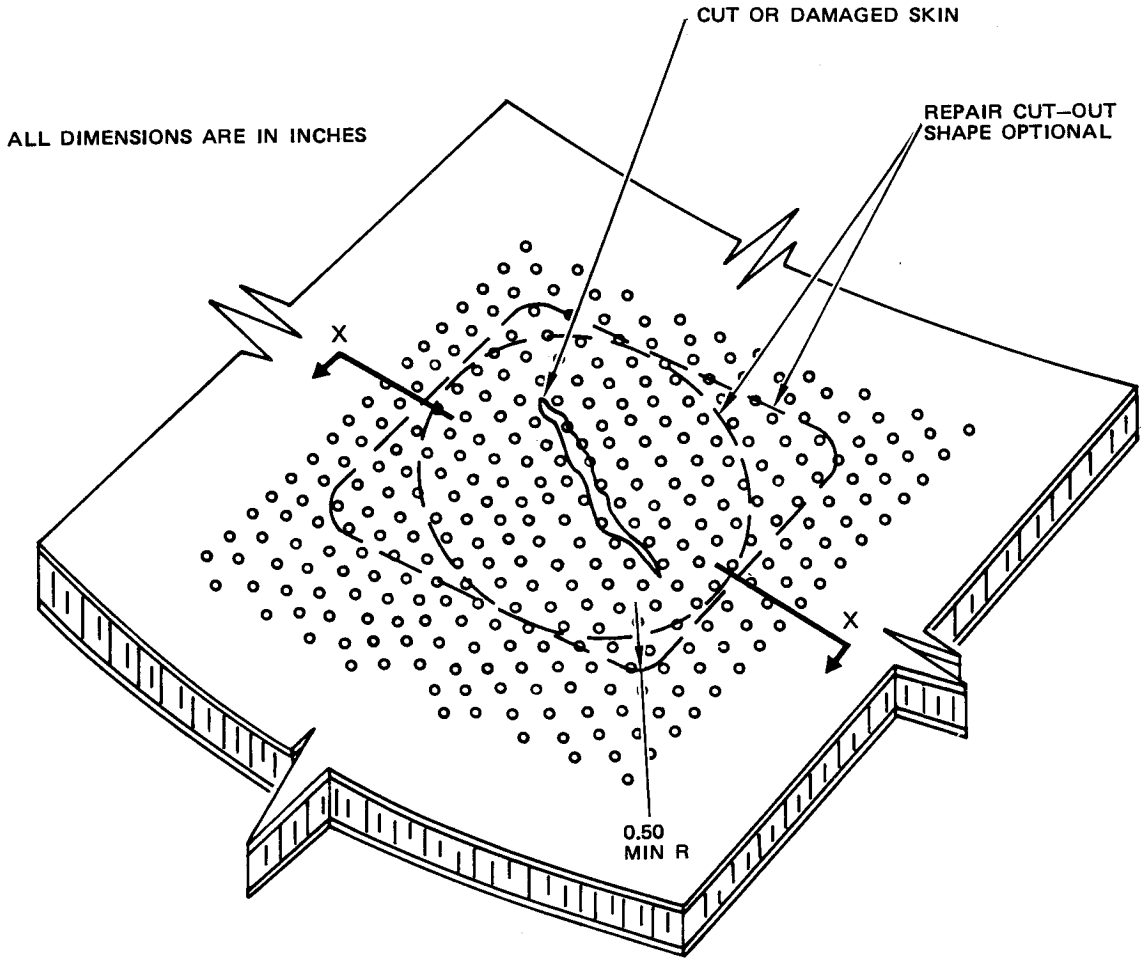
SECTION Y–Y



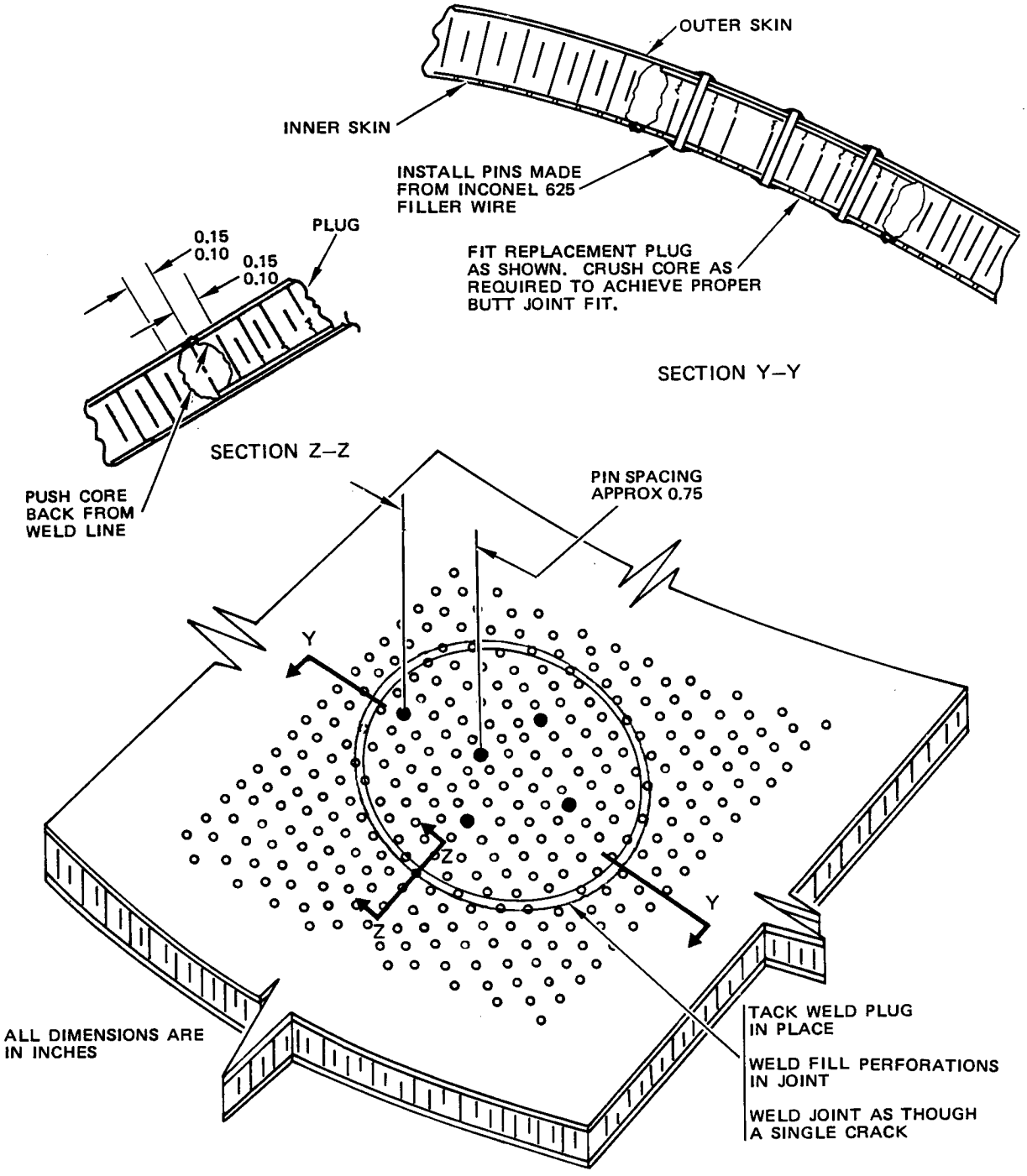
DELAMINATED SKIN REPAIR



SECTION X–X



DAMAGED SKIN REPAIR



DAMAGED SKIN REPAIR

Tailpipe 65-82788 Repair Procedures
Figure 417

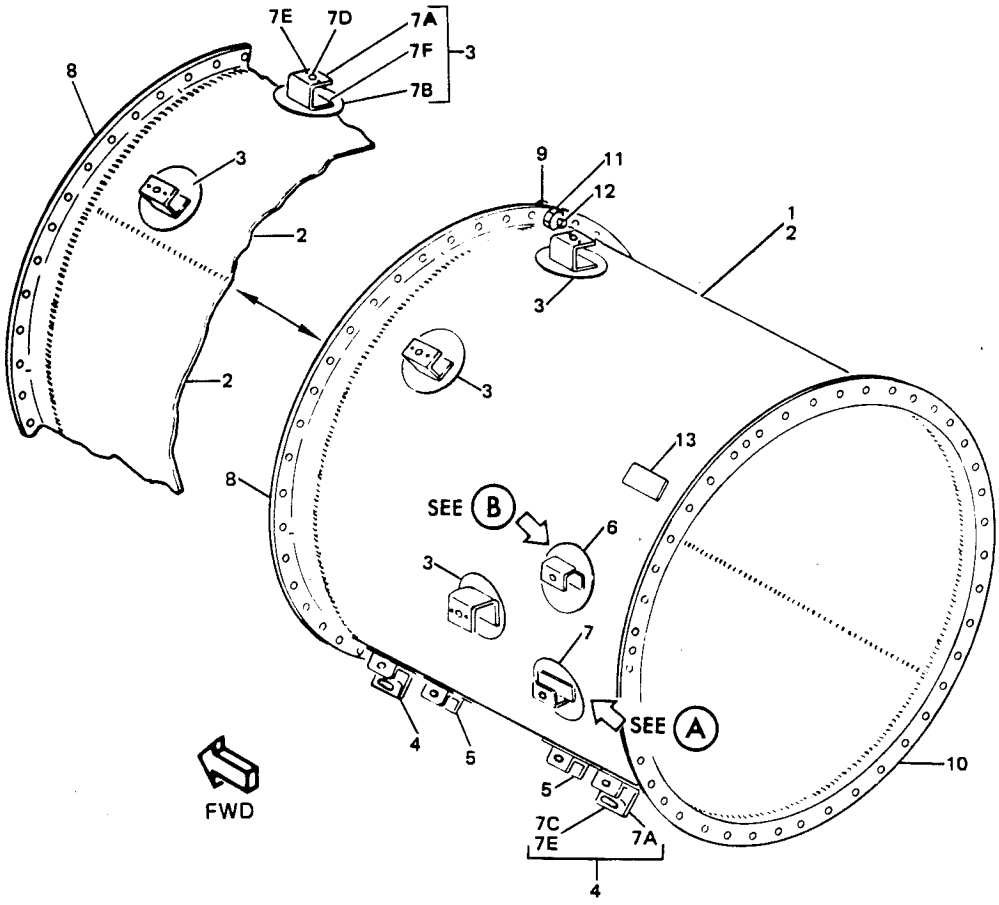
FITS AND CLEARANCES

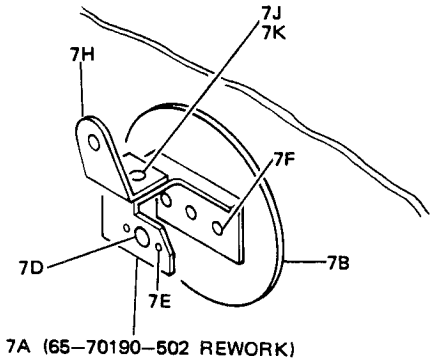
For Torque Values of Standard Fasteners, Refer to 20-50-01			
Item No. Fig. 1101	Name	Torque	
		Pound-Inches	Pound-Feet
15	Nut	7-30	

Torque Table
Figure 601

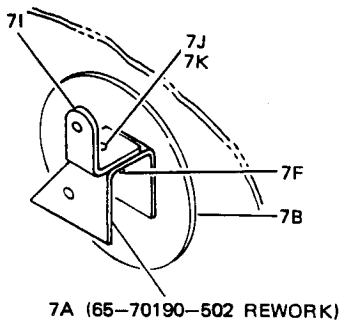
STORAGE INSTRUCTIONS

1. Wrap entire unit in vapor-barrier paper. Mark or tag with date of overhaul.
2. Enclose unit in strong container and store vertically on aft end to prevent physical damage.
3. For further information, refer to 20-44-02.

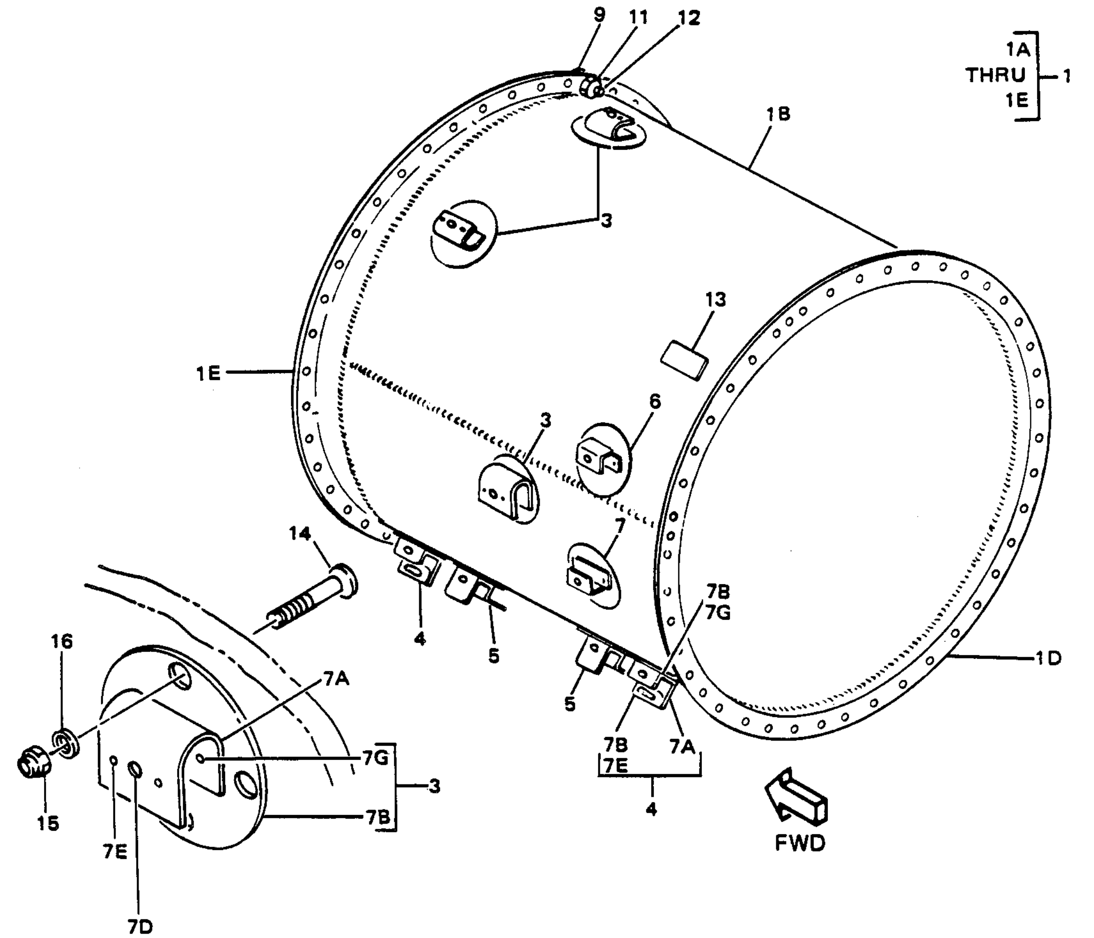

7E
7D
7A
7F
3
7B
8
3
9
11
12
1
2
2
3
2
3
13
8
SEE B
6
3
7
SEE A
4
5
10
5
7C
7E
7A
4
FWD
65–70190


7J
7K
7H
7F
7D
7B
7E
7A (65–70190–502 REWORK)

A


7J
7K
7F
7B
7A (65–70190–502 REWORK)

B



65—82788

Engine Tailpipe Assembly
Figure 1101 (Sheet 2)

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101					
	65-70190-1		ENGINE TAILPIPE ASSY (PRE SB 71-1256, 71-1221)	A	RF
	65-82788-1		ENGINE TAILPIPE ASSY (ACOUSTIC) (POST SB 71-1256, 71-1221)	B	RF
	65-82788-6		ENGINE TAILPIPE ASSY	C	RF
	65-82788-16		ENGINE TAILPIPE ASSY (ACOUSTIC)	D	RF
1	65-70190-2		. CYLINDER	A	1
1	65-82788-2		. TAILPIPE ASSY	B	1
1	65-82788-7		. TAILPIPE ASSY	C	1
1	65-82788-17		. TAILPIPE ASSY	D	1
1A	65-82788-3		. . PLATE-SPLICE (USED ON 65-82788-2, -16)		3
1B	65-82788-4		. . PANEL (USED ON 65-82788-2) *[3]		3
1B	65-82788-14		. . PANEL (USED ON 65-82788-2) *[3]		3
1B	65-82788-24		. . PANEL (USED ON 65-82788-2) *[3]		3
1B	65-82788-18		. . PANEL (USED ON 65-82788-17) *[4]		3
1B	65-82788-19		. . PANEL (USED ON 65-82788-17) *[4]		3
1B	65-82788-25		. . PANEL (USED ON 65-82788-17) *[4]		3
1B	65-82788-8		. . PANEL ASSY (USED ON 65-82788-7)		1
1D	65-82790-1		. . RING (USED ON 65-82788-2, -7)		1
1D	65-82790-3		. . RING (USED ON 65-82788-17)		1
1E	65-85885-3		. . RING (USED ON 65-82788-2, -7)		1
1E	65-85885-1		. . RING (OPT TO 65-85885-3)		1
1E	65-85885-6		. . RING ASSY (USED ON 65-82788-17)		1
1E	65-85885-8		. . RING (OPT TO 65-85885-6)		1
2	65-70190-3		. CYLINDER HALF (OPT TO 65-70190-2)	A	2
3	65-70190-505		. BRACKET ASSY	A	3
3	65-84112-13		. BRACKET ASSY	BD	3
3	65-84112-16		. BRACKET ASSY	C	3
4	65-70190-506		. BRACKET ASSY	A	2
4	65-84112-2		. BRACKET ASSY	BD	2
4	65-84112-15		. BRACKET ASSY	C	2
5	65-70190-507		. BRACKET ASSY	A	2
5	65-84112-1		. BRACKET ASSY	BD	2
5	65-84112-14		. BRACKET ASSY	C	2
6	65-70190-509		. BRACKET ASSY *[1]	A	1
6	65-84112-10		. BRACKET ASSY	BD	1
6	65-84112-18		. BRACKET ASSY	C	1
7	65-70190-510		. BRACKET ASSY *[2]	A	1
7	65-84112-9		. BRACKET ASSY	BD	1
7	65-84112-17		. BRACKET ASSY	C	1
7A	65-70190-502		. . CHANNEL (USED ON 65-70190-505) *[1] *[2]		1
7A	65-70190-503		. . CHANNEL (USED ON 65-70190-506)		1
7A	65-70190-504		. . CHANNEL (USED ON 65-70190-507)		1

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101					
7A	65-70190-511		. . CHANNEL (USED ON 65-70190-509, -510)		1
7A	65-84112-3		. . BRACKET (USED ON 65-84112-1)		1
7A	65-84112-7		. . BRACKET (USED ON 65-84112-2)		1
7A	65-84112-8		. . BRACKET (USED ON 65-84112-13)		1
7A	65-84112-11		. . BRACKET (USED ON 65-84112-9)		1
7A	65-84112-12		. . BRACKET (USED ON 65-84112-10)		1
7A	65-84112-20		. . BRACKET (USED ON 65-84112-14)		1
7A	65-84112-22		. . BRACKET (USED ON 65-84112-15)		1
7A	65-84112-23		. . BRACKET (USED ON 65-84112-16)		1
7A	65-84112-24		. . BRACKET (USED ON 65-84112-17)		1
7A	65-84112-25		. . BRACKET (USED ON 65-84112-18)		1
7B	65-70190-501		. . DOUBLER (USED ON 65-70190-505 THRU -507, -509, -510)		1
7B	65-84112-5		. . DOUBLER (USED ON 65-84112-1,-2, -9, -10, -13)		1
7B	65-84112-19		. . DOUBLER (USED ON 65-84112-14 THRU -18)		1
7C	65-84112-21		. . FILLER (USED ON 65-84112-15)		1
7C	65-70190-508		. . FILLER (USED ON 65-70190-506)		1
7D	BACN10JN3C		. . NUTPLATE (USED ON 65-84112-13, -16)		1
7D	NAS1068C3		. . NUTPLATE (USED ON 65-70190-505)		1
7E	BACR15DY3		. . RIVET (USED ON 65-84112-15)		4
7E	MS20427M3		. . RIVET (USED ON 65-70190-505) (65-84112-13)		2
7E	MS20427M3		. . RIVET (USED ON 65-70190-506) (65-84112-2)		4
7F	MS20427M5		. . RIVET (USED ON 65-70190-506, -507) (65-84112-1, -2)		4
7F	MS20427M5		. . RIVET (USED ON 65-70190-505, -509, -510) (65-84112-9, -10, -13)		2
7G	BACR15DY5		. . RIVET (USED ON 65-84112-14,-15)		4
7G	BACR15DY5		. . RIVET (USED ON 65-84112-16,-17, -18)		2
7H	65-70190-512		. CLIP *[2]		1
7I	65-70190-513		. CLIP *[1]		1
7J	BACB30DX6A2U		. BOLT, LOCK (USED WITH 65-70190-512, -513)		1
7K	BACC3006		. COLLAR (USED WITH ITEM 7J)		1

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101-					
8	65-70197-1		. RING	A	1
8	65-70197-2		. RING (OPT)	A	1
8	65-85885-1		DELETED		
9	65-70197-4		. PIN		1
10	65-70198-1		. RING	A	1
10	65-70198-2		. RING (OPT)	A	1
10	65-82790-1		DELETED		
11	BACN10GW3A		. NUT		1
12	AN960C10L		. WASHER		1
13	MS27253C1		. IDENTIFICATION PLATE		1
14	HL265-5-21		. PIN, V73197	B-D	36
15	HLN17-5		. NUT, V73197	B-D	36
16	AN960C8		. WASHER	B-D	36

*[1] BRACKET, 65-70190-509, REPLACED BY ASSEMBLY OF REWORKED BRACKET 65-70190-502, CLIP 65-70190-513, AND DOUBLER 65-70190-501 (OPT).

*[2] BRACKET, 65-70190-510, REPLACED BY ASSEMBLY OF REWORKED BRACKET 65-70190-502, CLIP 65-70190-512, AND DOUBLER 65-70190-501 (OPT).

*[3] PANELS 65-82788-4, -14 AND -24 ARE OPTIONAL. NO INTERMIX OF THESE PANELS IS ALLOWED.

*[4] PANELS 65-82788-18, -19 AND -25 ARE OPTIONAL. NO INTERMIX OF THESE PANELS IS ALLOWED.

VENDORS

V73197 HI-SHEAR TECHNOLOGY CORP., 2600 SKYPARK DR., TORRANCE, CALIFORNIA 90505