Honeywell

ENGINE MANUAL
ALF502R

VOLUME III

TURBOFAN ENGINE

PART NO.	MODEL NO.
2-003-040-03	ALF502R-3
2-003-040-05	ALF502R-3A
2-003-040-04	ALF502R-5
2-003-040-10	ALF502R-5 Serial No. Suffix "A"
2-003-040-13	ALF502R-5 Serial No. Suffix "B"
2-003-040-16	ALF502R-3A-102A
2-003-040-17	ALF502R-5-102A
2-003-040-18	ALF502R-5-103A
2-003-040-19	ALF502R-5-104A

ENGINE MANUAL

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SPINNER AND CAP – CLEANING

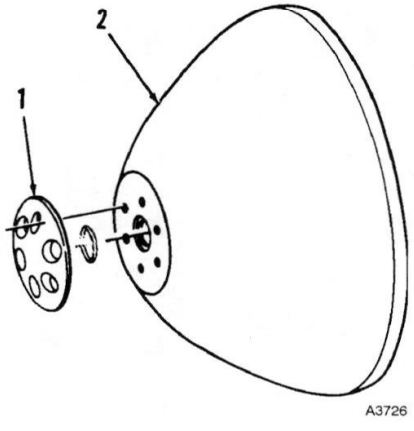
1. Spinner and Cap (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



1. CAP
2. SPINNER

Spinner and Cap
Figure 601

SPINNER AND CAP – INSPECTION/CHECK

1. Spinner and Cap – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect parts for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Cracks. Not acceptable. Replace.

         (c) Nicks, dents, burrs, and scratches. Minor nicks and dents are acceptable. Blend-repair defects. (Refer to 70-25-01, SPM.) Touch up repaired areas with alodine. (Refer to 70-30-07, SPM.)

         (d) Damaged threads on bolts. Repair. (Refer to 70-25-03, SPM.)

         (e) Deformation of spinner. Deformation not exceeding 0.100 inch (2.54 millimeter) as measured from unaffected contour is acceptable. Check balance spinner. (Refer to Repair-02.)

         (f) Anodic coating for mechanical or chemical damage. If 10 percent or more of the anodic coating is damaged, or if cosmetic improvement is desired, repair. (Refer to Repair-01 and Repair-03.)

   C. Non-Destructive Testing (NDT) (SC)

      Fluorescent-penetrant inspect spinner for cracks. (Refer to 70-20-05, SPM.) If cracks are evident, replace spinner.

SPINNER AND CAP – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-009-08/-10	-01 thru -03	None

SPINNER AND CAP– REPAIR-01

1. Replacement of Damaged Anodic Coating – Repair-01

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Strip existing anodic coating by immersion in a phosphoric-chromic acid solution at 100 ±6°C (212 ±10°F). The solution shall consist of the following:

Phosphoric acid, 85%	35 milliliters
Chromic acid (CrO_3)	20 grams
Water to make	1000 milliliters

      (2) Anodize in accordance with 70-30-10, SPM. Base alloy is 6061-T6.

SPINNER AND CAP – REPAIR-02

1. Balancing Fan Spinner – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

LTCT14623-01	Balance Arbor

B. Procedure

(1) For spinner Part Number 2-043-009-08:

(a) Position spinner on balance arbor LTCT14623-01.

(b) Static (force) balance the spinner to within 1 gram-inch by removing material from balance area A as shown in *Figure 901.*

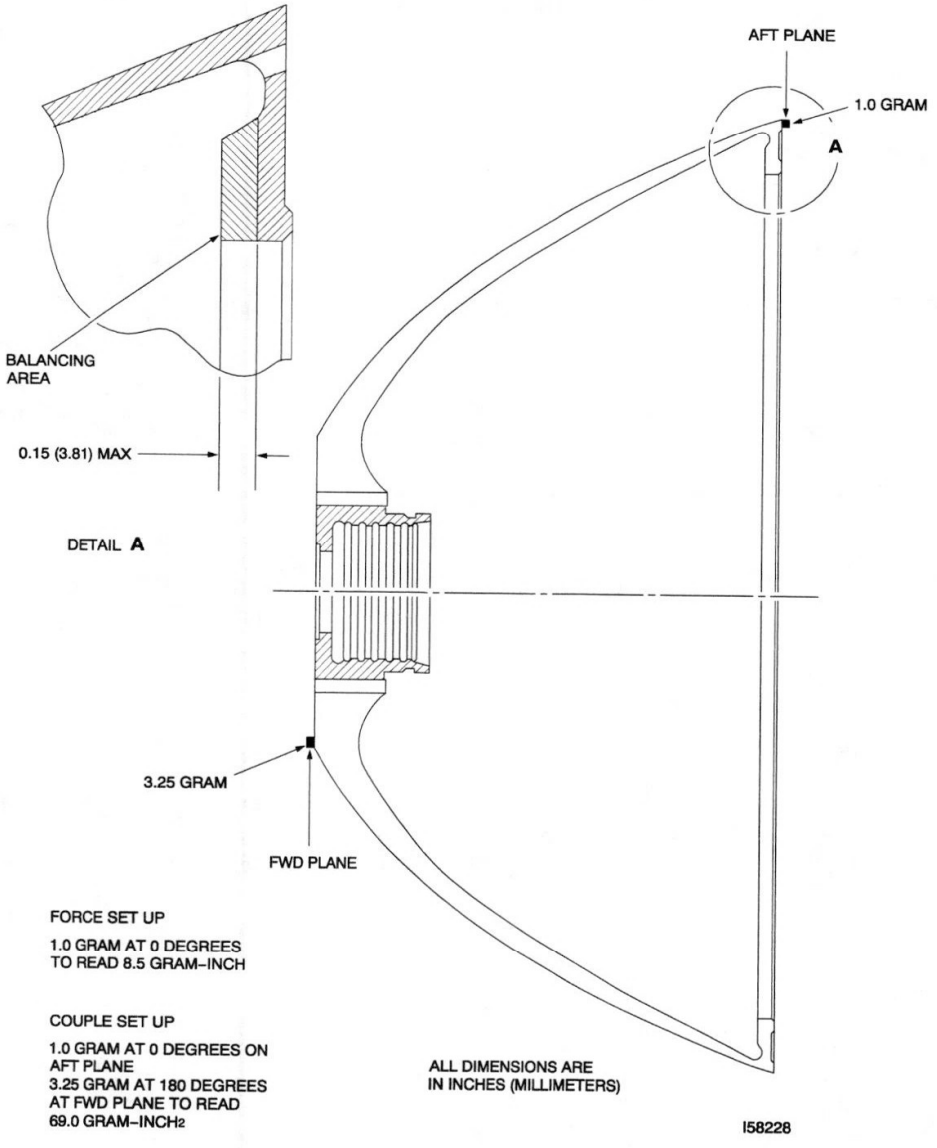
(c) Check the couple unbalance as indicated in *Figure 901.* The remaining couple unbalance shall not exceed 30 gram-inch.

NOTE: The couple unbalance can not be corrected for this spinner configuration. Replace spinner if couple unbalance is out of limits.

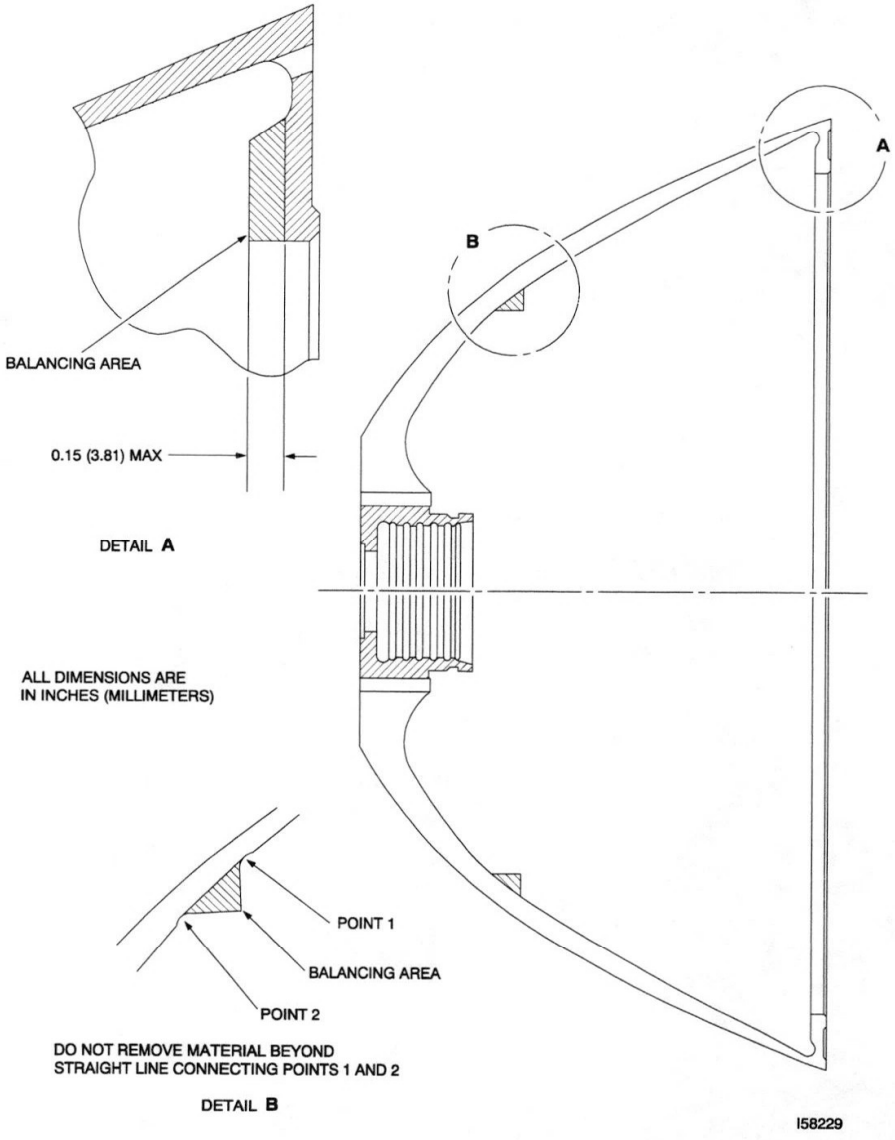
(2) For spinner Part Number 2-043-009-10:

(a) Position spinner on balance arbor LTCT14623-01.

(b) Dynamically balance the spinner using the two-plane, force-to-force balancing setup shown in *Figure 902.* Balance spinner to within 1 gram-inch in both balance planes by removing material from balance areas A and B as indicated in *Figure 902.*



Spinner Assembly 2-043-009-08
Figure 901



Spinner Assembly 2-043-009-10
Figure 902

SPINNER AND CAP – REPAIR-03

1. Painting of Spinner and Cap – Repair-03

NOTE: Refer to Repair-00 for part number application. This procedure is optional and may be performed at the operator's discretion.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Impact-resistant Primer (515X349)	
Impact-resistant Urethane Top Coat, Black (822K002)	
Impact-resistant Urethane Top Coat, Tinted White (831K055)	
Impact-resistant Urethane Top Coat, Untinted White (821X820)	
Tape, Masking	10-22

NOTE: The coatings selected for this procedure are impact resistant for maximum longevity. They can not be removed by plastic bead media blasting. They may be obtained from Courtlands Aerospace, 5430 San Fernando Road, Glendale, CA 91203 (818)240-2060.

B. Procedure

(1) Remove spinner from engine. (Refer to 72-01-01, Removal.)

(2) Alternative to removing spinner:

(a) Remove spinner cap and paint separately.

(b) Fabricate a mask out of cardboard or other suitable material as shown in *Figure 901.* The mask shall fit into the gap between the aft end of the spinner and the retaining ring and shall cover the fan blades completely. If necessary, mask the fan outer support structures also.

(3) Degrease spinner and cap. (Refer to 70-15-14, SPM.)

(4) Using tape or other suitable masking material, mask the flat surface on the forward end of the spinner.

(5) Mask aft side and bolt holes on cap.

(6) Mask aft and internal surfaces of spinner.

1. B. (7) Inspect anodic coating on spinner and cap. Touch up minor local damage. (Refer to 70-30-07, SPM.) If more than 10 percent of the anodic coating is damaged, replace anodic coating. (Refer to Repair-01.)

(8) Prepare and apply primer to spinner and cap using suitable spray equipment in accordance with the manufacturer's instructions. Allow to dry.

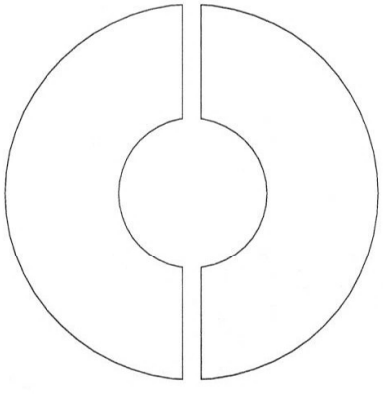
(9) Mask spinner and cap as desired for final appearance of spinner. The final appearance of the spinner shall be determined by the operator.

(10) Prepare and apply top coat to spinner and cap using suitable spray equipment. Allow to dry.

NOTE: Total coating thickness shall not exceed 0.004 inch (0.10 millimeter).

(11) Remove masking and inspect spinner and cap for maskant leakage. Touch up as required.

(12) Assemble spinner and cap. (Refer to 72-01-01, Installation.)



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Fan Blade Mask
Figure 901

FAN BLADES RETAINING RING – CLEANING

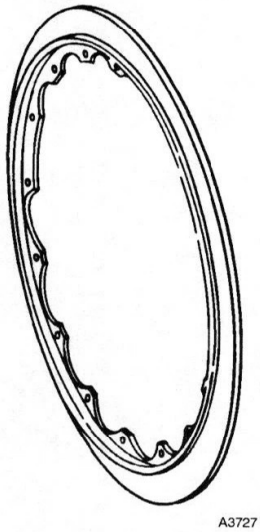
1. Fan Blades Retaining Ring (*See Figure 601*) – Cleaning

   A. Equipment and Material

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



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Fan Blades Retaining Ring
Figure 601

FAN BLADES RETAINING RING – INSPECTION/CHECK

1. Fan Blades Retaining Ring – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

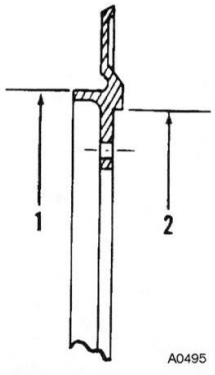
      (2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) If cracks are noted, replace.

      (3) Dimensionally inspect. (*Refer to Table 801 and Figure 801.*) Replace or repair if dimensions cannot be met. (Refer to Repair-01.)

Table 801. Fan Blades Retaining Ring Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		REFER TO FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
					801
OD*	15.1986 (386.044)	15.2000 (386.080)			1
ID*	14.7400 (374.396)	14.7422 (374.452)			2

*Dimensional inspection required only if visual inspection indicates obvious damage.



Fan Blades Retaining Ring Dimensional Inspection Locations
Figure 801

FAN BLADES RETAINING RING – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-104-02/-03/-04	-01	None

FAN BLADES RETAINING RING – REPAIR-01

1. Repair of 15.1986 to 15.2000 Inch (386.044 to 386.080 Millimeter) Diameter – Repair-01

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Ethyl Alcohol	07-19
Plasma Spray	06-20

B. Procedure

CAUTION: DO NOT MACHINE OFF MORE THAN IS NECESSARY TO PROCESS PART.

(1) Machine the minimum amount necessary to true up the diameter and obtain a 0.003 to 0.010 inch (0.071 to 0.25 millimeter) plasma spray buildup thickness after final machining.

(2) Using ethyl alcohol, clean repair area.

NOTE: Retaining ring is composed of titanium alloy.

(3) Prepare, mask, and grit blast retaining ring. (Refer to 70-50-01, SPM.) Remove all grit blast residue.

CAUTION: IF REPAIR AREA IS NOT PLASMA SPRAYED WITHIN TWO HOURS AFTER SURFACE CLEANING AND PREPARATION, REPAIR AREA MUST BE RESURFACED.

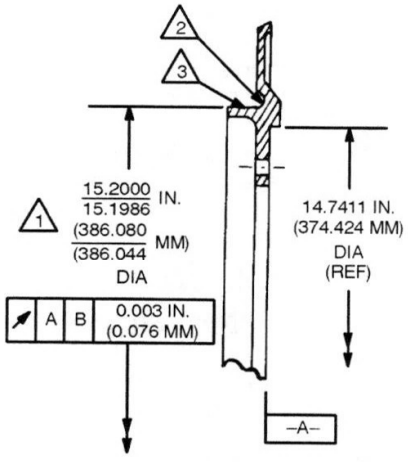
PLASMA SPRAY BUILDUP IS NOT ALLOWED IN RADIUS. (*SEE FIGURE 901.*)

(4) Immediately plasma-spray repair area. (Refer to 70-50-01, SPM.)

(5) Machine to specified dimensions. (*See Figure 901.*)

(6) Coat repaired area with graphite varnish. (Refer to 70-30-11, SPM.)

(7) Inspect fan blade retaining ring. (Refer to Inspection/Check.) All inspection requirements must be met.



1. DIMENSION APPLIES BEFORE COATING
2. NO BUILD–UP OF PLASMA–SPRAY ALLOWED IN RADIUS
3. COAT THIS AREA IN ACCORDANCE WITH 70–30–11, SPM

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Final Machining Dimensional Requirements
Figure 901

FAN DISC NUT – CLEANING

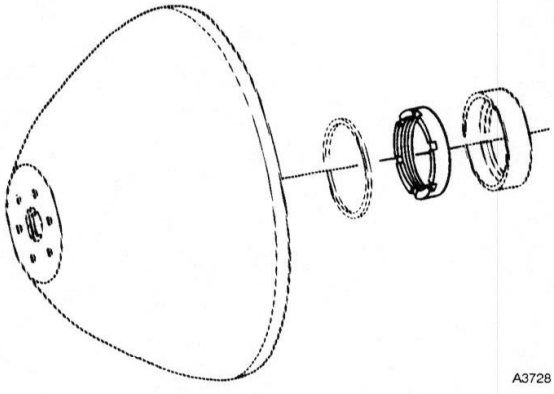
1. Fan Disc Nut (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Fan Disc Nut
Figure 601

FAN DISC NUT – INSPECTION/CHECK

1. Fan Disc Nut – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Thread damage. Repair. (Refer to 70-25-03, SPM.)

      (2) Magnetic-particle inspect for cracks. (Refer to 70-20-03, SPM.) If cracks are noted, replace.

FAN DISC LOCKING CUP – CLEANING

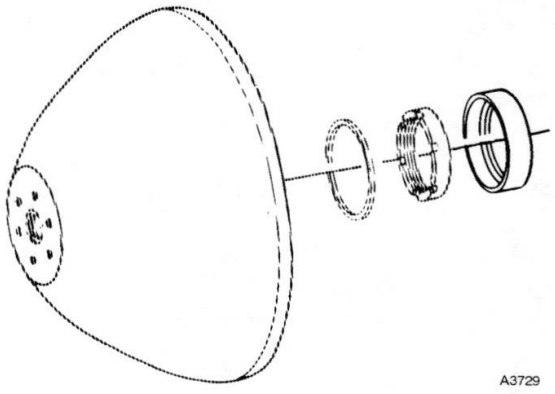
1. Fan Disc Locking Cup (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method. (Refer to 70-15-01, SPM.)



Fan Disc Locking Cup
Figure 601

FAN DISC LOCKING CUP – INSPECTION/CHECK

1. Fan Disc Locking Cup – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      Visually inspect rim of locking cup for number of locking impressions. If it is evident that locking cup has been reused three times, it shall be replaced. If locking cup has been used twice or less, straighten rim of locking cup. (Refer to 72-25-10, SPM.) Inspect reworked locking cup for cracks. Cracks are not allowed.

FAN DISC – CLEANING

1. Fan Disc (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

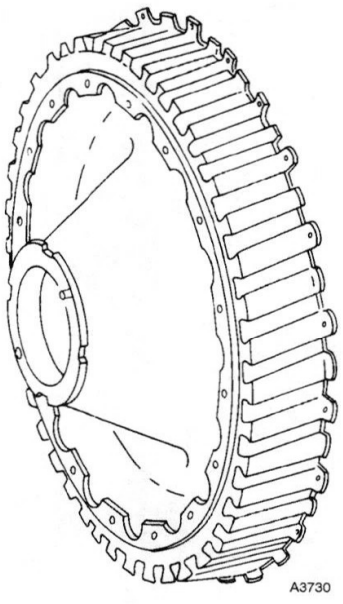
   B. Cleaning

      (1) Clean using hot alkaline soak No. 1 (Refer to 70-15-06, SPM) with the following modifications:

         (a) Do not use the vapor-degrease method.

         (b) Recommended soak time in an alkaline solution is 30 minutes.

         (c) Do not coat with corrosion-preventive oils or compounds.



Fan Disc
Figure 601

FAN DISC – INSPECTION/CHECK

1. Fan Disc – Inspection/Check

   A. Equipment and Materials

      None.

   B. Visual Inspection

      Visually inspect for the following:

      (1) Nicks, burrs, and scratches. Blend-repair nicks, burrs, and scratches. (Refer to 70-25-01, SPM.)

      (2) Fretting in broached fan blade slots. Repair. (Refer to Repair-02.)

   C. Dimensional Inspection (SC)

      (1) Dimensionally inspect. (*See Figure 801.*) Repair (Refer to Repair-01) or replace if limits cannot be met.

      (2) Inspect splines. (Refer to 70-20-08, SPM.)

      (3) Reapply graphite-varnish coating to broached fan blade slots in disc. (Refer to Repair-04.)

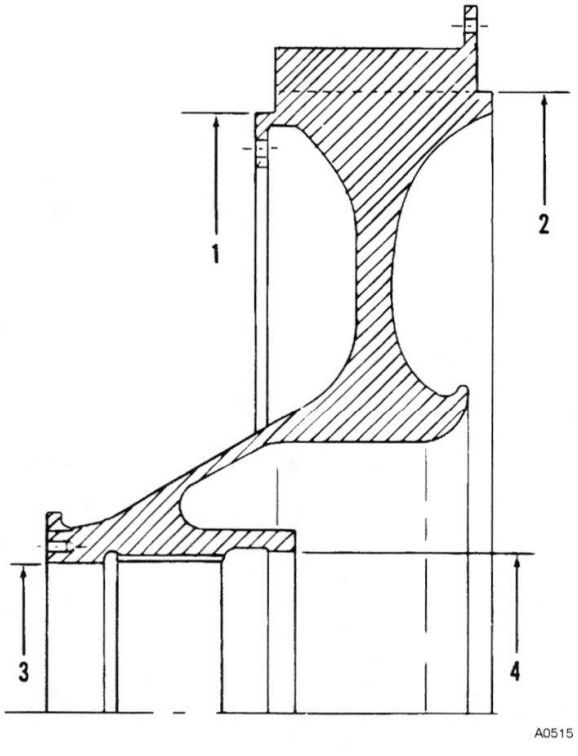
      (4) Inspect locking cup engagement pins as follows:

         (a) Inspect for loose or missing locking cup engagement pins. Not acceptable. Repair. (Refer to Repair-03.)

         (b) Inspect for 0.095 to 0.100 inch (2.41 to 2.54 millimeter) protrusion of pins above fan disc hub. (*See Figure 802.*) Replace pins that have been pushed in below specified limits. (Refer to Repair-03.)

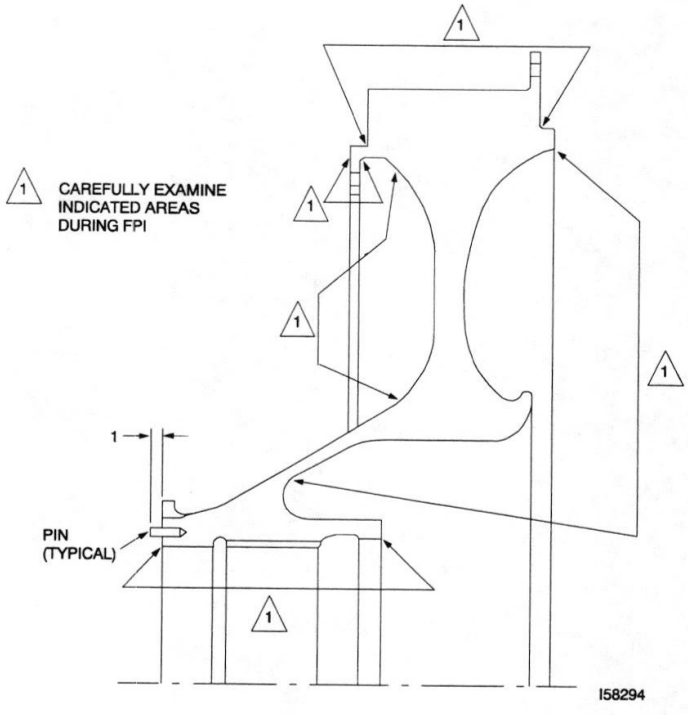
   D. Non-Destructive Test (NDT) (SC)

      Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Carefully examine the disc bore, web, flange bolt holes, and blade slot areas as shown in *Figure 802.* Cracks are not acceptable. Replace disc.



1. 14.7380 TO 14.7400 INCH (374.345 TO 374.396 MILLIMETER) DIAMETER
2. 15.1380 TO 15.1400 INCH (384.505 TO 384.556 MILLIMETER) DIAMETER
3. 3.5993 TO 3.6001 INCH (91.422 TO 91.443 MILLIMETER) DIAMETER
4. 3.9352 TO 3.9361 INCH (99.954 TO 99.977 MILLIMETER) DIAMETER

Fan Disc Dimensional Inspection Locations
Figure 801



1. 0.095 TO 0.100 INCH (2.41 TO 2.54 MILLIMETER)

FPI Areas and Measuring Pin Protrusion From Fan Disc Hub
Figure 802

FAN DISC – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-002-09/-10/-11	-01 thru -04	None

FAN DISC – REPAIR-01

1. Repair of Discrepant 15.1386 to 15.1400 Inch (384.520 to 384.556 Millimeter) Diameter – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-49
Plasma-Spray Powder	06-19

B. Procedure

(1) Machine dimension, if necessary, to obtain a 0.003 to 0.015 inch (0.08 to 0.38 millimeter) buildup thickness after final machining.

WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS. CHLORINATED HYDROCARBONS WILL DAMAGE BLADES.

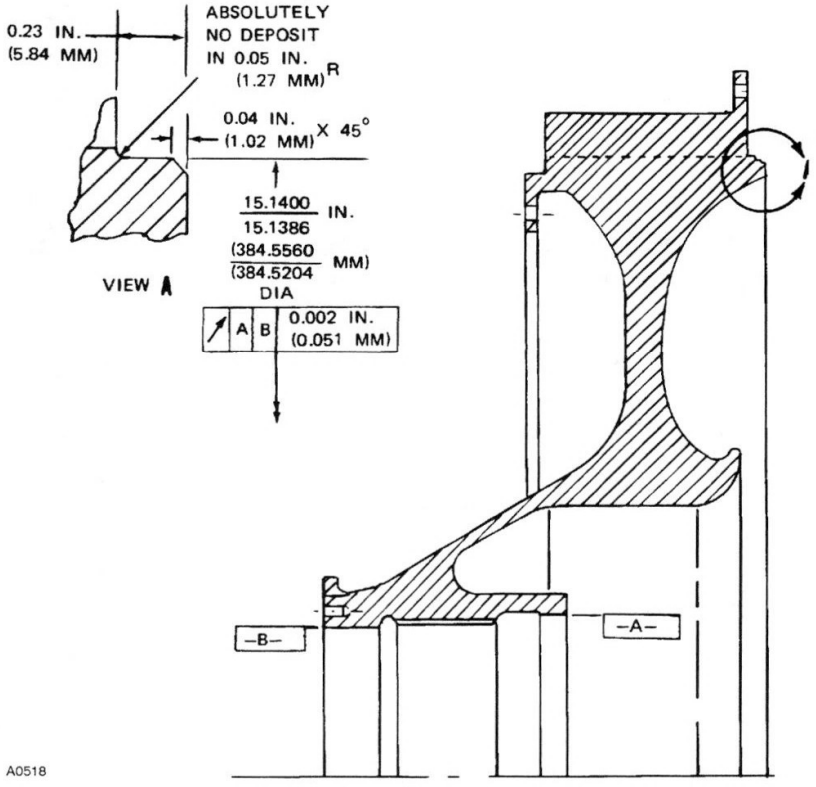
(2) Using dry cleaning solvent, clean repair area.

(3) Mask and grit-blast.

(4) Remove all silicon carbide particles.

(5) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

(6) Machine to specified dimensions. (*See Figure 901.*)



Repair of Discrepant 15.1386 to 15.1400 Inch (384.520 to 384.556 Millimeter) Diameter
Figure 901

FAN DISC – REPAIR-02

1. Repair of Fretting in Broached Fan Blade Slots – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

(1) If not already accomplished in accordance with 72-31-07, Inspection/Check, perform fluorescent-penetrant inspection prior to any shot peening operation. (Refer to 70-20-05, SPM.) All inspection criteria must be met.

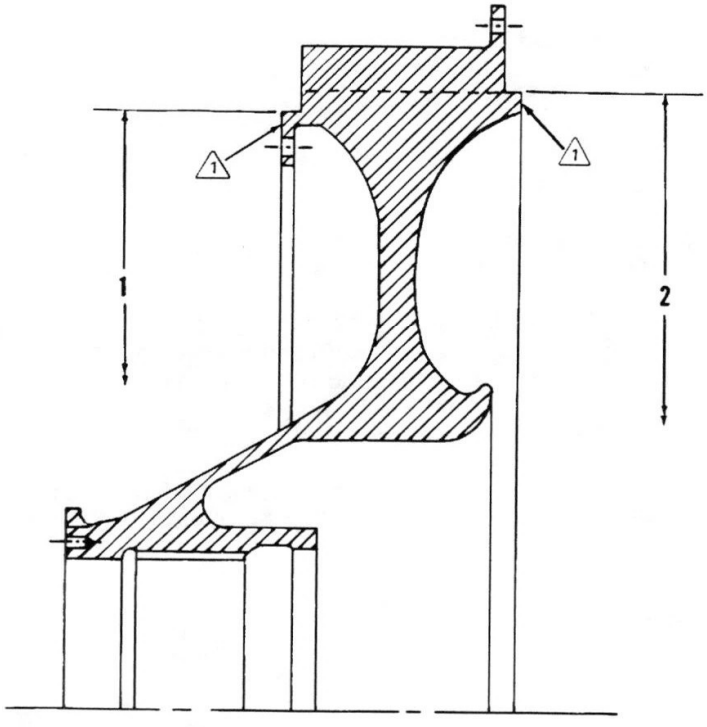
(2) Mask front and rear face of fan disc to protect closely toleranced diameters. (Refer to 1 and 2, *Figure 901.*)

(3) Steel shot peen load faces of broached fan blade slots in accordance with MIL-S-13165; incidental over-spray on unloaded slot face is acceptable.

NOTE: Nominal diameter of cast shot shall be 0.0165 inch (0.419 millimeter) (size No. 170) and peening intensity shall be 8 to 12A with a minimum coverage of 200 percent.

(4) Dimensionally inspect disc. (Refer to 72-31-07, Inspection/Check.)

(5) Apply graphite-varnish coating to broached fan blades slots in disc. (Refer to 70-30-11, SPM.) Coating thickness shall be 0.0004 to 0.0007 inch (0.010 to 0.018 millimeter).



1 MASK FRONT AND REAR DISC FACES TO PROTECT DIAMETERS 1 AND 2.

A0517

Masking of Front and Rear Disc Faces
Figure 901

FAN DISC – REPAIR-03

1. Repair of Loose, Missing, or Bottomed Locking Cup Engagement Pins – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Bar Steel	08-51

B. Procedure

CAUTION: DO NOT MACHINE MORE THAN IS NECESSARY.

(1) If pin is pushed flush to or below fan disc hub surface, machine carefully to remove pin, or using suitable tooling, drill, tap, and pull out pin.

(2) Inspect pin hole diameter. If cleanup required is less than 0.285 inch (7.24 millimeter) in diameter, ream hole. If cleanup required is greater than 0.285 inch (7.24 millimeter), relocate holes. (*See Figure 901.*)

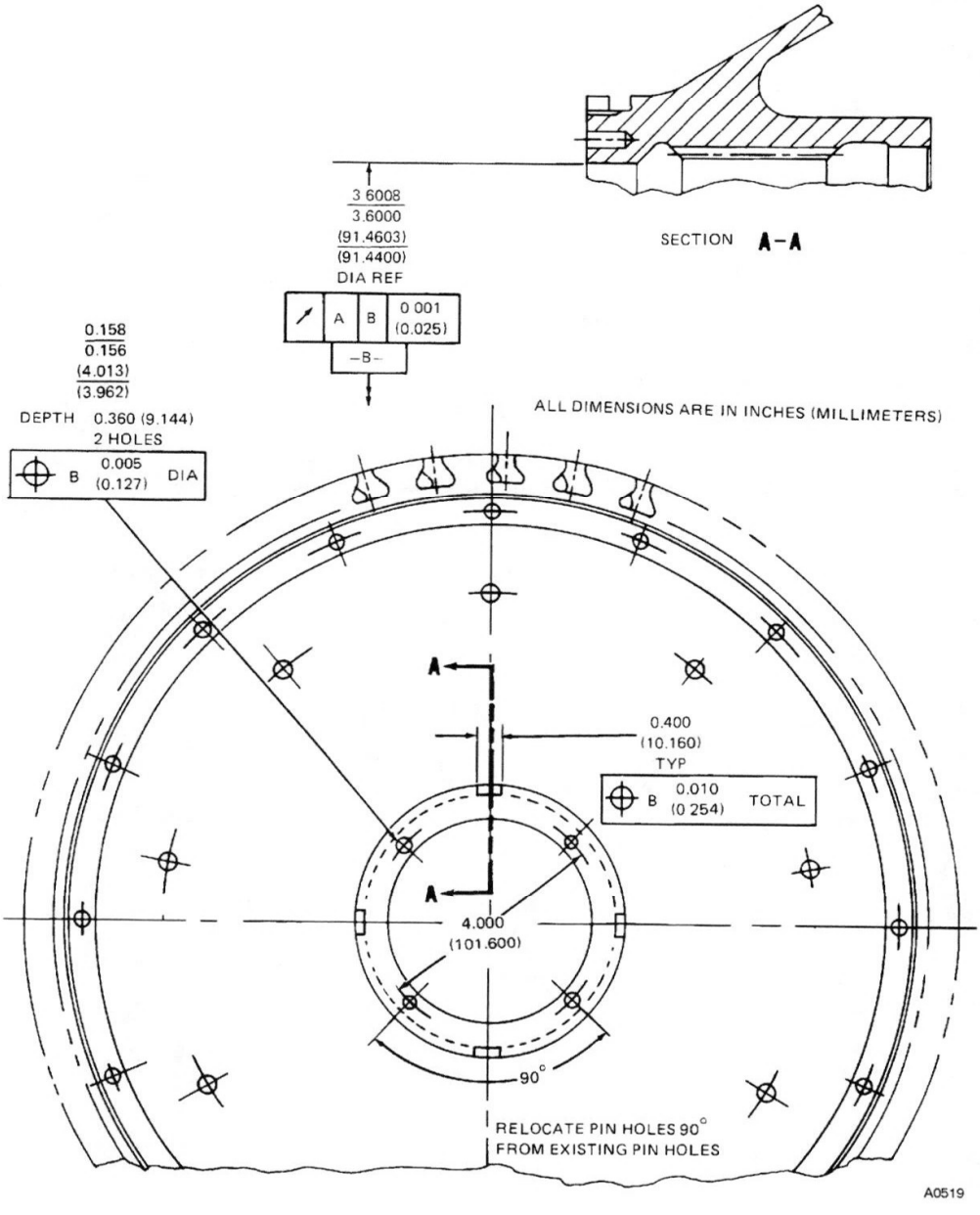
NOTE: Reamed holes shall not exceed 0.285 inch (7.24 millimeter).

(3) Using bar steel, fabricate special steel pins same as pin MS9390-290, except dimensions shall be varied as shown. (*See Figure 902.*)

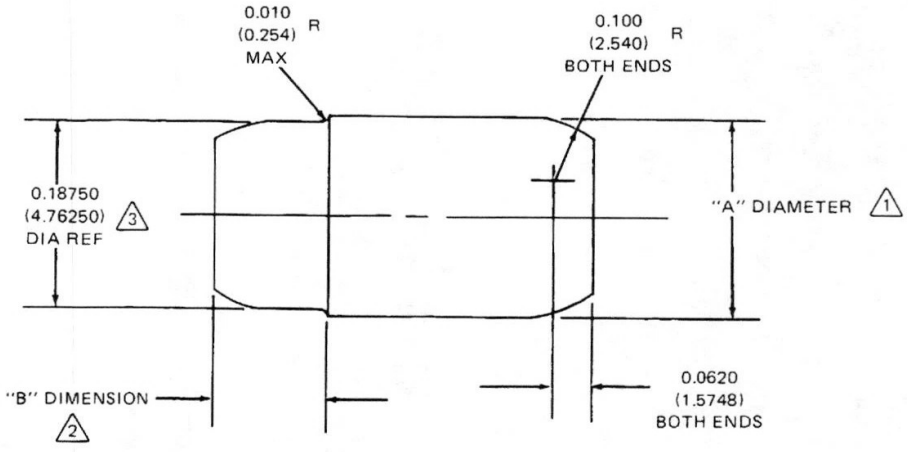
NOTE: Diameter "A" shall have a 0.00025 to 0.00145 inch (0.0064 to 0.0368 millimeter) tight fit with reamed hole. Dimensions "B" shall be 0.105 to 0.110 inch (2.67 to 2.79 millimeter).

(4) Install diameter "A" of pin into reamed hole. Maintain 0.095 to 0.100 inch (2.41 to 2.54 millimeter) protrusion of pin above fan disc surface. (*See Figure 903.*)

NOTE: Two pins are required to be 180 degrees apart.



Relocation of Holes
Figure 901



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

NOTES.

1. DIAMETER "A" SHALL HAVE A 0.00025 TO 0.00145 (0.00635 TO 0.03683) TIGHT FIT WITH REAMED HOLE IN DISC.

2. DIMENSION "B" SHALL BE 0.105 TO 0.110 (2.667 TO 2.794)

3. MS9390-290 REFERENCE DATA

   DIAMETER: 0.18750 ± 0.00025 (4.76250 ± 0.00635)
   OVERALL LENGTH: 0.375 ± 0.010 (9.525 ± 0.254)
   MATERIAL: AMS5732
   STRAIGHTNESS 0.0005 (0.0127) F.I.R.
   SURFACE TEXTURE USAS B46.1 1962 32

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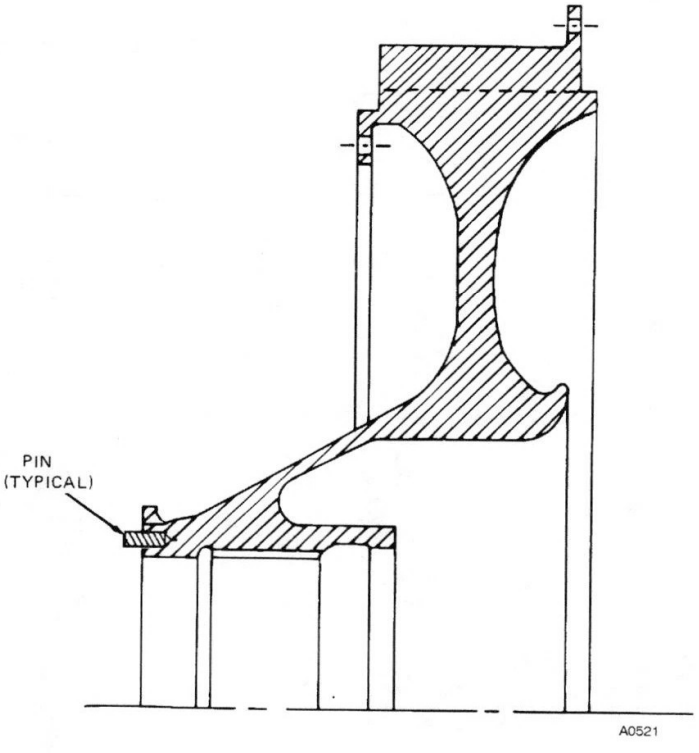
Special Pin Fabrication
Figure 902



Pin Location
Figure 903

FAN DISC – REPAIR-04

1. Reapplication of Anti–Friction Coating to Broached Fan Blade Slots – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Coating, Dry Film Lubricant	06-12, -49
Dry Cleaning Solvent	07-48 or -49
Graphite Varnish (See SPM, 70-30-11)	
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A

B. Procedure

CAUTION: CHLORINATED SOLVENTS SHALL NOT BE USED AT ANY TIME DURING THIS PROCEDURE. FAILURE TO COMPLY WILL CAUSE DAMAGE TO FAN DISC.

NOTE: This service is available at the following facility.

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

NOTE: The following steps (1) through (3) shall be omitted if accomplished during inspection.

(1) Clean fan disc using dry cleaning solvent, acetone, or equivalent.

(2) Using plastic media blasting, remove coating from the blade slots. (Refer to SPM, 70-15-15).

(3) Clean fan blade slot areas using dry cleaning solvent method. (Refer to SPM, 70-15-03).

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1. B. (4) Mask fan blade slot areas as required to apply solid film lubricant. Apply any of the following three solid film lubricants to the root area of the fan blade slot areas:

(a) Graphite Varnish: Prepare and apply varnish in accordance with SPM, 70-30-11.

(b) Molykote 3400A: Apply Molykote 3400A in accordance with the manufacture's instructions. Cure Molykote at 290 to 300°F (143 to 149°C) for 2 to 3 hours. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

(c) Molydag 254: Apply Molydag in accordance with the manufacture's instructions. Cure Molydag at 390 to 400°F (199 to 204°C) for 60 to 90 minutes. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

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FAN BLADES – CLEANING

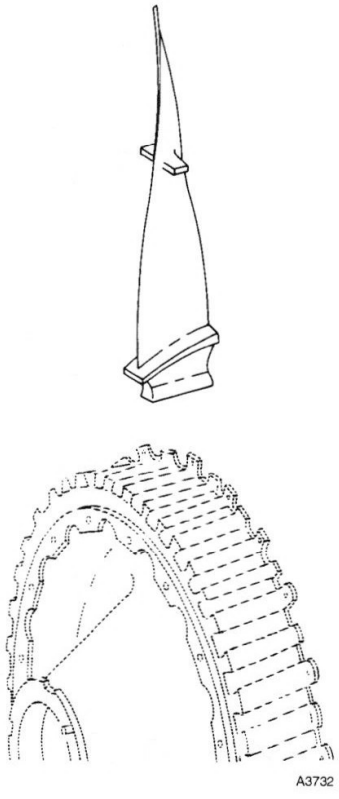
1. Fan Blades (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Fan Blade
Figure 601

FAN BLADES – INSPECTION/CHECK

1. Fan Blades – Inspection/Check

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT7692	Fretting Gage

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A
Masking Tape	10-22

B. Inspection

(1) Visually inspect for the following:

(a) Nicks or dents in blade roots. Not acceptable. Replace blades. (Refer to Repair-01, -08, or -09.)

(b) Damaged coating on blade roots. Repair. (Refer to Repair-02 or -03.)

NOTE: Fan blade root coating may be identified by its color. Graphite-varnish coating is black, while solid-film lubrication coating has a metallic gray tint.

(c) Fretting of blade root. Area of fretting less than 0.250 inch (6.35 millimeter) by 0.250 inch (6.35 millimeter) or equivalent in area is acceptable without rework. If area of fretting exceeds this limit, proceed as follows:

1 Mask airfoil surfaces of blade with masking tape to protect during blasting.

2 Using plastic media blasting, remove coating from blade root areas. (Refer to 70-15-15, SPM.)

3 Remove masking tape. Clean blade root area using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

4 Fluorescent-penetrant inspect root area for cracks using Group VI method. (Refer to 70-20-05, SPM.) Replace cracked blades. (Refer to Repair-01.)

1. B. (1) (c) 5 Using fretting gage LTCT7692 or equivalent, dimensionally inspect fretting. Repair or replace blades in accordance with the following:

a If depth of fretting is less than 0.003 inch (0.08 millimeter) and is evident on less than one-half of blade root, repair fretting. (Refer to Repair-02 or -03.)

b If depth of fretting is from 0.003 inch (0.08 millimeter) to 0.005 inch (0.13 millimeter) or is evident on more than one-half blade root area, repair fretting. (Refer to Repair-03.)

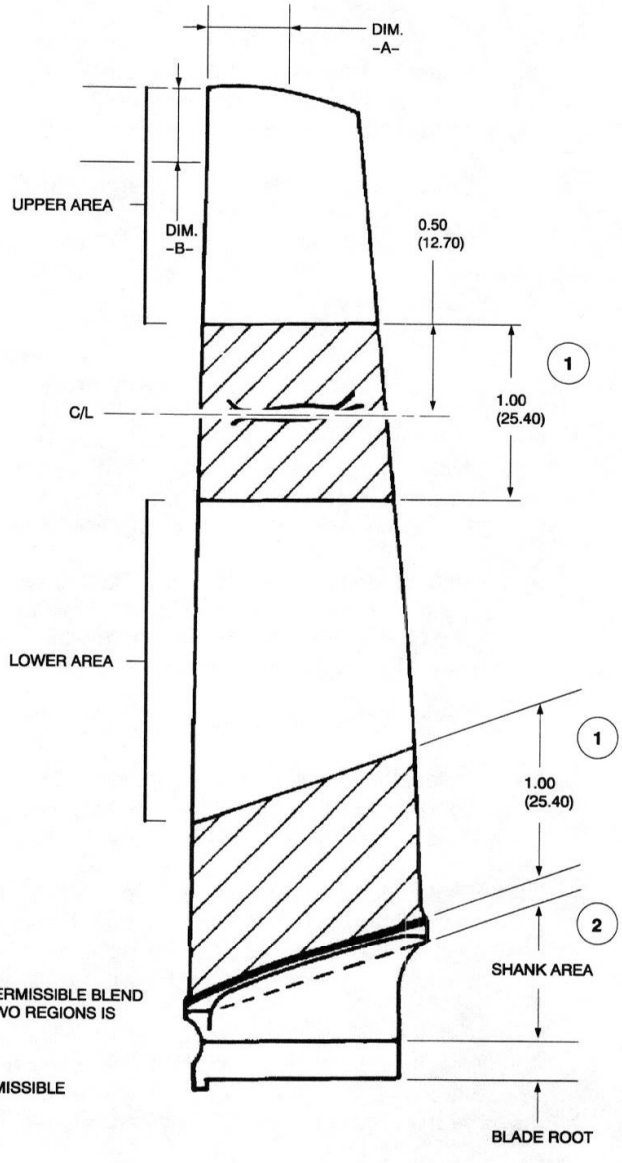
c If depth of fretting is more than 0.005 inch (0.13 millimeter), replace blade (Refer to Repair-02) and return old blade to AlliedSignal Engines for further analysis and disposition.

(d) Gouges, dents, or nicks in lower and upper critical area. (*See Figure 801.*) Gouges are not allowed. Minor nicks or smooth dents are acceptable, provided they do not exceed 0.125 inch (3.18 millimeter) in diameter and 0.030 inch (0.76 millimeter) in depth. Repair is limited to blending to remove any sharp projections caused by minor nicking. Remove only as much material as necessary to provide smooth repair. (Refer to Repair-04.)

(e) Nicks and dents in lower area leading and trailing edges and airfoil. On leading and trailing edges, nicks and dents are permitted provided that, after repair, they do not exceed 0.120 inch (3.05 millimeter) in depth and 0.500 inch (12.70 millimeter) in length. On airfoil surface, nicks and dents are acceptable provided that, after repair, they do not exceed 0.030 inch (0.76 millimeter) in depth and 0.250 inch (6.35 millimeter) in diameter. Repair defects. (Refer to Repair-04 or -07.)

NOTE: The lower area is that area of the blade that is between the critical area and 0.050 inch (1.27 millimeter) below the horizontal centerline of the midspan shroud and the blade tip. (*See Figure 801.*)

(f) Smooth-bottomed dents in shank area (above root and below platform) are acceptable up to 0.010 inch (0.25 millimeter) deep. (*See Figure 801.*) Blend sharp-bottomed nicks to obtain smooth bottom. (Refer to 70-25-01, SPM.) Dye-penetrant inspect to ensure no cracks exist. (Refer to 70-20-04, SPM.)



(1) CRITICAL AREA: MAXIMUM PERMISSIBLE BLEND REPAIR IN EACH OF THESE TWO REGIONS IS 0.125 (3.175) LENGTH BY 0.030 (0.762) DEPTH.

(2) SHANK AREA–MAXIMUM PERMISSIBLE BLEND IS 0.010 (0.254) DEEP.

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

Critical Inspection Areas
Figure 801

1. B. (1) (g) Cracks, nicks, and dents in upper area leading and trailing edges, tip, and airfoil. Cracks are not allowed. On leading and trailing edges and blade tips, nicks and dents are acceptable provided that after repair, they do not exceed 0.250 inch (6.350 millimeter) in depth and 1.000 inch (25.40 millimeter) in length. On airfoil surface, nicks and dents are acceptable provided that, after repair, they do not exceed 0.030 inch (0.76 millimeter) in depth and 0.500 inch (12.70 millimeter) in diameter. Repairs made within 0.250 inch (6.35 millimeter) of each blade tip corner must be blended to a smooth radius. (Refer to Repair-04 or -07.)

NOTE: The upper area is that area of the blade that is between the critical area and 0.050 inch (1.27 millimeter) above the horizontal centerline of the midspan shroud and the blade tip. (*See Figure 801.*)

Extensive cracks, nicks, dents, erosion, flattening, or other types of damage to the leading edge of the airfoil may be corrected using a weld-repair. (Refer to Repair-07.)

(h) Nicks and dents on blade tips. Acceptable provided that after repair, dimension A plus dimension B (*Figure 801*) does not exceed 1.0 inch (25.4 millimeter) in length and 0.25 inch (6.35 millimeter) in depth. Blend repair defects. (Refer to 70-25-01, SPM.) Blend repair is limited to removal of sharp or protruding metal.

(i) Light blade tip rub indications. Blades exhibiting roll-over material may be blend-repaired provided material removal from entire blade tip does not exceed a depth of 0.005 inch (0.127 millimeter). (Refer to Repair-04.) Blend width shall be at least eight times the depth.

NOTE: Do not remove sharp edges.

(j) Rejectable blade conditions and evidence of galled, fretted, or otherwise damaged midspan support load face surfaces. If blades exhibit any of these conditions, repair blades. (Refer to Repair-05.)

(k) Flattening of blade leading edge. Repair is allowed but not required. (Refer to Repair-04 or -07.) Blending of leading edge areas that exhibit flattening (*See Figure 802*) is allowed but not required, provided the blending does not reduce the chord dimension of the blade.

(l) Airfoil surface finish. Roughness shall not exceed 32 micro-inches. Flaws or irregularities such as scratches are not part of the normal surface pattern and should not be included in the surface roughness measurement. If limits cannot be met, repair. (Refer to Repair-06.)

CAUTION: USE OF POWERED EQUIPMENT MAY GENERATE ENOUGH HEAT TO IMPAIR MATERIAL PROPERTIES AND, AS SUCH, IS PROHIBITED. (REFER TO 70-25-01, SPM.)

1. B. (1) (m) Leading and trailing edge tip curls as follows:

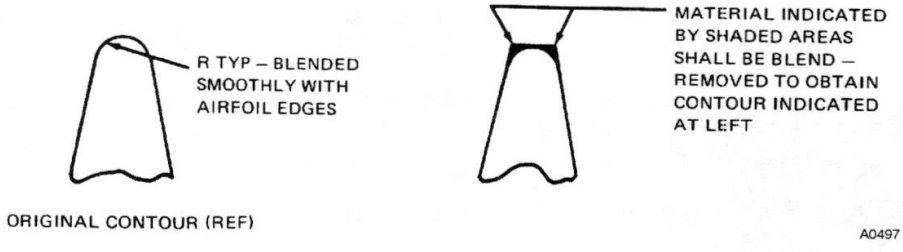
1 Any number of blades may have tip curl provided tip curl does not extend more than 0.25 inch (6.4 millimeter) across blade tip and no more than 0.5 inch (12.7 millimeter) down the leading edge. Maximum deflection from the original contour shall not exceed 0.18 inch (4.6 millimeter) and angle of tip curl shall not exceed 45 degrees.

2 On leading edges, a maximum of four blades with tip curl are allowed provided tip curl does not extend more than 0.5 inch (12.7 millimeter) across blade tip and no more than 1.5 inches (38.1 millimeters) down leading edge. Maximum deflection from original contour shall not exceed 0.35 inch (8.9 millimeter); and angle of tip curl shall not exceed 45 degrees. No more than two damaged blades shall be adjacent.

3 On trailing edge a maximum of four blades with tip curl is allowed provided tip curl does not extend more than 0.4 inch (10.2 millimeter) across blade tip and no more than 1.0 inch (25.4 millimeter) down trailing edge. Maximum deflection from original contour shall not exceed 0.3 inch (7.6 millimeter); and angle of tip curl shall not exceed 45 degrees. No more than two damaged blades shall be adjacent.

4 Blades exceeding above limits must be replaced.

5 Blades with tip curl shall be fluorescent-penetrant inspected for cracks. (Refer to 70-20-05, SPM.) Cracked blades shall be replaced.



Fan Blade Leading Edge Blend-Repair Areas
Figure 802

1. B. (2) Perform dimensional inspection. (*See Figure 803.*)

(3) Inspect fan disc assembly for proper midspan shroud gap measurement when a new fan blade set or used/serviceable blades from another engine or fan disc are fitted as follows:

(a) Install fan blades (Refer to 72-01-02, Installation, 10, *Figure 402*) (as originally positioned) into fan disc.

(b) Install retaining ring (9) and secure with 16 bolts (1, 2, 3, and 4) and 16 nuts (5). Tighten No. 10 size bolts 30 to 35 pound-inches (3.39 to 3.95 newton-meters) torque or 1/4 inch (6.35 millimeter) diameter bolts 50 to 60 pound-inches (5.65 to 6.78 newton-meters) torque.

(c) Invert fan disc assembly so it rests forward face down.

NOTE: Before accurate shroud gap measurements can be obtained, it is necessary to load all blades to their operating position, outboard and forward as outlined in following Steps (d) and (e).

Shim stock used in following Step (d) should be at least 2.5 inches (63.5 millimeters) long, by 0.500 to 0.625 inch (12.70 to 15.87 millimeter) wide. Thickness could vary from 0.002 to 0.022 inch (0.05 to 0.56 millimeter). No more than 0.022 inch (0.56 millimeter) of total shim thickness should be required in any one location.

(d) Load all blades outboard by inserting shim stock between base of disc slot and blade root. Shim stock must travel entire length of blade root to ensure parallelism is maintained between slot and blade root.

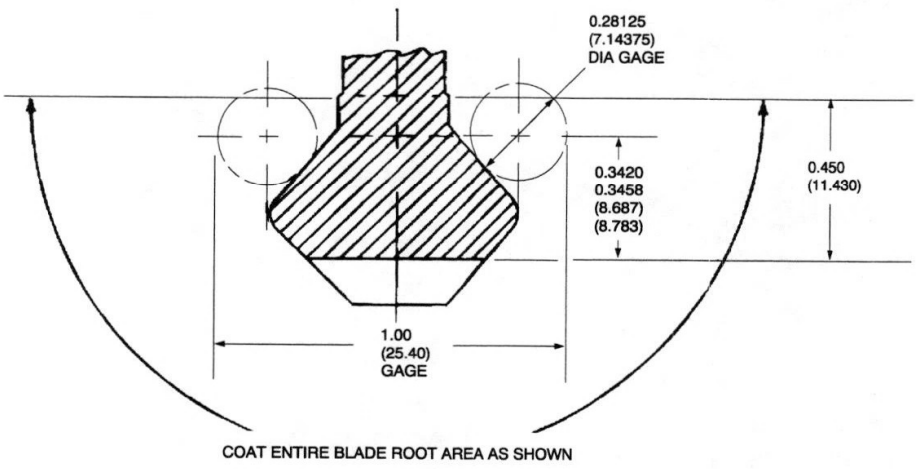
(e) Load all blades forward by lightly tapping blades with a soft-faced mallet until all blade roots rest against retaining ring.

CAUTION: IN THE FOLLOWING STEP, EXCESSIVELY TIGHT FIT OF FEELER GAGE STOCK COULD RESULT IN TWISTING OF BLADES AND SUBSEQUENT ERRONEOUS MEASUREMENTS.

(f) Insert feeler gage stock in all midspan shroud gaps so that no looseness remains. Midspan shroud gaps shall be a total (cumulative) 0.092 to 0.360 inch (2.33 to 9.15 millimeter).

(g) Remove all shim stock from fan disc assembly.

(h) Invert fan disc assembly and remove all blades.



ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)

I58450

Coating of Blade Roots
Figure 803

FAN BLADES – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-001-12	-01 thru -09	None
2-043-001-21	-01 thru -09	SPB ALF/LF 1003
2-043-001R32/R34	-01 thru -03, -05 thru -09	ALF/LF 72-1022

FAN BLADES – REPAIR-01

1. Replacement of Fan Blades – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT5988-01	Balancing Arbor
LTCT7468-01	Check Fixture
LTCT7549-01	Shroud
LTCT13568-55	Sleeve Bearing
LTCT13966-01	Pusher
LTCT14243-01	Puller
Model HF3B	Balancing Machine (Schenck)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Antiseize Compound	02-01C
Marker	09-06

B. Procedure

(1) Using check fixture LTCT7468-01, measure overall length of all blades (new or used). Blades that do not meet check fixture limits within ±0.002 inch (0.05 millimeter) may be blended. (Refer to 72-31-08, Repair-04.)

(2) Arrange blades as follows:

(a) Place blades in a row according to descending blade moment weight as shown in *Figure 901*, Step 1.

(b) Rearrange blades as shown in *Figure 901*, Step 2.

(3) Vibropeen position numbers on blade roots.

1. B. (4) Inspect fan disc assembly for proper midspan shroud gap measurements, midspan shroud contact surface mismatch, and blade platform gap measurements as follows:

(a) Install fan blades into fan disc.

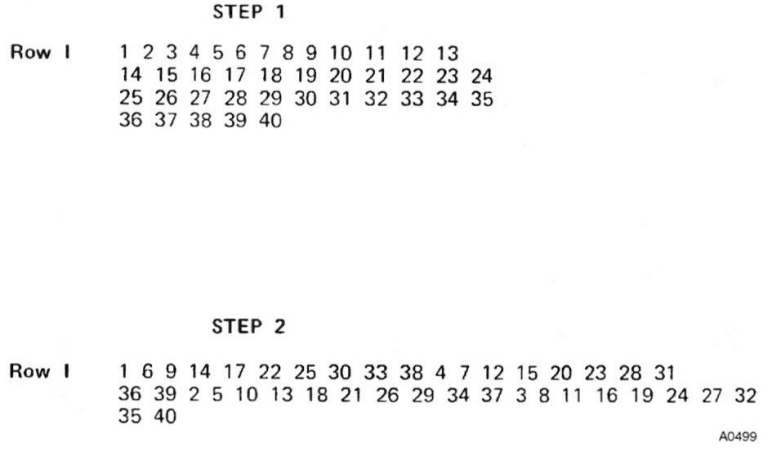
NOTE: Although not mandatory, blades with the same blade root coating should be used within a given disc. Coating may be identified by its color. Graphite-varnish coating is black, while solid-film lubricant coating has a metallic gray tint.

(b) Install retaining ring and secure with 16 bolts and 16 nuts. Tighten bolts 30 to 35 pound-inches (3.39 to 3.95 newton-meters) torque on fan disc assemblies 2-043-010-09/13 or 50 to 60 pound-inches (5.65 to 6.78 newton-meters) torque on fan disc assembly 2-043-010-15.

(c) Invert fan disc assembly so it rests forward face down.

NOTE: Before accurate shroud gap measurements can be obtained, it is necessary to load all blades to their operating position, outboard and forward as specified in following Steps (d) and (e).

Shim stock used in following Step (d) should be at least 2.5 inches (64 millimeters) long, by 0.5 to 0.625 inch (13 to 15.87 millimeter) wide. Thickness could vary from 0.002 to 0.022 inch (0.05 to 0.56 millimeter).



Fan Disc Assembly Blade Arrangement
Figure 901

1. B. (4) (d) Load all blades outboard by inserting shim stock between base of disc slot and blade root. Shim stock must travel entire length of blade root to ensure parallelism is maintained between slot and blade root.

(e) Load all blades forward by lightly tapping blades with a soft-faced mallet until all blade roots rest against retaining ring.

CAUTION: EXCESSIVELY TIGHT FIT OF FEELER GAGE STOCK COULD RESULT IN TWISTING OR SIDE LOADING OF BLADES AND SUBSEQUENT ERRONEOUS MEASUREMENTS.

(f) Insert feeler gage material in all midspan shroud gaps so that no looseness remains. Cumulative midspan shroud gap shall not exceed 0.360 inch (9.14 millimeter).

(g) Remove all shim stock from fan disc assembly.

(h) Inspect to ensure fore and aft mismatch of midspan shroud contact surfaces does not exceed 0.048 inch (1.22 millimeter) at any location.

(i) Determine all blade root platform gaps by inserting feeler gage material until no looseness remains. Limits are 0.0005 to 0.0025 inch (0.013 to 0.064 millimeter) at each location. Record individual gaps in engine build log.

(5) Install first low pressure compressor disc assembly and fan blade retaining ring on fan disc and tighten bolts to proper torque.

NOTE: Ensure matchmarks on fan disc and low pressure compressor discs are aligned.

(6) Using pusher LTCT13966-01, install fan disc and low pressure compressor disc assembly on balancing arbor LTCT5988-01 and support assembly with babbitt sleeve bearing LTCT13568-55 installed in balancing machine.

NOTE: Apply a liberal amount of antiseize compound to threaded areas of arbor. Tighten arbor nut to 200 pound-feet (271.2 newton-meters) torque. Release torque to zero and retighten to 110 pound-feet (149.2 newton-meters) torque.

WARNING: USE SHROUD LTCT7549-01 OR EQUIVALENT DURING BALANCING OPERATIONS TO REDUCE AIR PUMPING AND/OR INJURY TO OPERATING PERSONNEL.

1. B. (7) Using a Schenck Model HF3B Balancing Machine or equivalent, calibrated for force-force balance, two-plane balance assembly.

NOTE: Use double compensation techniques to make sure tooling error is minimized.

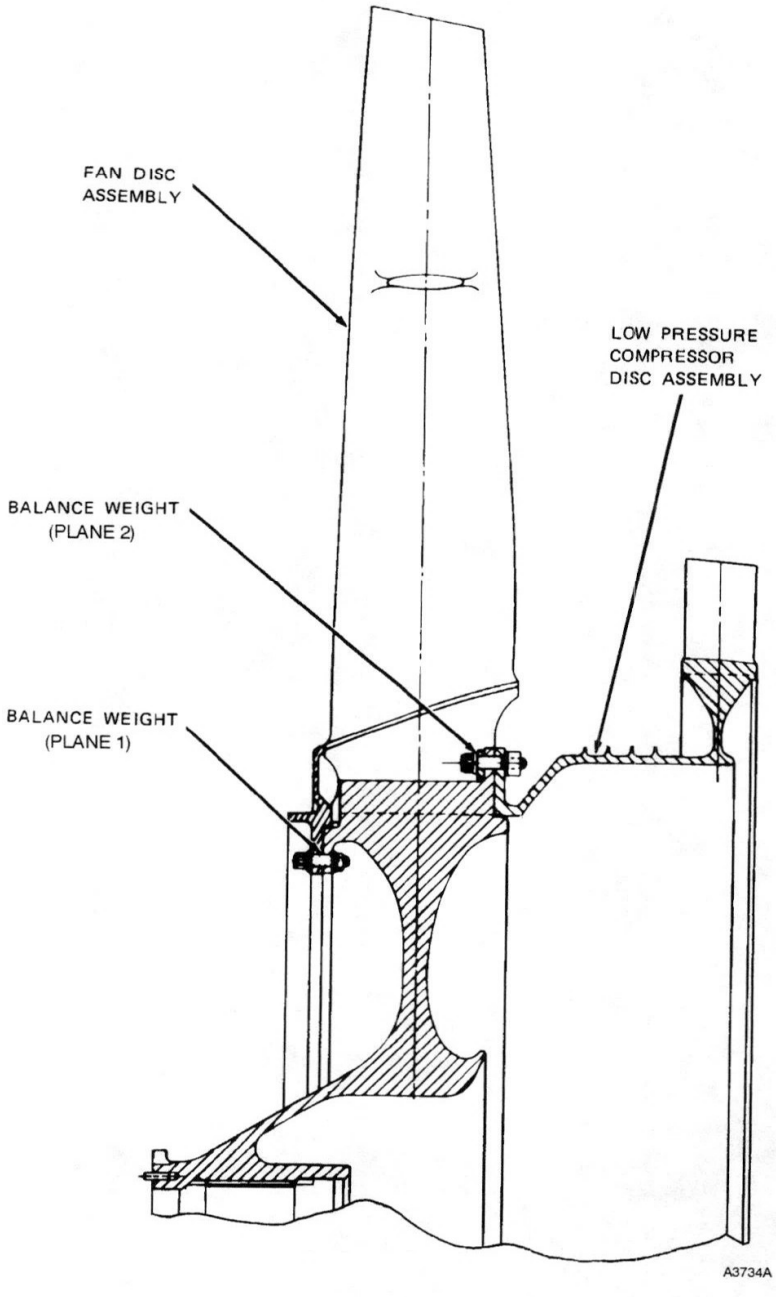
(8) Correct imbalanced condition by adding balance weights, as required, at locations shown in *Figure 902*. Remaining force imbalance shall not exceed 6 gram-inches in each plane.

NOTE: Material may be removed from balance weights to achieve limits.

(9) Check-balance assembly.

(10) Using a felt-tip marker, matchmark balance weights and bolts to their position on retaining ring, and retaining ring to disc, to ensure proper reinstallation during final assembly. Record all weight values and positions in engine build log.

(11) Using puller LTCT14243-01, remove fan disc and low pressure compressor disc assemblies from arbor.



Balancing Fan Disc and Low Pressure Compressor Disc Assembly
Figure 902

FAN BLADES – REPAIR-02

1. Replacement of Blade Root Coating (Graphite or Moly Method) – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Coating, Dry Film Lubricant	06-12, -49
Dry Cleaning Solvent	07-48 or -49
Graphite Varnish (See 70-30-11, SPM)	
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A

B. Procedure

NOTE: This repair is available at:

Honeywell Aerospace Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

CAUTION: CHLORINATED SOLVENTS SHALL NOT BE USED AT ANY TIME DURING THIS PROCEDURE. FAILURE TO COMPLY WILL CAUSE DAMAGE TO BLADES.

NOTE: The following Steps (1) thru (5) shall be omitted if accomplished during inspection.

(1) Clean blade using dry cleaning solvent, acetone, or equivalent.

(2) Mask airfoil surfaces of blades, using suitable masks.

(3) Using plastic media blasting, remove coating from blade root areas. (Refer to 70-15-15, SPM.)

(4) Remove masking and clean root areas using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

1. B. (5) Mask fan blade as required to apply solid film lubricant (*See Figure 901.*) Apply any of the following three solid film lubricants to the root area of the of the fan blade:

NOTE: While not mandatory, it is recommended that blades having different root coatings not be intermixed within any disk assembly.

(a) Graphite Varnish: Prepare and apply varnish in accordance with 70-30-11, SPM.

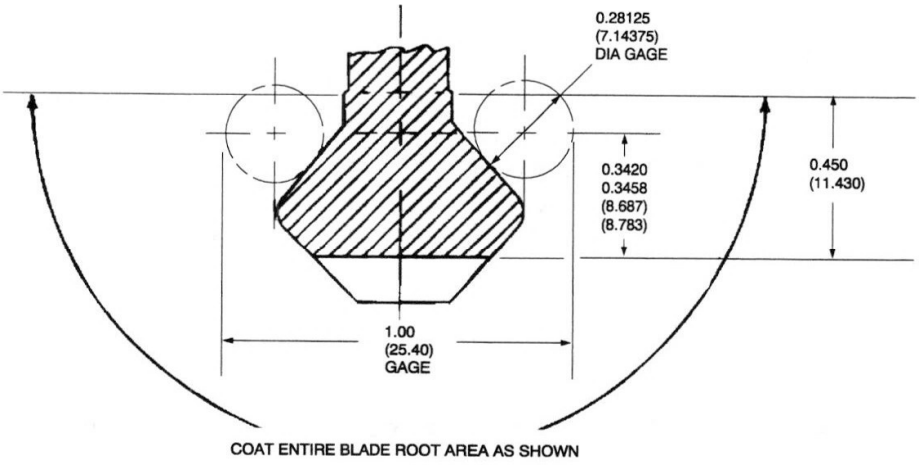
(b) Molykote 3400A: Apply Molykote 3400A in accordance with the manufacture's instructions. Cure Molykote at 290 to 300°F (143 to 149°C) for two to three hours. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

(c) Moly-dag 254: Apply Moly-dag 254 in accordance with the manufacture's instructions. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

(6) Remove blades from mask.

NOTE: While not mandatory, it is recommended that blades having different root coatings not be intermixed within any given disc assembly.

(7) Dimensionally inspect blade root area. (*See Figure 901.*)



Coating of Blade Roots
Figure 901

FAN BLADES – REPAIR-03

1. Replacement of Blade Root Coating (Cu/Ni/In Method) – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Oxide Grit	05-11
Coating, Dry Film Lubricant	06-12, -49
Dry Cleaning Solvent	07-48 or -49
Glass Bead No. 232	05-02
Masking Tape	10-22
Nitric Acid	04-06
Plasma Spray Powder	06-41
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A
Steel Shot No. 170	05-17

B. Procedure

NOTE: This service is available at the following facility.

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

This procedure may be used in lieu of graphite-varnish coating repair. (Refer to Repair-02.) However, it is recommended that blades with the same root coating be used within a given disc assembly.

As applicable, the following Steps (1) thru (5) shall be omitted if accomplished during inspection.

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CAUTION: CHLORINATED SOLVENTS SHALL NOT BE USED AT ANY TIME DURING THIS PROCEDURE. FAILURE TO COMPLY WILL CAUSE DAMAGE TO BLADES.

1. B. (1) If not already accomplished in accordance with 72-31-08, Inspection/Check, perform fluorescent-penetrant inspection prior to any shot peening operation. (Refer to 70-20-05, SPM.) All inspection criteria must be met.

(2) If blade root was previously coated with graphite-varnish, strip coating as follows:

(a) Clean blade using dry cleaning solvent, or equivalent.

(b) Mask airfoil surfaces to protect during blasting.

(c) Using plastic media blasting, remove coating from blade root areas. (Refer to 70-15-15, SPM.)

(d) Remove masking and clean root areas using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

(3) If blade root was previously coated with solid-film lubricant coating, clean blade using dry cleaning solvent or equivalent.

(4) If blade root was previously coated with coating material Cu-36Ni-5In or plasma spray powder, strip coating as follows:

WARNING: BOTH NITRIC ACID AND ITS VAPORS ARE A PERSONNEL HAZARD. AVOID CONTACT WITH SKIN, EYES OR CLOTHING. AVOID INHALATION OF VAPORS. IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN OR EYES WITH WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION.

(a) Prepare stripping agent of 70 percent nitric acid heated to 100°F (38°C) for 15 minutes.

CAUTION: STRIPPING RATE IS VERY RAPID.

(b) Remove heat from agent, and submerge area of blade to be stripped in agent. Check blade root every 20 seconds for coating removal.

NOTE: Complete submersion of blade is not required.

WARNING: USED NITRIC ACID AND RINSE WATER SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCALLY APPROVED ORDINANCES.

(c) When coating is removed, remove blade from stripping agent and submerge in rinse water several times to completely remove agent.

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1. B. (5) Visually inspect blade root for fretting. If fretting is present, remove as follows:

(a) Mask airfoil surfaces (Area B, *Figure 901)* as required.

(b) Glass bead peen blade root (Area A) using glass peen size No. 232 or steel shot peen using shot (cast) with nominal diameter of 0.0165 inch (0.419 millimeter) (size No. 170). Peening intensity shall be 7 to 9A2 with a minimum coverage of 200 percent.

(c) Clean blade root using dry cleaning solvent.

(6) Grit-blast blade root area to be coated using abrasive grit at 60 psi (414 kN/m^2).

(7) Apply base coating to blade root as follows:

(a) Using plasma spraying method (Refer to 70-50-01, SPM), apply coating material on pressure angles to a thickness of 0.001 to 0.003 inch (0.03 to 0.08 millimeter). *(See Figure 902.)*

(b) Remove loosely bonded particles of coating by brushing with soft wire brush.

(c) Clean area with dry cleaning solvent. Allow to air-dry.

(8) Mask fan blade as required to apply solid film lubricant. *(See Figure 902.)* Apply any one of the following two solid film lubricants to the root area of the of the fan blade:

(a) Molykote 3400A: Apply Molykote 3400A in accordance with the manufacture's instructions. Cure Molykote at 290 to 300°F (143 to 149°C) for 2 to 3 hours. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

(b) Moly-dag 254: Apply Moly-dag 254 in accordance with the manufacture's instructions. Final cured thickness is 0.0002 to 0.0005 inch (0.005 to 0.013 millimeter.)

(9) Check total thickness of coating. Coating shall be 0.0015 to 0.003 inches (0.038 to 0.08 millimeters.) If coating is not within minimum thickness, repeat Steps (8)(a) or (b) as required.

NOTE: While not mandatory, it is recommended that blades having different root coatings not be intermixed within any disk assembly. (For an alternate blade root coating method, refer to Repair-02.)

(10) Dimensionally inspect blade root area. *(See Figure 903.)*

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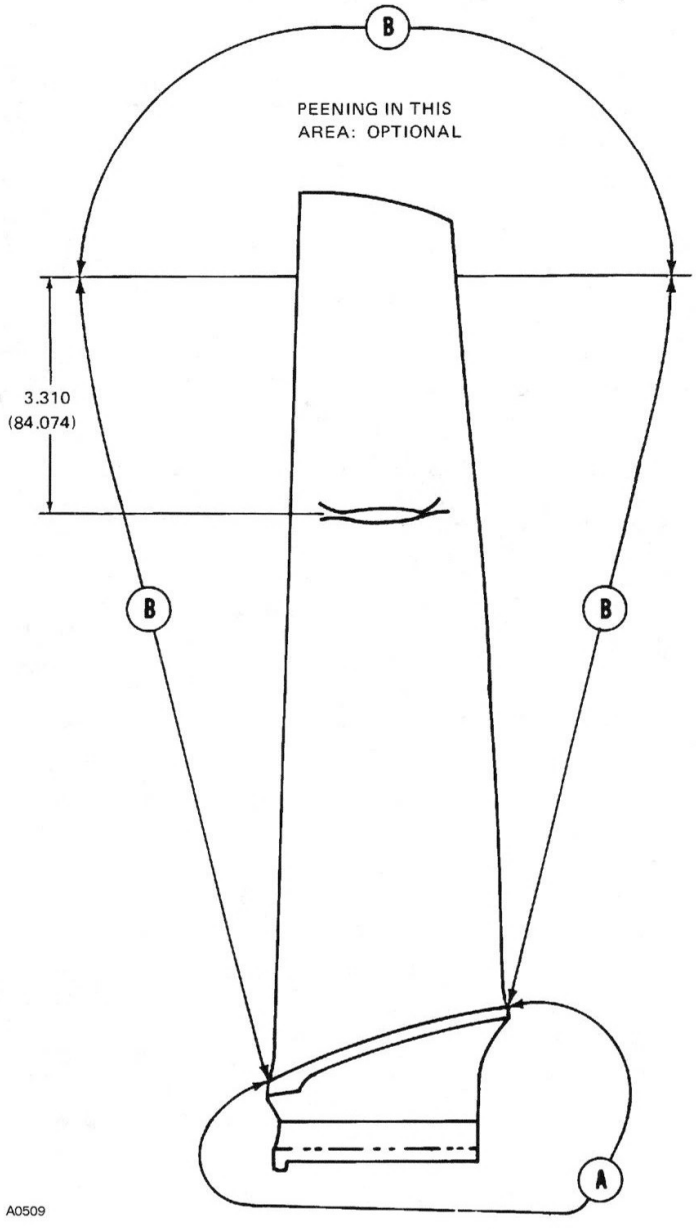

Fan Blade Mask and Peen Areas
Figure 901

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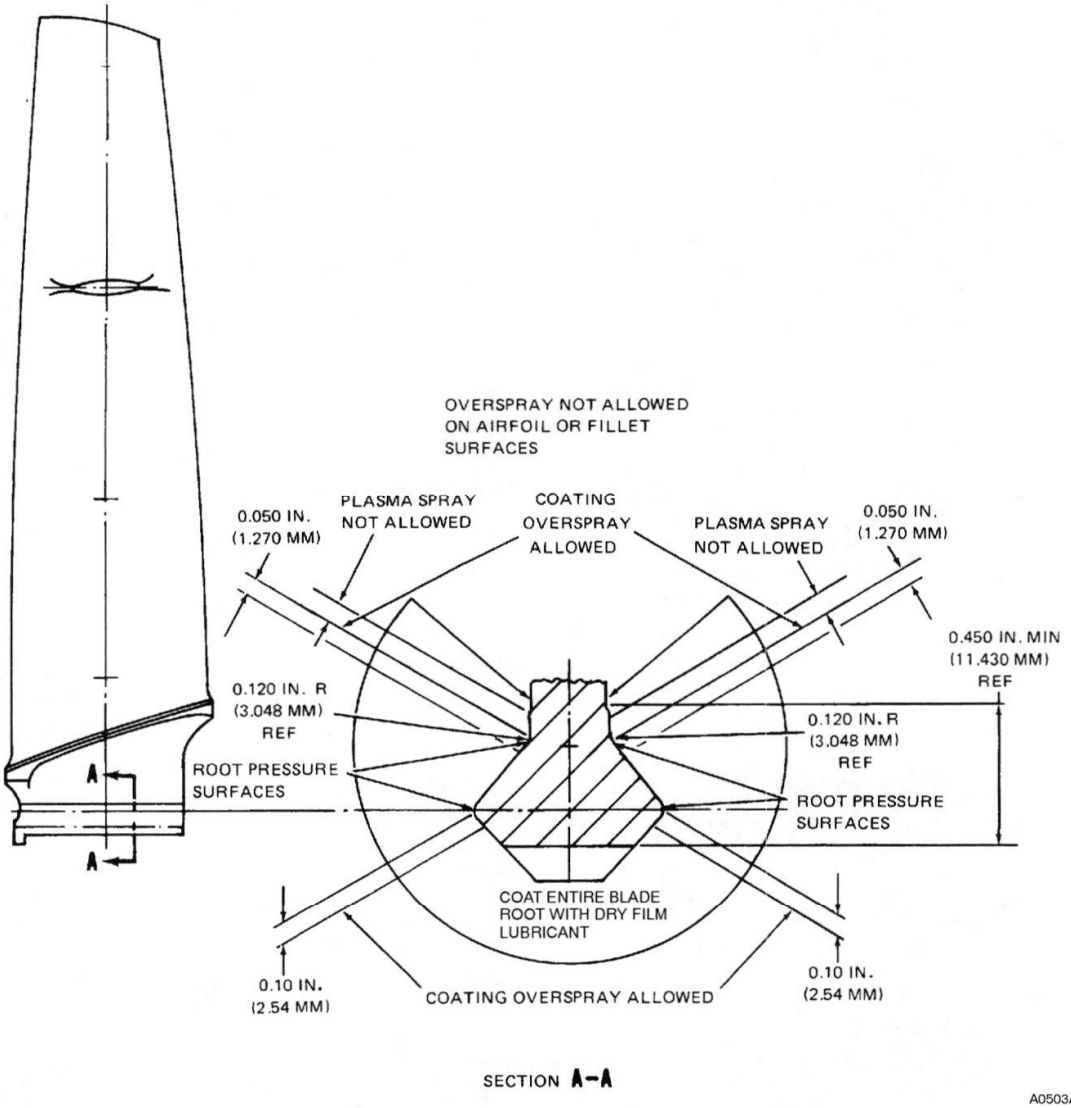

SECTION A-A

A0503/

Fan Blade Coating Areas
Figure 902

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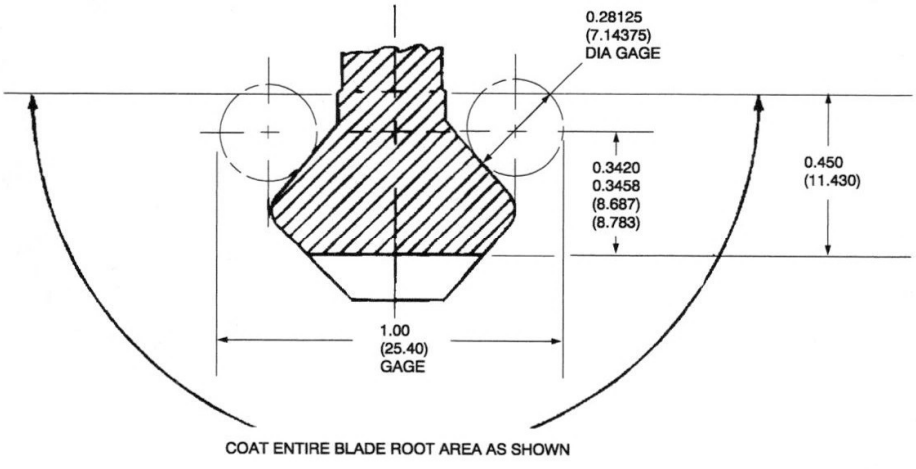

ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)

I58450

Coating of Blade Roots
Figure 903

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FAN BLADES – REPAIR-04

1. Blend-Repair of Fan Blades – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
Model 10112	Strainweigh Balance Machine (Exact Weight Scale Co, Columbus, OH)

B. Procedure

CAUTION: DO NOT USE POWER TOOLS WHEN ACCOMPLISHING THE FOLLOWING. EXCESSIVE HEAT MAY BE GENERATED, ADVERSELY AFFECTING MATERIAL PROPERTIES.

(1) Blend-repair defects to limits specified in Inspection/Check. (Refer to 70-25-01, SPM.) If blending is accomplished, recalculate moment weight *(Figure 901)* as follows:

NOTE: Following procedure may be done using a Strainweigh balance machine Model 10112 or equivalent. If leading edge radius blending is done in the following step, recalculate the moment weight only after all blending has been completed.

Recalculation of moment weight will not be required for blades having five or less blend repairs if the depth of each repair does not exceed 0.030 inch (0.76 millimeters) and no more than 3 blended blades are in each quadrant.

(a) Establish Datum -AB- on fan blade root at 7.955 inches (202.06 millimeters) from engine centerline.

(b) Determine actual distance AC between Datum -AB- and blade center of gravity AD.

(c) Add 7.955 inches (202.06 millimeters) and distance AC together. Multiply result by fan blade weight, in grams, to determine blade moment weight.

(d) Using vibropeen method, etch new blade moment weight 0.001 to 0.006 inch (0.03 to 0.15 millimeter) deep in location shown in *Figure 901.*

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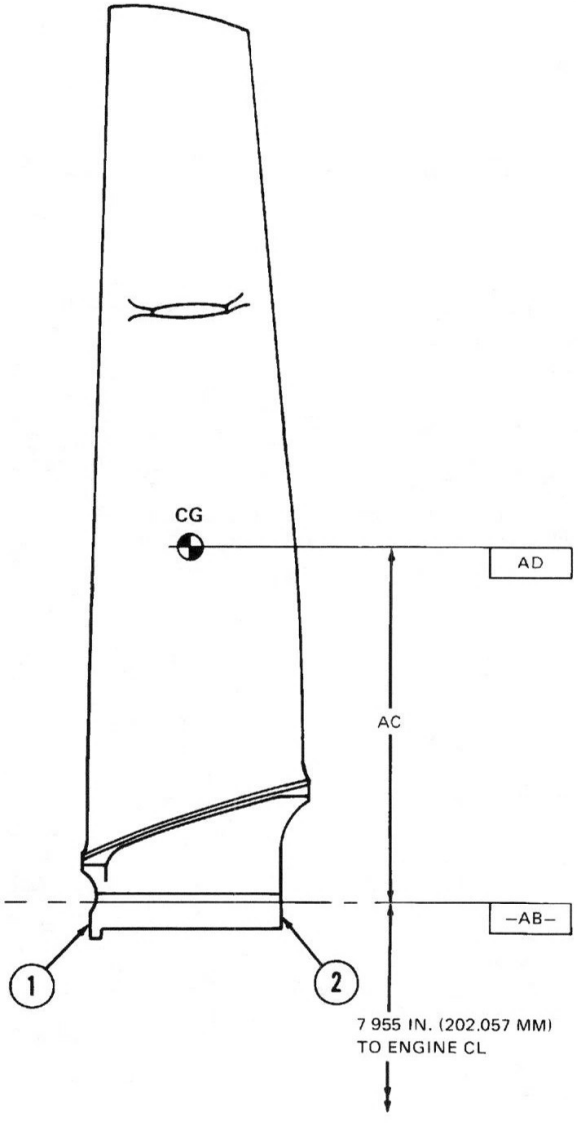

1. OBLITERATE EXISTING MOMENT WEIGHT AND INSTALLATION POSITION NUMBERS.
2. ETCH BLADE MOMENT WEIGHT IN THIS AREA. INSTALLATION POSITION NO. SHALL BE ETCHED IMMEDIATELY ABOVE.

A0504

Fan Blade Moment Weight Calculation
Figure 901

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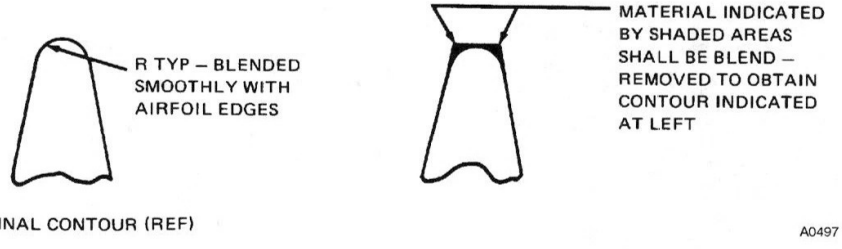
1. B. (2) Blend-repair fan blades that exhibit flattening on leading edge areas. *(See Figure 902.)* Blending shall be accomplished in a manner that does not result in a reduction below the minimum chordal dimensions. *(Refer to Table 901 and Figure 903.)*

NOTE: The performance of fan blades 2-043-001R32 and 2-043-001R34, which have an optimized leading edge profile, will be adversely effected if a circular leading edge radius is applied as shown in *Figure 902.* For information on sources approved to apply the optimized leading edge profile, contact:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

(3) Inspect fan blades. (Refer to 72-31-08, Inspection/Check.) All inspection criteria must be met.



Fan Blade Leading Edge Blend-Repair Areas
Figure 902

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Table 901. Fan Blade Dimensional Inspection

SECTION	RADIUS (GAGE) INCH (MILLIMETER)	CHORD LENGTH INCH (MILLIMETER)
A-A	11.118 (282.40)	4.096 (104.04)
B-B	10.291 (261.39)	4.009 (101.83)
C-C	9.464 (240.39)	3.920 (99.57)
D-D	8.637 (219.38)	3.830 (97.28)
E-E	7.809 (198.35)	3.737 (94.92)
F-F	6.983 (177.37)	3.639 (92.43)
G-G	6.155 (156.34)	3.537 (89.84)
H-H	5.328 (135.33)	3.431 (87.15)
J-J	4.502 (114.35)	3.317 (84.25)
K-K	3.676 (93.37)	3.202 (981.33)
L-L	2.850 (72.39)	3.078 (78.18)
M-M	2.024 (51.41)	2.937 (74.60)

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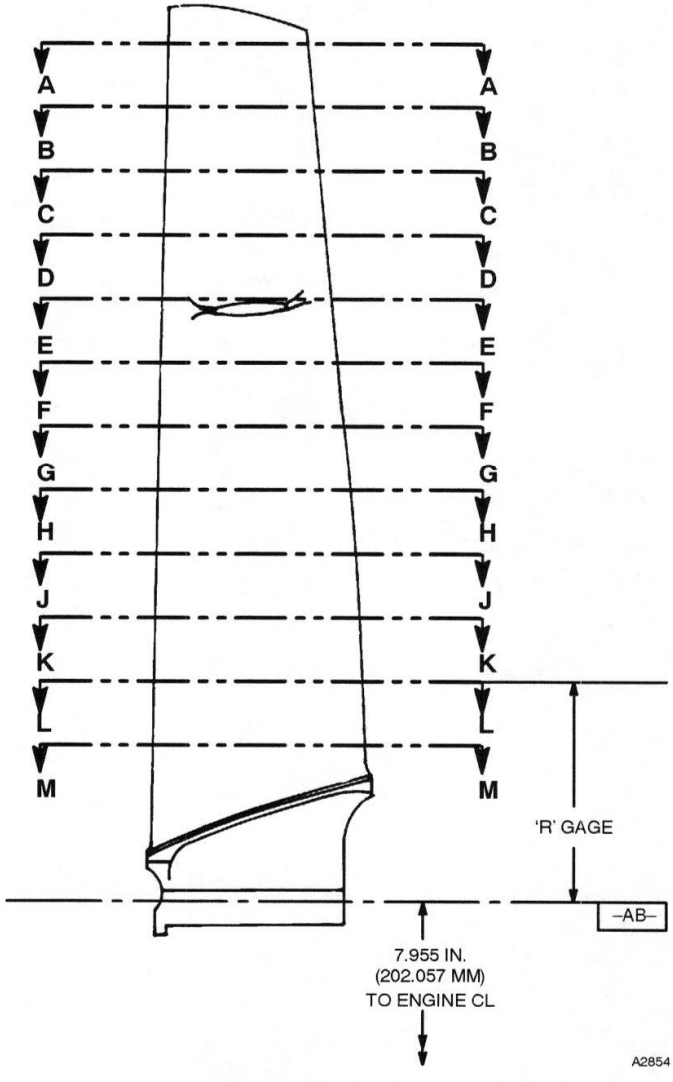

Fan Blade Minimum Chord Dimension Limits
Figure 903

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FAN BLADES – REPAIR-05

1. Refurbishment of Fan Blades – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
66SD	Nozzle
10112	Strainweigh Balance Machine (Exact Weight Scale Co, Columbus, OH)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Alcohol	07-17, -18, or -20
Alkaline Derust Cleaning Compound	07-30
Corrosion Preventive Resin Varnish	02-32
Dry Cleaning Solvent	07-48 or -49
Distilled Water	10-24
Glass Shot	05-02
Graphite Powder	02-07
Hardface Coating	06-04
Hydrofluoric Acid	04-05
Nickel Chloride	04-16
Nitric Acid	04-06
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A
Steel Shot	05-17
Welding Wire	03-23 or -22

B. Procedure

CAUTION: TO PREVENT DAMAGE TO BLADES, DO NOT USE CHLORINATED SOLVENTS.

(1) Using dry cleaning solvent, degrease blades.

(2) Using suitable masking, mask airfoil surface of blades to protect during blasting.

1. B. (3) Using plastic media blasting, remove coating from blade root areas. (Refer to 70-15-15, SPM.)

(4) Remove masking and clean root areas using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

(5) Visually inspect midspan support load faces for evidence of galled, fretted, or otherwise damaged parent metal. If such condition(s) exists, machine an equal (and minimum) amount of material from each load face as shown on *Figure 901* until 100 percent clean-up of both faces is achieved.

(6) Fluorescent-penetrant inspect repaired areas for cracks. Cracks are not allowed. (Refer to 70-20-05, SPM.)

(7) Measure to determine cross-shroud dimension; if 2.0466 inches (51.984 millimeters) or more, proceed to Step (9); if less than 2.0466 inches (51.984 millimeters), perform following Step (8).

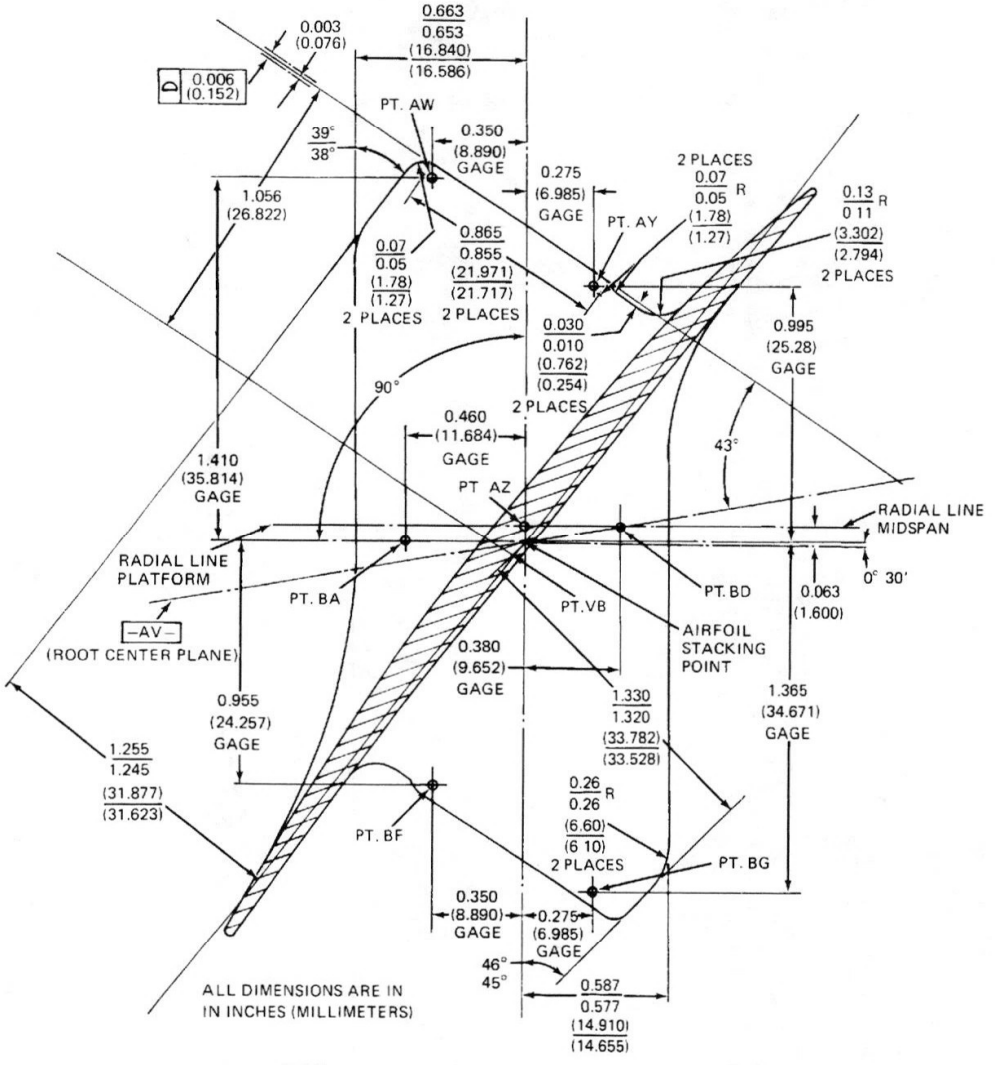
NOTE: Cross-shroud dimensional inspection requirement is applicable to all blades after stripping of hardface coating, including those that have not required load face machining. Blades rejected for any unrepairable condition shall not be discarded; future repair development efforts may address such conditions.

This repair shall not be done to blades exceeding maximum material removal limit of 0.175 inch (4.45 millimeter) from finished cross-shroud dimension. (*See Figure 902.*)

(8) Perform fusion-weld buildup of midspan shroud as follows:

(a) Using Hot-Alkali Soak No. 2, clean midspan shroud surfaces. (Refer to 70-15-07, SPM.)

(b) Using distilled water with a nickel chloride content of less than 17 ppm, rinse blade until blade is cooled to room temperature.



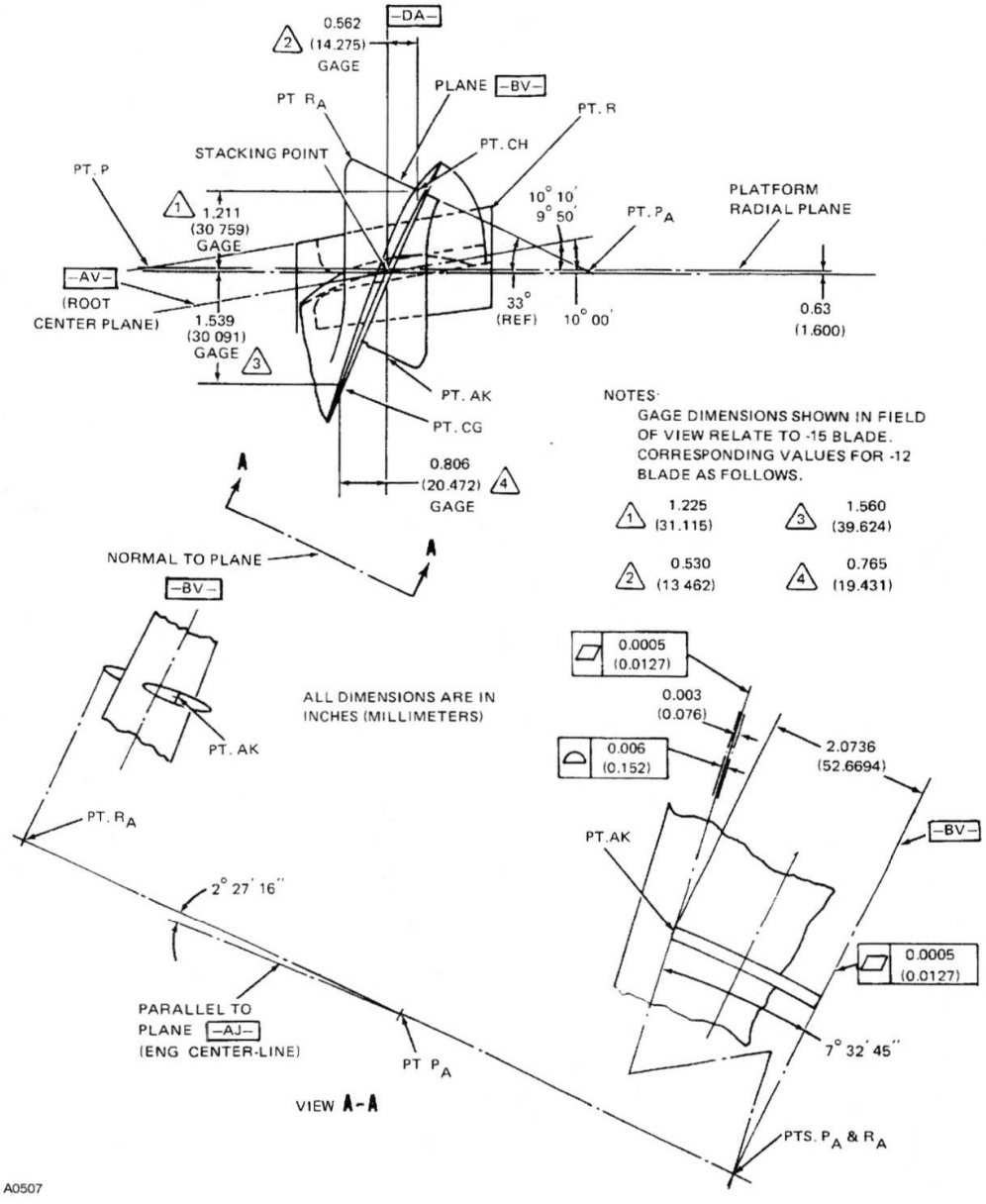
NOTE:

1 UNLESS OTHERWISE INDICATED ALL DIMENSIONS ARE FINISH REQUIREMENTS

2 MACHINING OF SHROUD FACES IN PREPARATION FOR D-GUN COATING APPLICATION SHALL BE WITHIN TOLERANCES INDICATED.

A0506-X

Machining Load Faces of Fan Blades
Figure 901 (Sheet 1 of 2)



Machining Load Faces of Fan Blades
Figure 901 (Sheet 2)

1. B. (8) (c) Using an etching solution consisting of 32 to 36 percent by volume nitric acid (40° Baume), 2 to 4 percent by volume hydrofluoric acid (70 percent commercial grade), and enough distilled water to make one gallon (3.785 liters), acid-etch area to be welded.

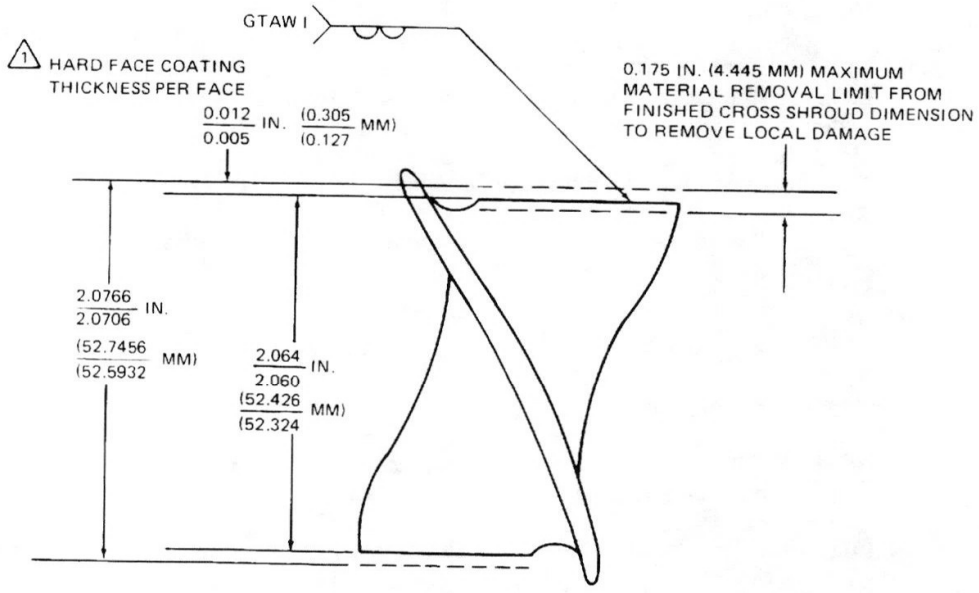
NOTE: Nickel chloride content of distilled water shall not exceed 17 ppm.

(d) Using cold, clean distilled water, rinse blade.

(e) Oven-dry blade at a temperature not to exceed 350°F (177°C).

CAUTION: DURING WELDING PROCEDURE, ALLOW WELD TO COOL FOR AT LEAST 1 MINUTE BETWEEN EACH PASS. MAXIMUM BLADE TEMPERATURE AROUND MIDSPAN AREA SHALL NOT EXCEED 900°F (482°C).

(f) Using welding wire and fusion welding method with adequate argon shielding and backup, build-up midspan shroud faces. (See *Figure 902* and 70-45-01, SPM.)



1 IF WELD BUILDUP OF MIDSPAN SHROUD WAS ACCOMPLISHED, HARD FACE THICKNESS PER FACE SHALL BE 0.005 TO 0.007 IN. (0.127 TO 0.178 MM).

A0508

Buildup of Fan Blade Midspan Shroud
Figure 902

1. B. (8) (g) Stress relieve blade at a temperature of 1000°F (538°C) for two hours in a vacuum of 1 micron (maximum) or in an argon atmosphere.

(h) Using suitable holding fixture, machine midspan shroud as necessary to obtain a 2.0706 to 2.0766 inch (52.593 to 52.746 millimeter) dimension after hardface coating is applied. (*See Figure 901 and Figure 902.*)

(i) Blend shroud as required. (Refer to Repair-04.)

(j) Fluorescent-penetrant inspect repaired shroud to Class I fusion-weld requirements. (Refer to 70-20-05 and 70-45-01, SPM.) Cracks are not allowed.

(9) With Area B suitably masked (See *Figure 903*), shot peen blade root Area A in accordance with MIL-S-13165 using either glass shot size No. 232 or steel shot size CS170. Peening intensity shall be 7-9A, with a minimum coverage of 200 percent. Remove masking.

(10) Shot peen airfoil Area B (*Figure 903*) in accordance with MIL-S-13165 using either glass shot size No. 165 or steel shot size CS110. Peening intensity shall be 12-15N, with a minimum coverage of 200 percent. Surface finish shall be 32 microinches or better after peening.

(11) Polish blades to achieve a 16 to 32 microinch surface finish. (Refer to 72-31-08, Repair-06.)

(12) Using D-Gun or Gator Guard process, reapply hardface coating to midspan support contact surfaces. A finish deposit thickness of 0.005 to 0.012 inch (0.13 to 0.31 millimeter) shall be applied equally to both load faces as required to achieve a finished cross-shroud dimension of 2.0706 to 2.0766 inches (52.593 to 52.746 millimeters). Chipping of hardface coating is unacceptable.

NOTE: If weld buildup was accomplished on midspan shroud, hardface coating thickness shall be 0.005 to 0.007 inch (0.13 to 0.18 millimeter).

Take care not to overspray onto airfoil or fillet.

(13) Recalculate moment weight as follows: (*See Figure 904.*)

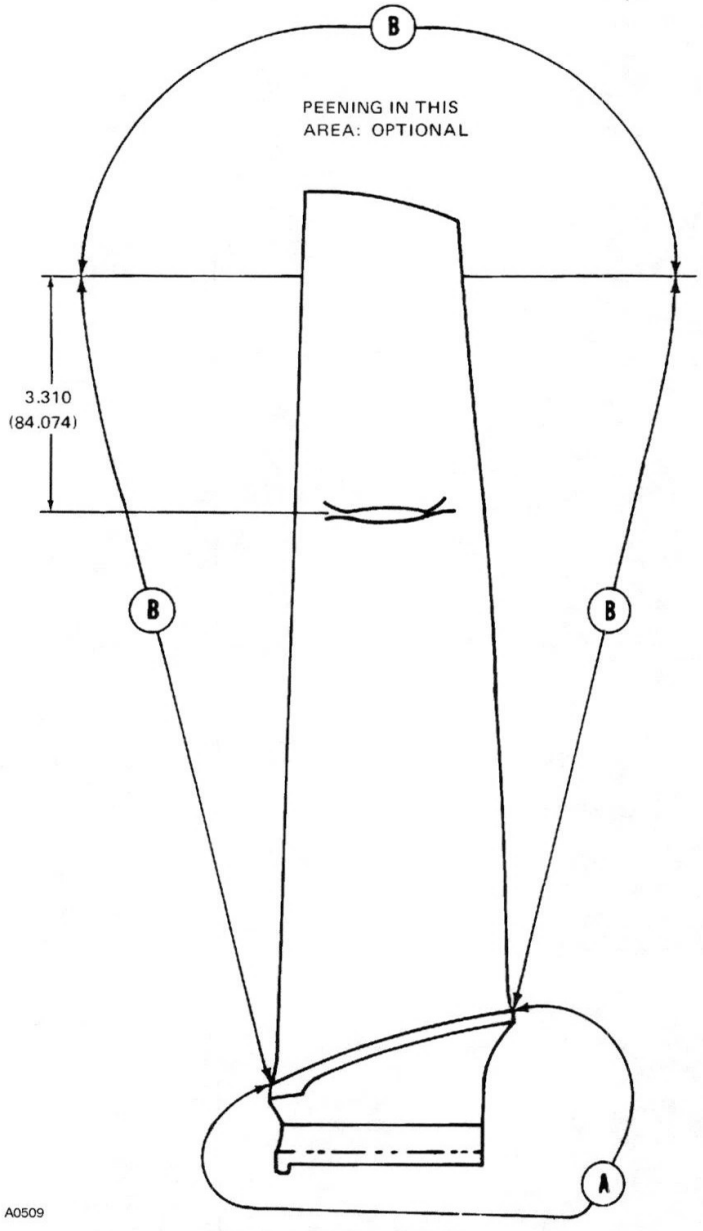
NOTE: Following procedure may be accomplished using a Strainweigh balance machine Model 10112 or equivalent.

(a) Establish Datum -AB- on fan blade root at 7.955 inches (202.06 millimeters) from engine centerline.

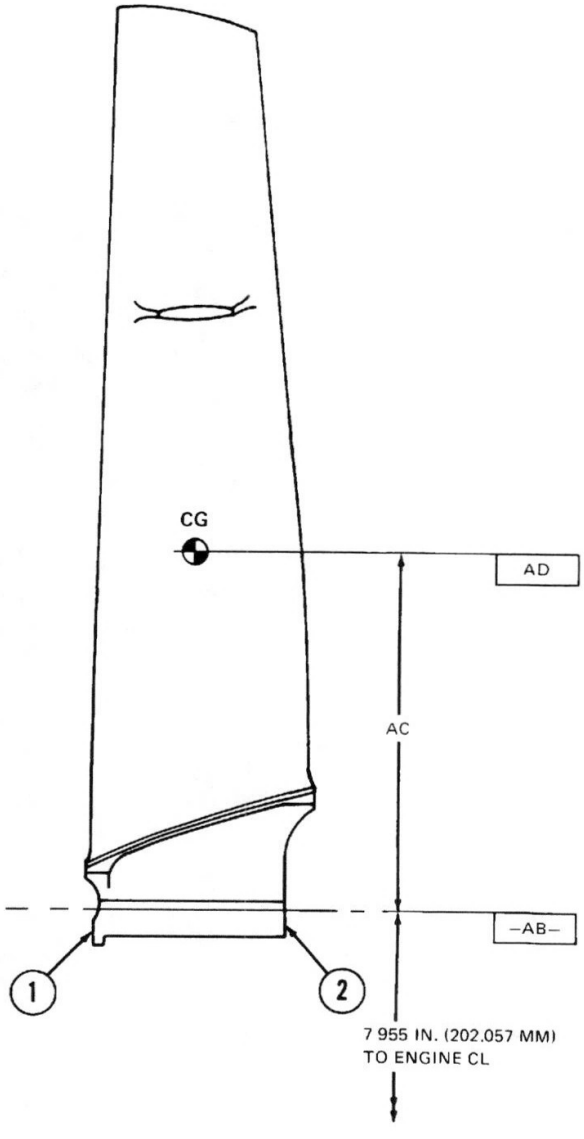
(b) Determine actual distance AC between Datum -AB- and blade center of gravity AD.

(c) Add 7.955 inches (202.06 millimeters) and distance AC together. Multiply result by fan blade weight, in grams, to determine blade moment weight.

1. B. (13) (d) Using vibropeen method, etch new blade moment weight 0.001 to 0.006 inch (0.03 to 0.15 millimeter) deep in location shown in *Figure 904*. If necessary, restore blade serial number by same method.



Fan Blade Glass Bead Peening Areas
Figure 903



1. OBLITERATE EXISTING MOMENT WEIGHT AND INSTALLATION POSITION NUMBERS.

2. ETCH BLADE MOMENT WEIGHT IN THIS AREA. INSTALLATION POSITION NO. SHALL BE ETCHED IMMEDIATELY ABOVE.

A0504

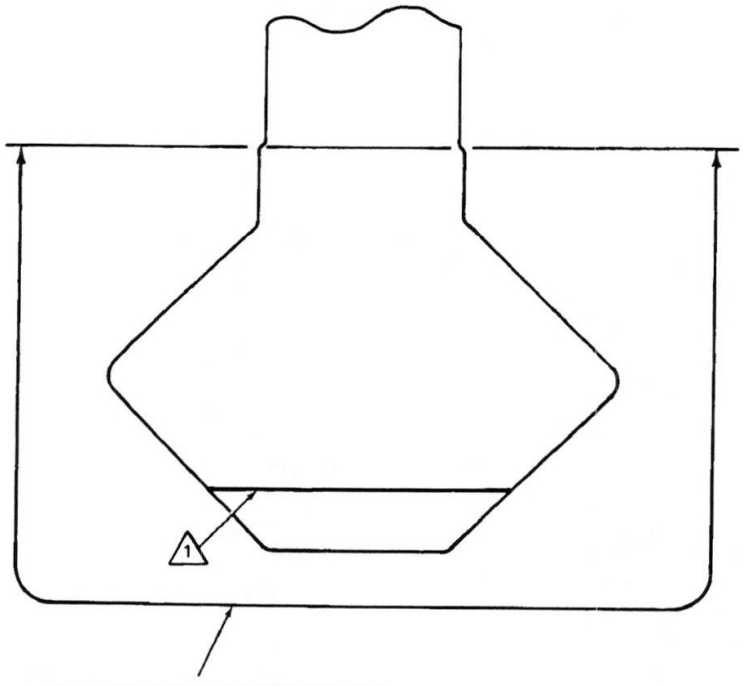
Fan Blade Moment Weight Calculation
Figure 904

1. B. (14) Mask midspan support hardface coating Area B (*See Figure 903*) and anodize fan blade(s). (Refer to 70-30-10, SPM.)

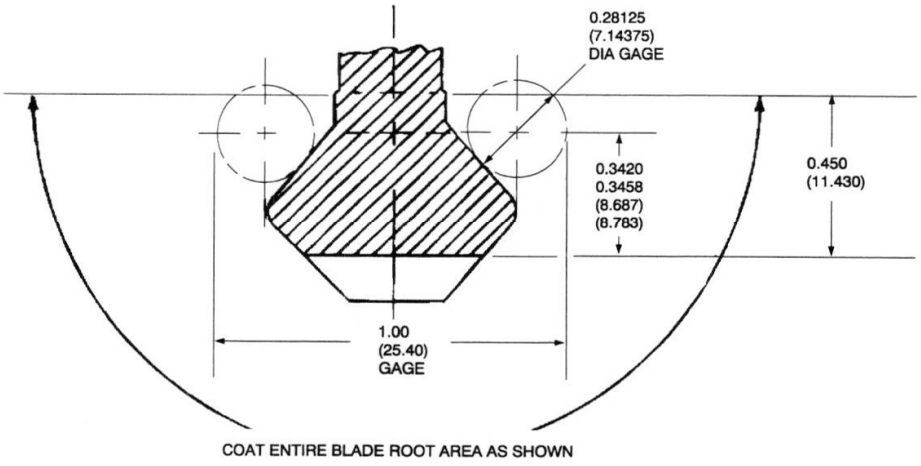
NOTE: Re-anodizing of fan blade(s) is optional.

(15) Apply graphite-varnish coating to blade root areas (*See Figure 905*) in accordance with Repair-02 or -03.

(16) Dimensionally inspect. (*See Figure 906.*)



Surface Treatment of Fan Blade Root Areas
Figure 905



ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)

I58450

Coating of Blade Roots
Figure 906

FAN BLADES – REPAIR-06

1. Repair of Airfoil Surface Finish – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

NOTE: Equivalent material substitutes may be used instead of those listed below.

Special Tools:

Part No.	Nomenclature
No Number	Finishing Milling Machine (New England Metal Finishing, Inc, North Granby, CT)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Plastic Abrasive Media	05-20, -20A, -20B, -21, -22, -22A

B. Procedure

(1) Clean blade, using dry cleaning solvent. (Refer to 70-15-03, SPM.)

(2) Inspect airfoil surface finish. Roughness shall not exceed 32 microinches. Flaws or irregularities such as scratches are not part of the normal surface pattern and should not be included in the surface roughness measurement.

WARNING: PERFORM REPAIR AFTER ALL BLENDING OR LEADING EDGE RE-PROFILING AND BEFORE REAPPLICATION OF BLADE ROOT COATING.

(3) If blade root coating has not previously been removed, remove coating as follows:

(a) Mask airfoil surface of blade to protect during blasting.

(b) Using plastic media blasting, remove coating from blade root areas. (Refer to 70-15-15, SPM.)

(c) Remove masking and rinse blade, first with cold water, then with hot water heated to 160°F (71°C). Thoroughly dry blade.

1. B. (4) Polish blades in finishing mill to achieve a surface finish of 16 to 32 microinches as follows:

(a) Mask blade root areas for protection during blade polishing operations.

(b) Load blades into finishing mill to prevent damage as result of contacting other blades.

(c) Use finishing media designed for fine to light burnishing.

(d) Use media composition, size, and shape to impart the required surface finish within the maximum allowable finishing time.

(e) Use angle/cylinder and angle/triangles for recommended media shapes.

(f) If necessary, use burnishing and brightening compounds in conjunction with the finishing media.

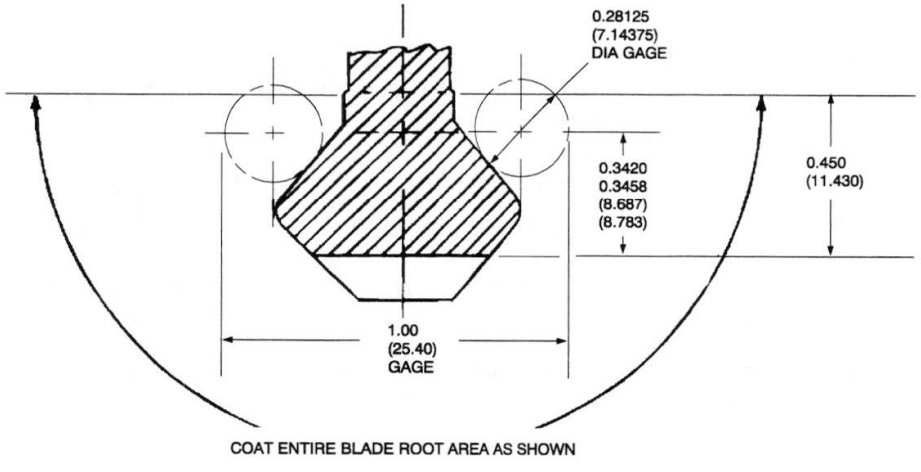
(g) Do not exceed two hours to achieve required 16 to 32 microinches surface finish.

(5) Inspect blade for damage. (Refer to 72-31-08, Inspection/Check.)

(6) Remove masking and clean root areas using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

(7) Reapply blade root coating. (Refer to 72-51-08, Repair-02 or -03.)

(8) Dimensionally inspect blade root area. (*See Figure 901.*)



Coating of Blade Roots
Figure 901

FAN BLADES – REPAIR-07

1. Repair of Fan Blade Leading Edge – Repair-07

A repair is available to weld repair the leading edge of damaged fan blades. This repair may be used to salvage damaged blades or blades with chord widths that have been reduced beyond the limits specified in Inspection/Check or Repair-04.

Execution of this repair is limited to sources that have demonstrated the ability to perform the repair in accordance with Honeywell requirements. For a list of approved sources and information about initial availability of this repair, contact the following:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

Weld-repaired fan blades will be reidentified with a "W" near the blade serial number.

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1. Replacement of Fan Blades (Heavy Maintenance Level) – Repair-08

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT26675-01	Vibration Analysis Kit

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
OPCO Marker	09-08

Repair Parts:

Name	Part Number
Fan Blade Kit	2-203-250-01

B. Procedure

CAUTION: ACCURATE RECORDS OF BLADE REPLACEMENT MUST BE KEPT AS NO MORE THAN SIX PAIRS MAY BE REPLACED BETWEEN BALANCE CYCLES ACCOMPLISHED AT SERVICE CENTER LEVEL.

NOTE: Use Field Replacement Fan Blade Kit 2-203-250-01.

(1) Single pair replacement.

(a) Remove blade to be replaced and its companion blade 180 degrees away.

(b) Note their moment weights and positions in disc.

(c) Replace removed blades with the field replacement fan blade kit. The field replacement fan blade kit consists of two blades with a moment weight difference not greater than 5 gram-inches between them.

1. B. (1) (d) Blade with higher moment weight must be installed at the position formerly occupied by the blade with the higher moment weight.

(e) Replace fan speed compensating resistor (Refer to 72-01-21, Installation) after blade replacement. (*Refer to Table 901.*)

NOTE: If a fan assembly is transferred from one engine to another, fan speed compensating resistor value must also be transferred.

Table 901. Fan Speed Compensating Resistor Changes Resulting From Fan Maintenance

	CIRCUMSTANCE	RESISTOR**	REMARKS
Replacement Blades	Up to 4 Blades	No Change	
	More than 4 Blades	For each 4 blades, lower dash number by 1.	If dash number less than -01 is called for, use -01.
	Over 12 Blades		Measure Thrust.
Maximum Blend-Repair Used Blades*	Up to 2 blades	Lower dash number by 1.	If dash number less than -01 is called for, do not use fan without ground run to measure thrust.
	2 to 4 Blades	Lower dash number by 2.	
	4 to 6 Blades	Lower dash number by 3.	
	6 to 8 Blades	Lower dash number by 4.	
	Over 10 Blades		Measure thrust.

*Near to maximum dimension limits. Minor blending requires no resistor change.
**Refer to 72-01-21, Inspection/Check, *Table 801*, for resistor dash numbers and resistance values.

1. B. (2) Multiple pair replacement.

(a) Up to and including six pairs:

1 Remove blade to be replaced and its companion blade 180 degrees away.

2 Note their moment weights and positions in disc.

3 Replace removed blades with a field replacement set. Field replacement set consists of two blades with a moment weight difference not greater than 5 gram-inches between them.

4 Blade with higher moment weight must be installed at position formerly occupied by blade with higher moment weight.

5 Calculate net (total) moment weight differences (delta) of blades before replacement. (See *Figure 901* for an example.)

6 Replacement pairs are selected so that net moment weight differences before and after replacement (net change) is within 5 gram-inches. (Using *Figure 901* as an example, net difference after replacement must fall within range of 9 to 19 gram-inches.)

(b) Under six pairs separated by 45 degrees or less:

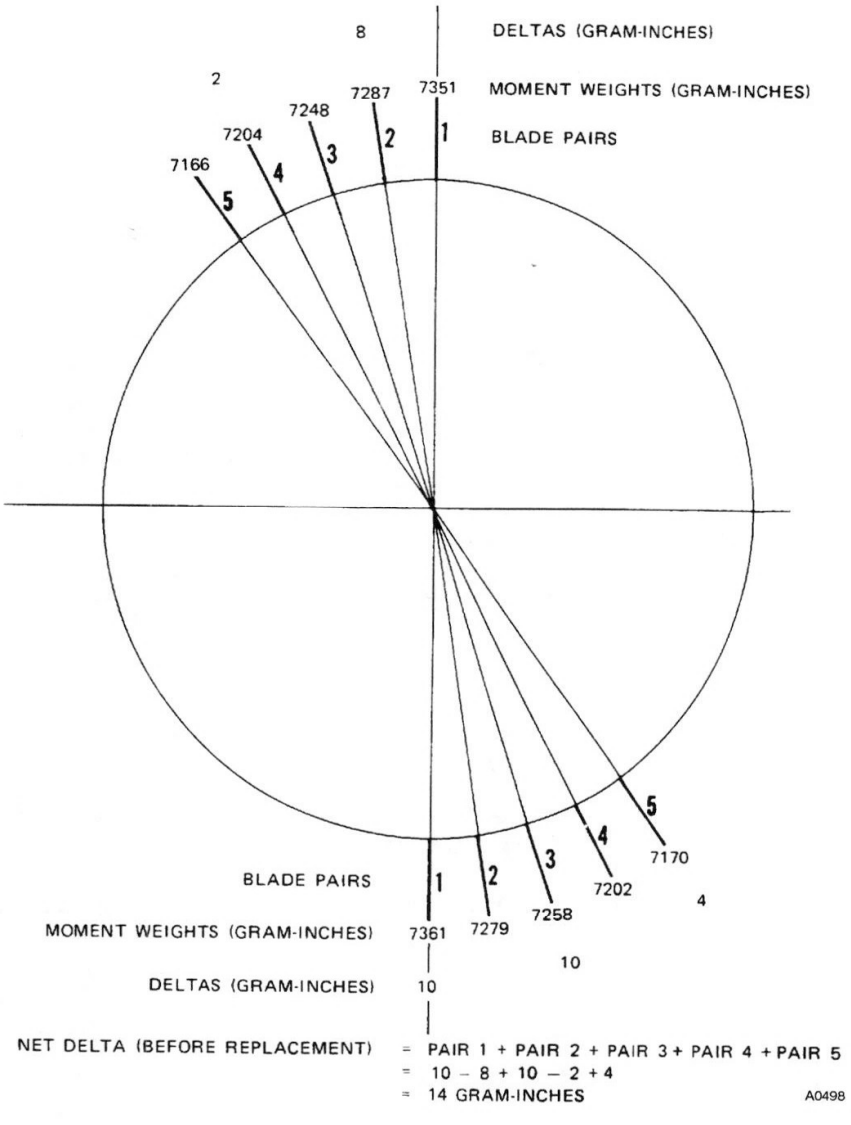
1 Remove blade to be replaced and its companion blade 180 degrees away.

2 Note their moment weights and positions in disc.

3 Replace removed blades with a field replacement set. Field replacement set consists of two blades with a moment weight difference not greater than 5 gram-inches between them.

4 Blade with higher moment weight must be installed at position formerly occupied by blade with higher moment weight.

5 Calculate net (total) moment weight differences (delta) of blades before replacement. (See *Figure 901* for an example.)



Example of Fan Blade Replacement
Figure 901

1. B. (2) (b) 6 Replacement pairs are selected so that net moment weight difference before and after replacement (net change) is within 5 gram-inches. (Using *Figure 901* as an example, net difference after replacement must fall within range of 9 to 19 gram-inches.)

7 It is permissible to reverse one or more blade pairs within 45 degree interval in order to bring net change (delta) after replacement closer to net change (delta) before replacement.

8 Replace fan speed compensating resistor (Refer to 72-01-21, Installation) after blade replacement. (*Refer to Table 901.*)

NOTE: If a fan assembly is transferred from one engine to another, fan speed compensating resistor value must also be transferred.

(3) Multiple pairs separated by 45 degrees or greater:

(a) Remove blade to be replaced and its companion blade 180 degrees away.

(b) Note their moment weights and positions in disc.

(c) Replace removed blades with the field replacement fan blade kit. The field replacement fan blade kit consists of two blades with a moment weight difference not greater than 5 gram-inches between them.

(d) Blade with higher moment weight must be installed at position formerly occupied by blade with higher moment weight.

(e) Calculate net (total) moment weight differences (delta) of blades before replacement. (See *Figure 901* for an example.)

(f) Replacement pairs are selected so that net moment weight difference before and after replacement (net change) is within 3 gram-inches for 2 pairs and 2 gram-inches for 3 pairs.

(g) It is permissible to reverse one or more blade pairs within 45 degree interval in order to bring net change (delta) after replacement closer to net change (delta) before replacement.

1. B. (4) Individual fan blade replacement.

(a) The following procedure is for individual fan blade replacement provided no more than 12 blades have been replaced and vibration limits are not exceeded after blade replacement.

(b) Remove blade(s) to be replaced.

(c) Install replacement blade(s) 2-043-001-11/-12/-15 as necessary.

(d) Mark blade(s) with OPCO marker for identification after engine run.

(e) Replace fan speed compensating resistor (Refer to 72-01-21, Installation) after blade replacement. (*Refer to Table 901.*)

NOTE: If a fan assembly is transferred from one engine to another, fan speed compensating resistor value must also be transferred.

(f) Perform vibration check on engine. If vibration level is exceeded perform trim balance of fan (Refer to 72-00-00, Testing-08) or low pressure turbine (Refer to 72-00-00, Testing-09).

(g) If vibration limits are still not within limits, perform vibration analysis as follows:

1 Using vibration analysis kit LTCT26675-01 or equivalent, monitor engine vibration. Overall vibration levels shall not exceed 1.2 inch/ second average velocity (peak-to-peak). If this limit is exceeded, and it has been determined that the primary component of vibration is the fan, then fan trim balancing may be required. (Refer to 72-00-00, Testing-08.)

2 Trim balance fan to reduce vibration. (Refer to 72-00-00, Testing-08.)

(h) If fan vibration limits cannot be attained, replace fan blade(s) with matched set 2-203-250-01, with blade moment tolerance of less than 5 gram inches. Proceed as follows:

1 Replace blade(s) with matched set.

2 Perform vibration analysis per Step (e).

3 If vibration limits are exceeded, remove engine, fan module, or fan assembly and return to approved service center level repair facility.

FAN BLADES – REPAIR-09

1. Replacement of Fan Blades, Alternate Method (SC) – Repair-09

NOTE: Refer to Repair-00 for part number application. This procedure may be used in lieu of Repair-01.

A. Equipment and Materials

Special Tools:

LTCT13966-01	Pusher
LTCT5988-01	Balancing Arbor
LTCT13568-01	Babbitt Sleeve Bearing
HF3B	Schenck Balancing Machine
LTCT14243-01	Puller

Special Tools:

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Antiseize Compound	02-01

B. Procedure

(1) If not previously accomplished, check balance first-stage low pressure compressor disc assembly (Refer to 72-31-09, Repair-01) and moment weigh the fan blades.

(2) Inspect fan disc assembly for proper midspan shroud gap measurement, midspan shroud contact surface mismatch, and blade platform gap measurements. (Refer to 72-31-08, Repair-02.)

NOTE: If fan blade midspan dampers have been overhauled, this operation may be omitted.

(3) Install first low pressure compressor disc assembly and fan blade retaining ring on fan disc and tighten bolts to proper torque. (Refer to 72-01-02, Installation.) Do not install fan blades.

(4) Using pusher LTCT13966-01 or equivalent, install fan and supercharger assembly on balancing arbor LTCT5988-01 or equivalent and support assembly with babbitt sleeve bearing LTCT13568-55 installed on balancing machine.

(5) Apply a liberal amount of antiseize compound to threaded areas of arbor. Tighten arbor nut to 200 foot-pound (271 Nm) torque. Release torque to zero and retighten to 110 foot-pound (149 Nm) torque.

1. B. (6) Using Schenck Model HF3B balancing machine or equivalent, calibrated for force-force balance, two-plane balance the assembly. (See *Figure 901* for plane locations.) Apply double-compensation method to minimize tooling error.

(7) If the imbalance exceeds 60 gram-inch in any balance plane, remove and rotate the supercharger rotor until the assembly imbalance in both planes is less than 60 gram-inch.

(8) Correct imbalance in Plane 2 by adding balance weights, as required, at locations shown in *Figure 901*. Do not install any weights on Plane 1. Remaining imbalance on Plane 2 shall not exceed 6.0 gram-inch. Measure the residual imbalance on Plane 1 but do not correct it.

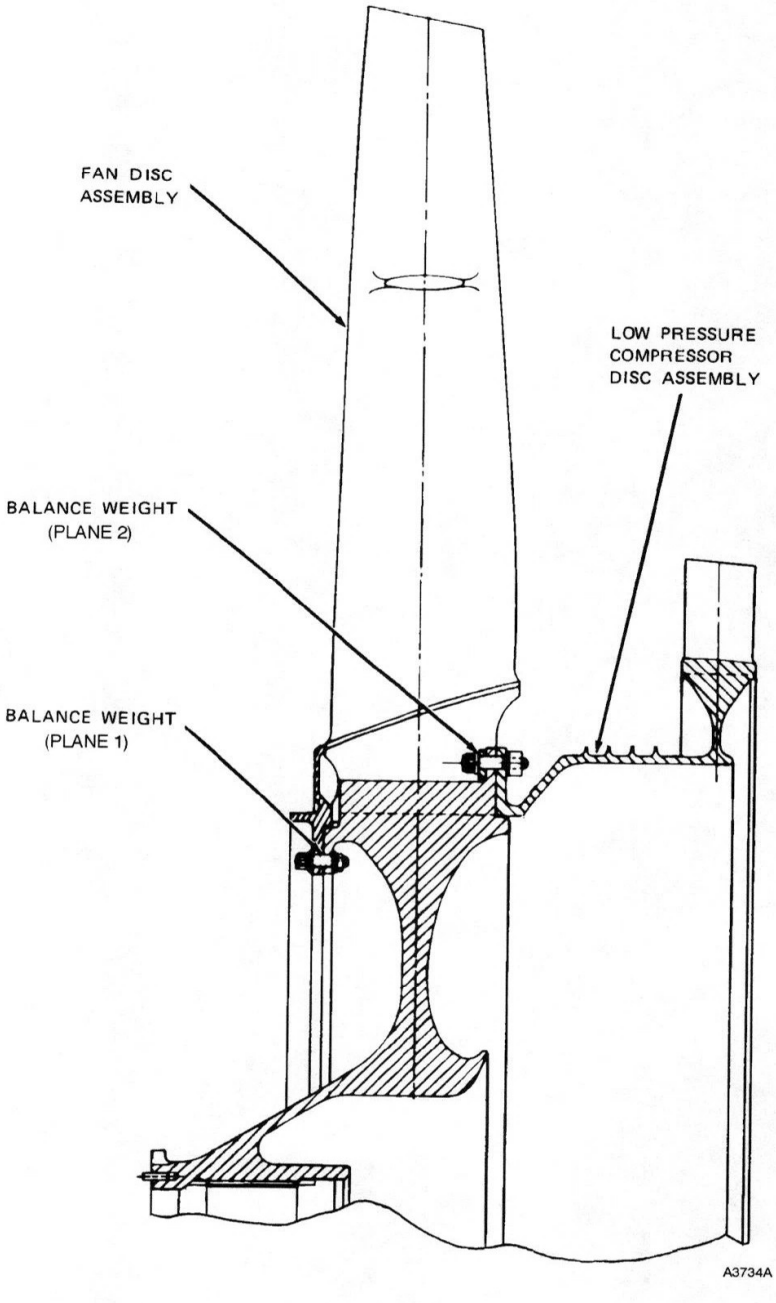
NOTE: Material may be removed from balance weights to achieve limits.

(9) Using felt-tip marker, match-mark the balancing weights prior to removing the assembly from the balancing arbor. Match-mark retaining ring and retaining ring bolts.

(10) Using puller LTCT14243-01, remove assembly from balancing arbor.

(11) Moment weigh all fan blades and distribute using a computer program that minimizes residual imbalance when installed in disc assembly. Use the residual imbalance on Plane 1 of the fan and supercharger disc assembly when prompted to input the disc assembly imbalance. Vibropeen position on blade roots. Do not check balance fan assembly with blades installed.

(12) At engine assembly, install fan blades in accordance with computerized sequence. (Refer to 72-01-02, Installation.)



Balancing Fan and Supercharger Assembly
Figure 901

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – CLEANING

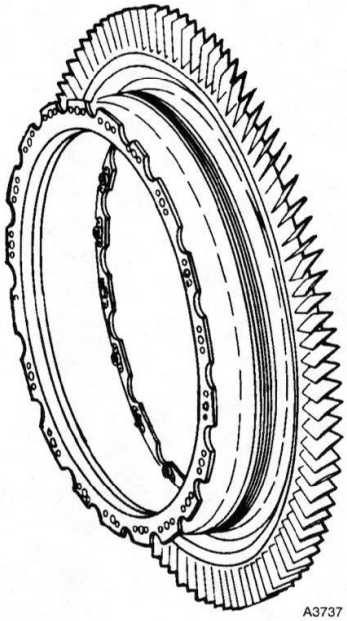
1. Low Pressure Compressor Disc Assembly (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Low Pressure Compressor Disc Assembly
Figure 601

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – INSPECTION/CHECK

1. Low Pressure Compressor Disc Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect blades for the following:

         (a) Bending or distortion. Bending or distortion affecting the whole blade is cause for rejection. Replace discrepant blades. (Refer to 72-31-09, Repair-01.)

         (b) Cracks, dents, and nicks in critical area. (*See Figure 801.*) Cracks or nicks are not allowed. Smooth dents are permitted, provided they do not exceed 0.030 inch (0.76 millimeter) in diameter and 0.010 inch (0.25 millimeter) in depth. Repair is not allowed in critical area. Replace discrepant blades. (Refer to Repair-01.)

         (c) Nicks, dents, or cracks in leading and trailing edges and in blade tip. Cracks are not allowed. Nicks and dents are permitted provided that, after repair, they do not exceed allowable repair limits. Repair nicks and dents. (Refer to Repair-02.) If limits cannot be met, replace discrepant blades. (Refer to Repair-01.)

         (d) Nicks, dents, and cracks in airfoil surfaces. Cracks are not allowed. Nicks and dents are permitted, provided they do not exceed 0.015 inch (0.38 millimeter) in depth and 0.350 inch (8.89 millimeter) in length. Repair within-limit nicks and dents. (Refer to Repair-02.) If limits cannot be met, replace discrepant blades. (Refer to Repair-01.)

      (2) Visually inspect disc for the following:

         (a) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (b) Cracks. Not acceptable. Replace.

         (c) Damaged nut plates. Replace nut plates. (Refer to 72-31-09, Repair-03.)

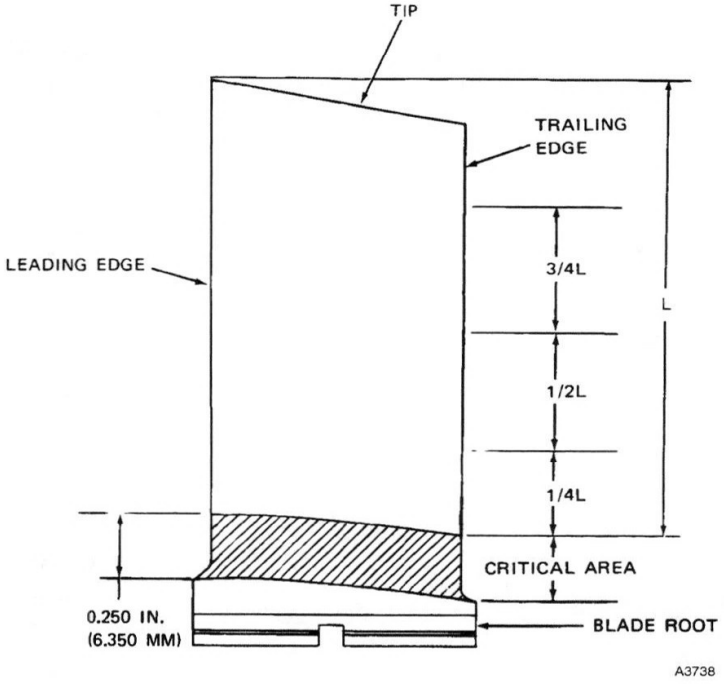
         (d) Rubs in rim. Light rubs up to 0.015 inch (0.38 millimeter) deep are acceptable. Blend-repair sharp edges. (Refer to 70-25-01, SPM.) Rubs are not acceptable in web areas.

      (3) Fluorescent-penetrant inspect parts for cracks. (Refer to 70-20-05, SPM.) Replace if cracks are noted.

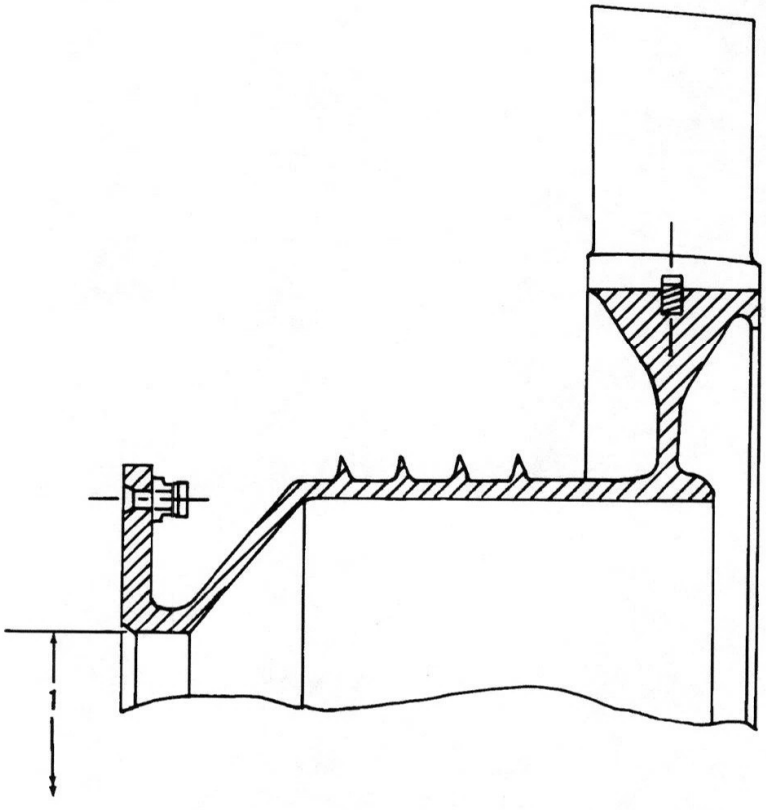
      (4) Dimensionally inspect. (*Refer to Table 801 and Figure 802.*) If limit cannot be met, replace disc assembly.

Table 801. Low Pressure Compressor Disc Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID*	15.1400 (384.556)	15.1414 (384.592)	Fit at Assembly		802 1
*Dimensional inspection required only if visual inspection indicates obvious damage.					



Low Pressure Compressor Disc Assembly Blade
Figure 801



Low Pressure Compressor Disc Assembly Dimensional Inspection Locations
Figure 802

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-070-04/-07	-01, -02, and -03	None

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – REPAIR-01

1. Replace Discrepant Low Pressure Compressor Disc Assembly Blades – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT12096	Balancing Arbor
LTCT12058	Balancing Arbor

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Marking Pencil	09-05

B. Procedure

NOTE: The following instructions pertain to the removal and installation of all blades. To replace only those blades that are defective, follow the procedures that deal only with blade removal and installation and disregard the instructions for arranging blades in the order of ascending weights. Select a new blade that is within 0.1 gram in weight of the blade to be replaced. If blade to be replaced has material missing so that accurate weight could not be obtained, remove blade 180 degrees from damaged blade, weigh and select new blade within 0.1 gram of it. If this is not possible, select two blades of any equal weight and install 180 degrees apart.

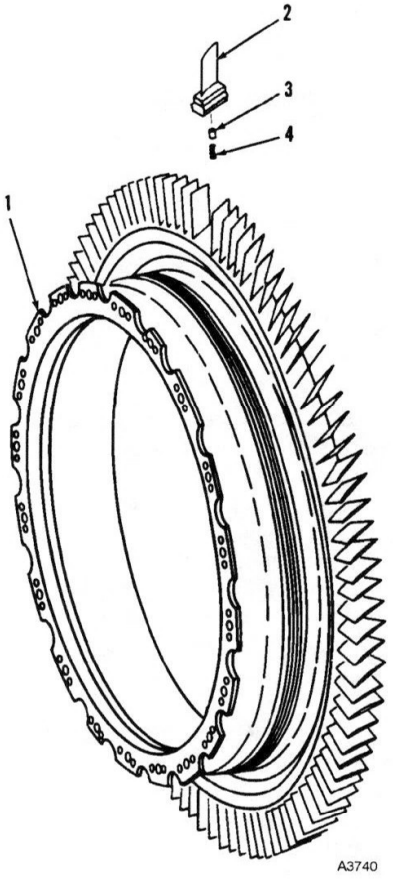
If more than six low pressure compressor blades are to be replaced, all blades in the disc shall be removed, and along with the new replacement blades, arranged in the order of descending weights.

(1) Starting with blade number 1, number blades and disc in a clockwise direction using a marking pencil, to ensure proper sequence for reinstallation.

(2) Place disc assembly, face up, on a suitable block of wood.

CAUTION: THE 1/8 INCH (3.2 MILLIMETER) TAPER MUST BE MAINTAINED TO PREVENT DAMAGE TO DISC. FREQUENT MACHINING OF DOWEL WILL BE NECESSARY.

(3) Using 5/16 inch (7.9 millimeter) brass dowel stock (ground to 1/8 inch (3.2 millimeter) face taper), tap blade root until lock pin (3, *Figure 901*) is sheared.



1. DISC
2. BLADE
3. LOCK PIN
4. LOCK SPRING

Low Pressure Compressor Disc Assembly Blade Replacement
Figure 901

1. B. (4) Remove blade (2), both pieces of sheared lock pin (3), and lock spring (4).

(5) Repeat Steps (3) and (4) until all blades are removed.

(6) Inspect underside of blade roots for damage to retention pin slots caused by blade or pin removal. If damage exists, replace blade.

(7) Inspect blade roots for damaged or missing Molykote or Graphite varnish coating. Touch up discrepant blades. (Refer to 70-30-11 or 70-30-24, SPM.)

(8) Inspect disc for damage to lock pin holes. Deburr if required.

(9) Arrange and mark blades as follows:

(a) Arrange all blades of disc assembly in a single row in order of descending weight. (See *Figure 902,* Step I.) The weight of any blade shall not vary more than 0.5 gram from weight of blade immediately preceding or succeeding it.

NOTE: Blade weight to the nearest 0.10 gram is stamped on the convex side of the blade. If not visible, blade must be weighed.

(b) Rearrange blades as shown in *Figure 902*, Step II.

(c) Starting with first blade, install blades into disc slots consecutively in the sequence arranged in Step (b).

(d) Using a marking pencil, number each blade consecutively, clockwise from number 1 blade.

NOTE: The number 1 blade will be first blade installed between two centerpunch marks on each side of disc slot.

(10) Install blades as follows.

(a) If required, stone bottom base of each blade to obtain a 0.0003 to 0.001 inch (0.007 to 0.025 millimeter) loose fit.

NOTE: Proper fit of blade into disc may be obtained by lightly grinding base of blades instead of stoning.

(b) Using suitable installing tool, install each blade partway into disc slot.

NOTE: Check for larger end slots in disc and insert from that direction.

1. B. (10) (c) Install new lock spring and lock pin in blade slot.

(d) Depress lock pin, and install blade completely into slot.

(e) Check lock pin engagement in blade root by inserting an 0.045 inch (1.14 millimeter) diameter wire into hole in base of blade not yet installed; bend wire over. Remove wire and insert into an installed blade. The bend of the wire should protrude approximately 1/16 inch (1.6 millimeter) from end of blade when end of wire is bottomed.

NOTE: Ensure wire end is squared off with sharp edges broken and is free of burrs.

STEP I

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
81 82 83 84 85 86 87 88 89 90

STEP II

1, 6, 9, 14, 17, 22, 25, 30, 33, 38, 41, 46,
49, 54, 57, 62, 65, 70, 73, 78, 81, 86, 89,
4, 7, 12, 15, 20, 23, 28, 31, 36, 39, 44, 47,
52, 55, 60, 63 68, 71, 76, 79, 84, 87
2, 5, 10, 13, 18, 21, 26, 29, 34, 37, 42, 45,
50, 53, 58, 61, 66, 69, 74, 77, 82, 85, 90,
3, 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48,
51, 56, 59, 64, 67, 72, 75, 80, 83, 88

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Low Pressure Compressor Disc Assembly Blade Arrangement
Figure 902

1. B. (11) If blades or discs have been replaced, grind blade tips, using a suitable OD grinder and grinding wheel as follows:

(a) Install disc assembly between suitable center fixtures in grinder.

(b) Grind blades to dimensions shown in *Figure 903.*

(c) Inspect all diameters before disc assembly is removed from grinder.

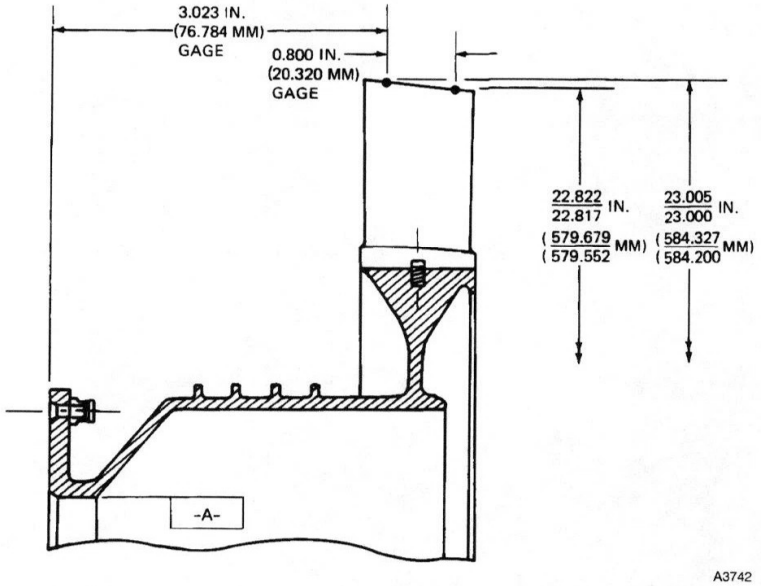
(12) Balance low pressure compressor disc assembly as follows:

(a) Mount disc assembly on balancing arbor LTCT12058 or LTCT12096. If balancing arbor LTCT5596 is to be used, support the disc assembly on bearings installed in balancing machine.

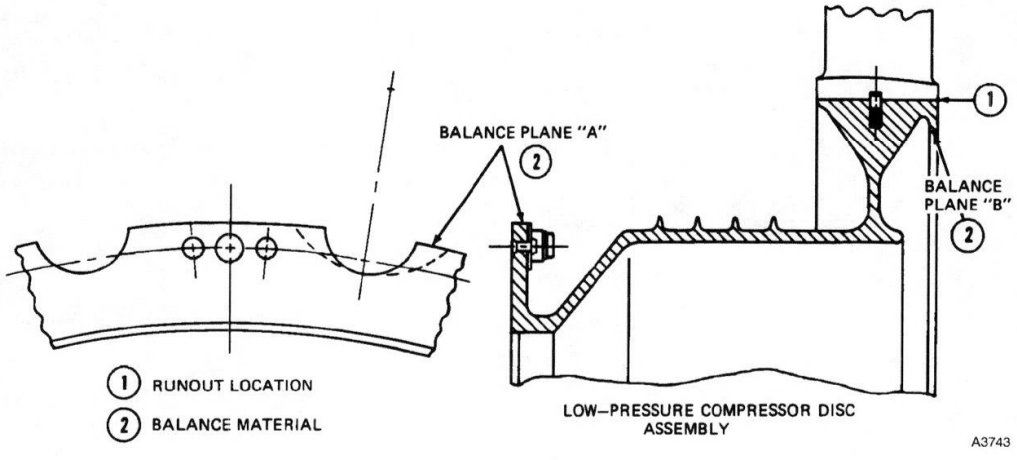
NOTE: Bearings LTCT13568-68 are not used with balancing arbor LTCT12058.

(b) Force balance disc assembly in balancing machine. Correct imbalance by removing material from areas shown in *Figure 904.* Remaining imbalance must not exceed one gram-inch in each plane.

(c) Measure and record runouts. (*See Figure 904.*) Face runout must not exceed 0.003 inch (0.08 millimeter) TIR and radial runout must not exceed 0.001 inch (0.03 millimeter) TIR.



Low Pressure Compressor Disc Assembly Blade Grinding Dimensions
Figure 903



Removing Material from Low Pressure Compressor Disc Assembly for Balancing
Figure 904

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – REPAIR-02

1. Repair Nicks and Dents in Blades – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

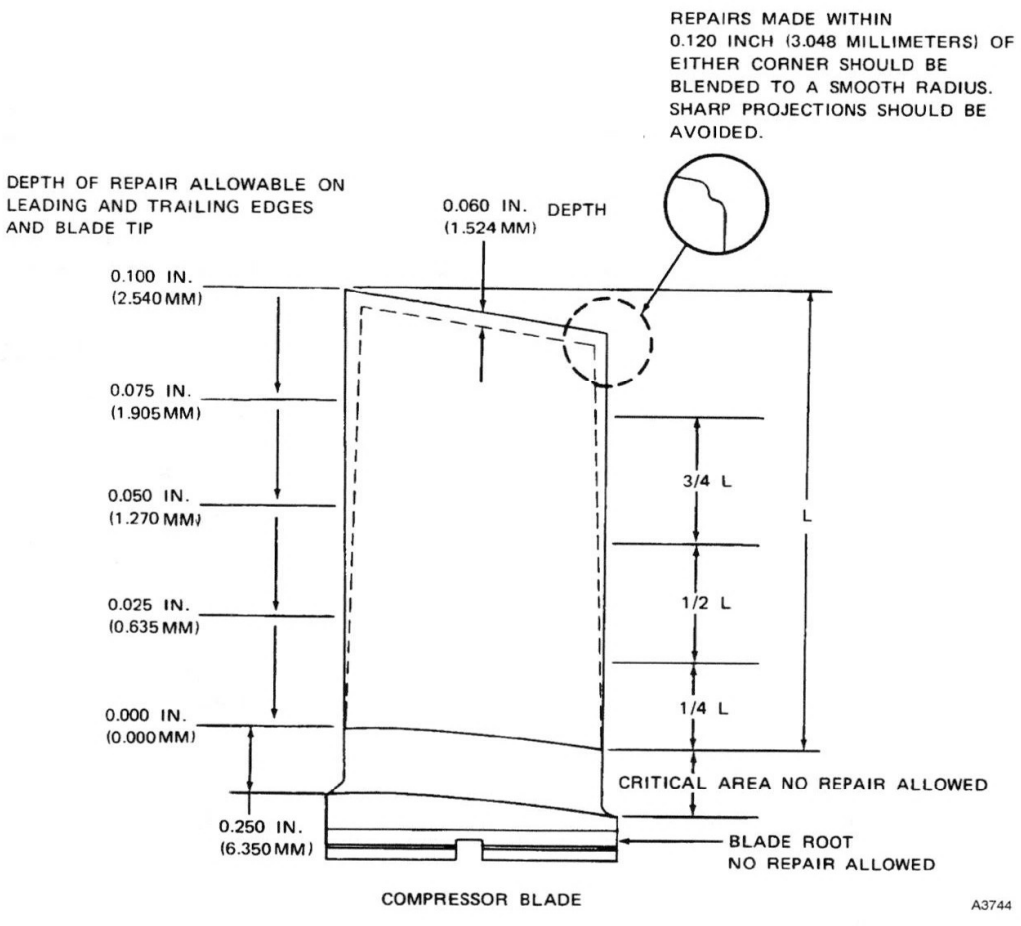
(1) Blend-repair nicks and dents in blades. (Refer to 70-25-01, SPM.) Remove only as much material as is necessary to provide a smooth repair. Limits are as follows:

NOTE: No repair is allowed in critical area.

(a) Leading and trailing edge and blade tip repair depth shall be within limits shown in *Figure 901.* Length of repair shall be at least twice, but not more than five times the repair depth.

(b) On airfoil surfaces, a minimum of 75 percent blade thickness shall remain after repair.

(c) If blade rework limits are exceeded, replace blade. (Refer to 72-31-09, Repair-01.)



Low Pressure Compressor Disc Assembly Blade Repair Limits
Figure 901

LOW PRESSURE COMPRESSOR DISC ASSEMBLY – REPAIR-03

1. Replace Damaged Nut Plate – Repair-03

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and materials

      None.

   B. Procedure

      (1) Remove rivets by drilling.

      (2) Pop out damaged nut plate.

      (3) Position new nut plate on disc assembly and install rivets.

         NOTE: Rivet heads shall be at least 0.001 inch (0.03 millimeter) below forward surface of disc.

FIRST STATOR BAND – CLEANING

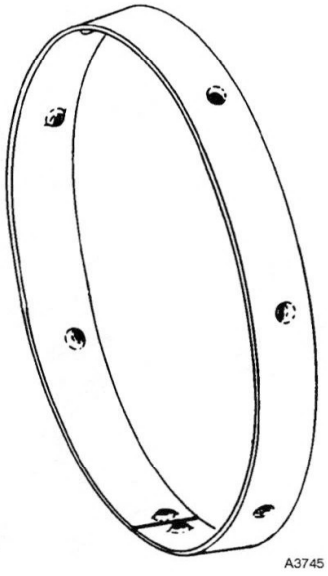
1. First Stator Band (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



First Stator Band
Figure 601

FIRST STATOR BAND – INSPECTION/CHECK

1. First Stator Band – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks, burrs, and scratches. Blend-repair. (Refer to70-25-01, SPM.)

         (b) Cracks in dimples.

            1 Converging or circumferential cracks not permitted.

            2 Three radial cracks per dimple each not to exceed 0.25 inch (6.4 millimeter) are acceptable. Repair cracks that exceed limit by fusion welding method. (Refer to 70-45-01, SPM.)

         (c) Fretting. Any amount of fretting is acceptable provided the thickness of the parent metal in the area of the fretting is not less than 0.016 inch (0.41 millimeter).

      (2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Cracks are not allowed. Replace if cracks are evident.

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – CLEANING

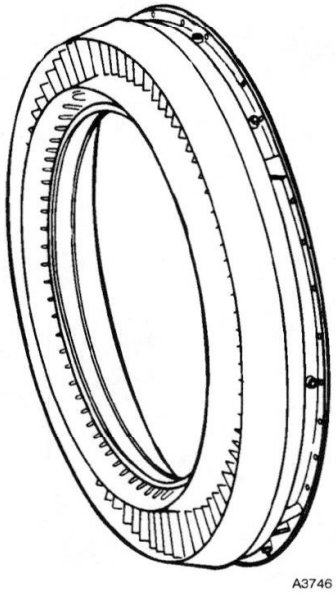
1. First Low Pressure Compressor Vane Assembly (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



First Low Pressure Compressor Vane Assembly
Figure 601

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – INSPECTION/CHECK

1. First Low Pressure Compressor Vane Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks and dents in vanes. Nicks and dents are permitted on vane leading and trailing edges, provided that after repair, they do not exceed a depth of 0.125 inch (3.18 millimeter). Length of repair shall be at least twice, but not more than five times repair depth. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (b) Nicks and dents in airfoil surfaces (sides). Smooth nicks or dents are acceptable without repair. Total area of nicks and/or dents may not exceed 0.20 square inches (129.0 square millimeters) per vane. Total area may not exceed 2.0 square inches (12904 square millimeters) per vane assembly. Punctures are not allowed. Replace vanes that exceed limits. (Refer to Repair-04.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Bending and distortion of vanes. Minor bending and distortion is acceptable. Straighten badly bent and distorted vanes. (Refer to Repair-04.)

         (e) Damaged inner and/or outer shrouds. Minor bending and distortion are acceptable. Straighten badly bent and distorted shrouds. (Refer to Repair-05.)

         (f) Grooving of vane assembly foam seal. Grooving is acceptable provided there is no penetration through seal to base metal. Breakout between three or more grooves is unacceptable. If limits are exceeded, repair foam seal. (Refer to Repair-01.)

      (2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Cracks in parent metal are acceptable only if they can be blended out within acceptable limits. Cracks in inner and outer shroud to vane brazements, which do not extend into parent metal, are permitted provided they do not exceed 0.125 inch (3.18 millimeter) in length. Brazement voids are acceptable. Blend-repair minor cracks. (Refer to 70-25-01, SPM.) If limits are exceeded, replace vane assembly.

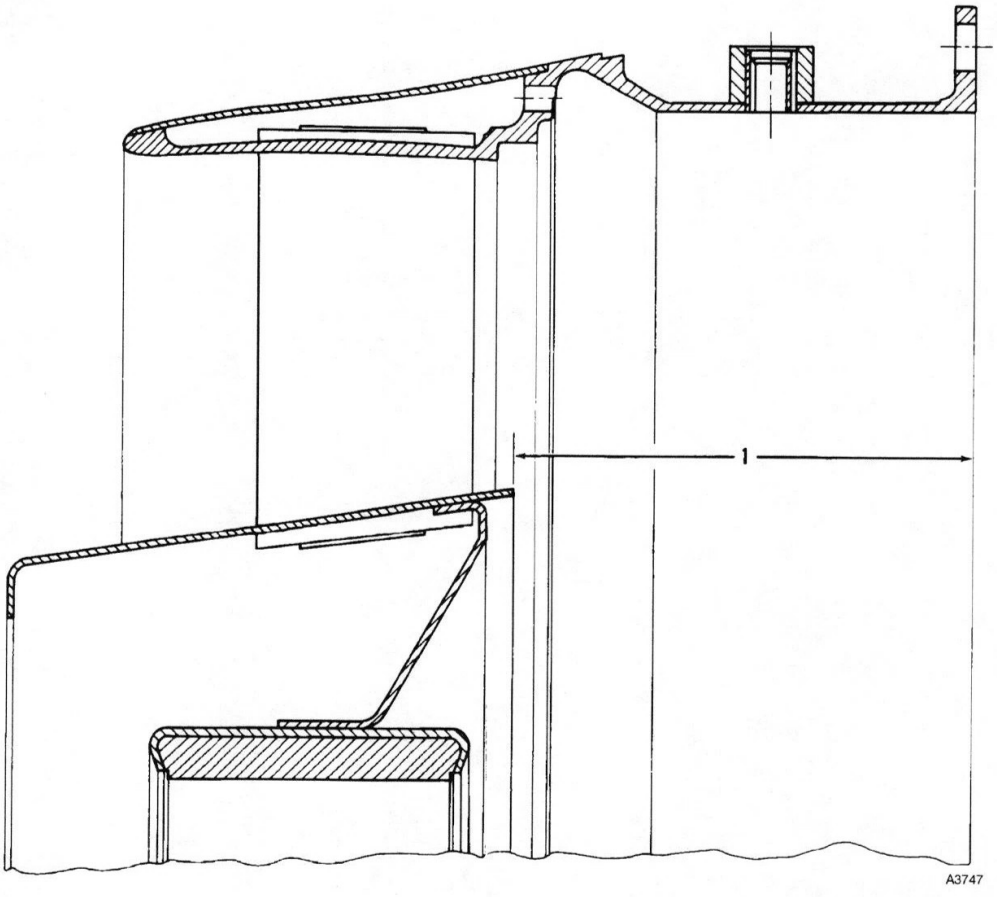
1. B. (3) Visually inspect eight threaded bosses for damaged or missing Rosan inserts. Repair all damaged or missing inserts. (Refer to Repair-02.)

(4) Inspect for rubs on aft face of inner support. Rubs that exceed 0.010 inch (0.25 millimeter) deep are not acceptable. Repair. (Refer to Repair-03.)

(5) Dimensionally inspect vane assembly. (*Refer to Table 801 and Figure 801.*) If dimension is not within limits, repair. (Refer to Repair-06.)

Table 801. Stator Vane Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
Axial*	2.299 (58.40)	2.309 (58.65)			**801** 1
*To meet assembly fit and clearance requirements refer to 72-01-00.					



Stator Vane Assembly Dimensional Limit
Figure 801

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-310-04	-01 thru -06	None
2-043-310-07	-01 thru -03, -05 thru -07	None

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-01

1. Repair Foam Seal Damage on First Low Pressure Compressor Vane Assembly – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Distilled Water	
Dry Cleaning Solvent	07-48, -48A
Foam Catalyst	01-19
Prepolymer	01-20
Resin	01-22
Stabilizer	01-25

B. Procedure

NOTE: For replacement of foam seal, send parts to:

Honeywell Engines, Systems & Services
Distribution Center
1944 East Sky Harbor Circle
Phoenix, AZ 85034-3440

(1) Mechanically remove all foam from foam seal area.

(2) Vapor-degrease vane assembly. (Refer to 70-15-01, SPM.)

(3) Lightly abrasive-blast vane assembly.

WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

(4) Using dry cleaning solvent (P-D-680), wipe vane assembly clean.

(5) Place vane assembly in suitable holding fixture and preheat to 151°F (66°C) in an oven.

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WARNING: AVOID INHALATION OF FUMES AND SKIN CONTACT WITH COMPONENTS P AND R. USE PROTECTIVE GLOVES AND SAFETY GOGGLES OR FACESHIELD. PERFORM OPERATIONS UNDER EXHAUST HOOD OR IN A PAINT SPRAY BOOTH. IN CASE OF CONTACT WITH SKIN, WASH THOROUGHLY WITH COLD WATER.

1. B. (6) Prepare Component R resin and Compound I in accordance with *Table 901*.

(7) Mix Component R premix, 68.5 parts by weight of Component R resin and 1.75 parts by weight Compound I, for 2 to 3 minutes at a speed of 300 to 500 rpm. Allow Component R premix to settle for at least 30 minutes before use.

(8) Mix Component P (prepolymer) at a speed of 300 to 500 rpm for 2 to 3 minutes. Allow Component P to settle for at least 30 minutes before use.

Table 901. Component R Ingredients.

INGREDIENTS	PARTS BY WEIGHT
*Compound R (Resin)	68.5
**Compound I, which consists of:	1.75
Stabilizer	8
Foam Catalyst	2
***Distilled Water	2 to 3

*Polyester resin #2, Voranol, consists of equal parts by weight of Voranol 270-370 and Voranol 240-490 OR Voranol 240-446, manufactured by Dow Chemical Corp., Midland, Michigan. When making master batch, weight 171.25 grams of Voranol 270-370 and 171.25 grams of Voranol 240-490 OR Voranol 240-446. Mix master batch at 300 to 500 rpm with a shear mixer for 2 to 3 minutes before storage. Master batch must be weighed with accuracy of ±1 percent.

**Shake components of Compound I vigorously for 1 minute minimum. The mixture will become warm during agitation. Allow the compound to settle for at least 30 minutes before using. The water content of Component I may be varied to achieve proper rise height.

***Water serves as the blowing agent during foaming. Final foam density and cell size are dependant on the amount of water used in the formulation and is sensitive enough to be effected by the ambient humidity.

NOTE: Premix may be stored in tightly sealed, moisture-proof containers at 60 to 80°F (15.5 to 26.7°C) for a period not to exceed 1 year from manufacture. Partially filled containers of premix larger than 5 gallons (19 liters) shall be blanketed with dry argon gas for storage.

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1. B. (9) Run test sample on premix, Component R as follows:

(a) Weigh in separate containers, 70.25 grams (±1 percent) of Component R premix, and 75.0 grams (±1 percent) of Component P prepolymer.

(b) Preheat Component P to 120 ±5°F (48.9 ±1°C).

(c) Combine the components and mix with mixer at a speed of 2000 to 2500 rpm for 45 to 55 seconds.

(d) Immediately following mixing, pour the mixture into a cylindrical cardboard test container having an inside diameter of 3.375 ±0.0625 inch (85.7 ±1.2 millimeter) and an inside height of 6.25 ±0.0625 inch (158.7 ±1.2 millimeter) with an approximate volume of 32 fluid ounces (#106 Fonda cup or equivalent).

CAUTION: THE TIME ELAPSED FROM STARTING TO MIX COMPONENTS R AND P TO THE COMPLETION OF POURING SHALL NOT EXCEED 2 MINUTES.

(e) Record cream time, rise time, tack-free time, exotherm temperature, and rise height. Properties must be within those specified in *Table 902*.

NOTE: Cream Time is the time required, after the start of mixing, for the foaming action to begin. It is marked by a general lightening in the color of the reactive mixture.

Rise Time is the time required, after the start of mixing, until the expansion of the foam is essentially complete. Some slight additional expansion may occur over a 10 to 30 minute period.

Tack-free Time is the time elapsed, after the start of mixing, until the product no longer transfers when touched lightly with a clean dry object such as a tongue depressor.

Exotherm Temperature is the maximum temperature attained by the system during foaming and is recorded at the point the temperature starts to recede. Temperature shall be measured close to the center of the mixture with a digital probe-type thermometer having a range of 50 to 400°F (10 to 205°C)range.

Rise Height is the minimum height the foam rises above the bottom of the test container.

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1. B. (10) When sample batch conforms to requirements of *Table 902*, proceed as follows:

(a) Weigh out required weight of Component R premix and Component P prepolymer. Preheat Component P to 120 ±5°F (48.9 ±1°C).

(b) Pour the required weight of Component R and Component P into a suitable container. Use two containers and mix for 45 to 55 seconds with power stirrer rotating at 2000 to 2500 rpm.

(c) Immediately (within 2 minutes of the start of mixing) pour prefoam into vane assembly.

(d) Clamp holding fixture tightly to retain foam.

(11) Allow vane assembly to stand at room temperature for 1 hour.

(12) Cure for 16 hours at 199°F (93°C).

(13) Machine seal material to final dimensions specified in *Figure 901*.

(14) After final machining, the foam shall show no visible indications of cracking, lifting, or separation from vane assembly. Voids up to 0.25 inch (6.4 millimeter) maximum dimension are allowed. A maximum of six voids per part larger than 0.120 inch (3.05 millimeter) are allowed provided the minimum distance between voids is 2 inches (51 millimeters). There is no limitation on the number of voids under 0.120 inch (3.05 millimeter). No voids allowed that extend to the base material. Remove and replace entire foam seal if requirements are not met.

Table 902. Prefoam Time and Temperature Requirements.

CONDITION	LIMITS	
	MINIMUM	MAXIMUM
Cream Time	1.00 minutes from start of mixing	1.75 minutes
Rise Time	3.00 minutes from start of mixing	4.50 minutes
Tack Free Time	3.50 minutes from start of mixing	5.00 minutes
Exotherm	255°F (124°C)	320°F (160°C)
Rise Height	3.75 inch (95.25 millimeter)	5.5 inch (139.7 millimeter)

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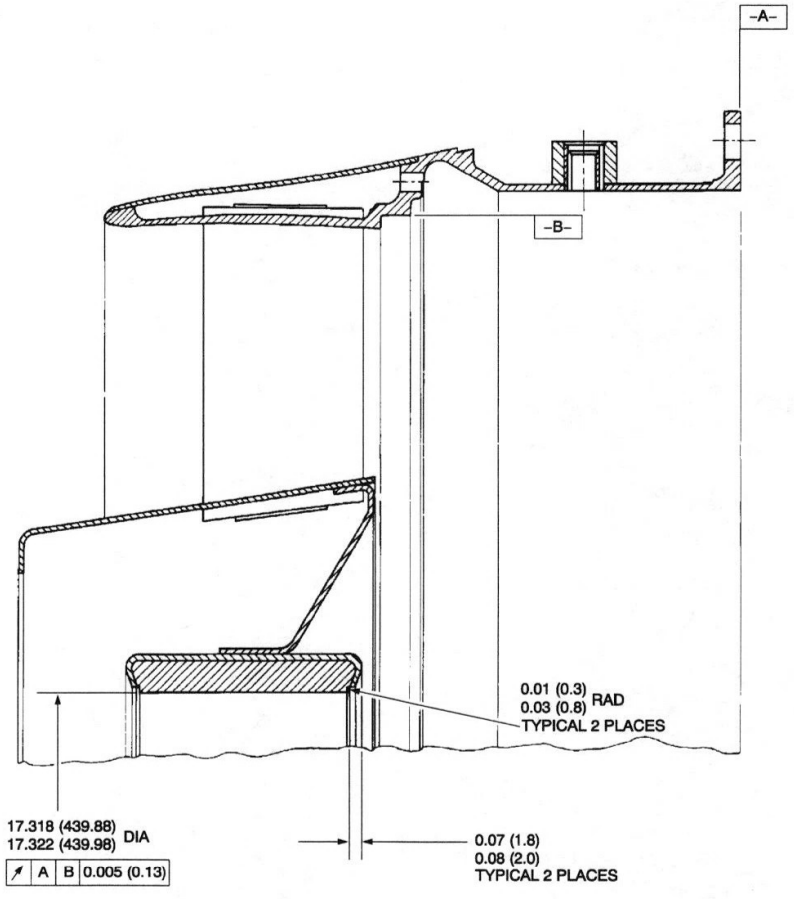

ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)

I58448

Foam Seal Final Machining Dimensions
Figure 901

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FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-02

1. Replace Damaged or Missing Inserts from Threaded Bosses – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Insert (SPL 192L SF-3, Rosan)	
Welding Wire	03-25

B. Procedure

(1) Using manufacturer's instructions, replace damaged or missing inserts. If counterbore on boss is smaller than 0.254 inch (6.45 millimeter), replace boss as follows:

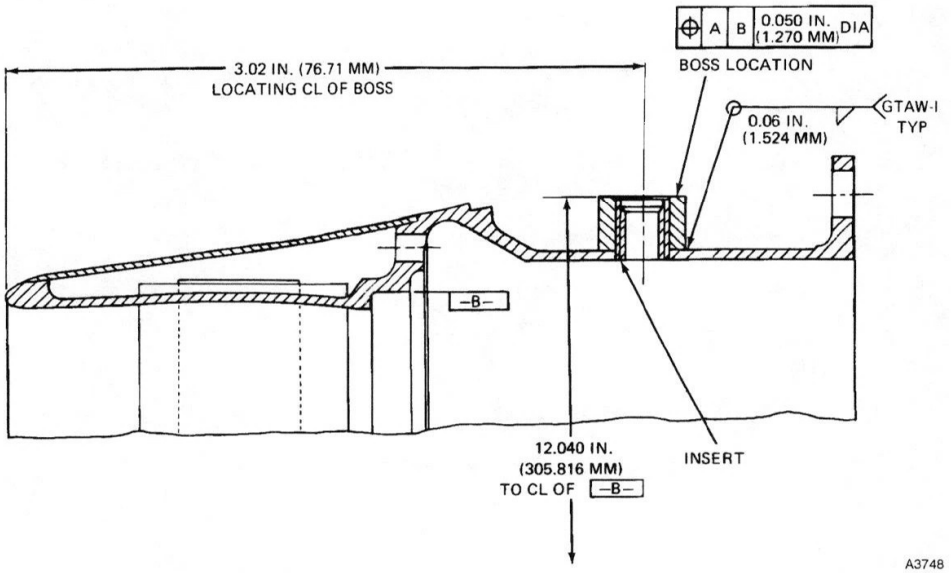
CAUTION: TO PREVENT DAMAGE, DO NOT REDUCE WALL THICKNESS OF OUTER SHROUD.

(a) Machine boss flush to original contour.

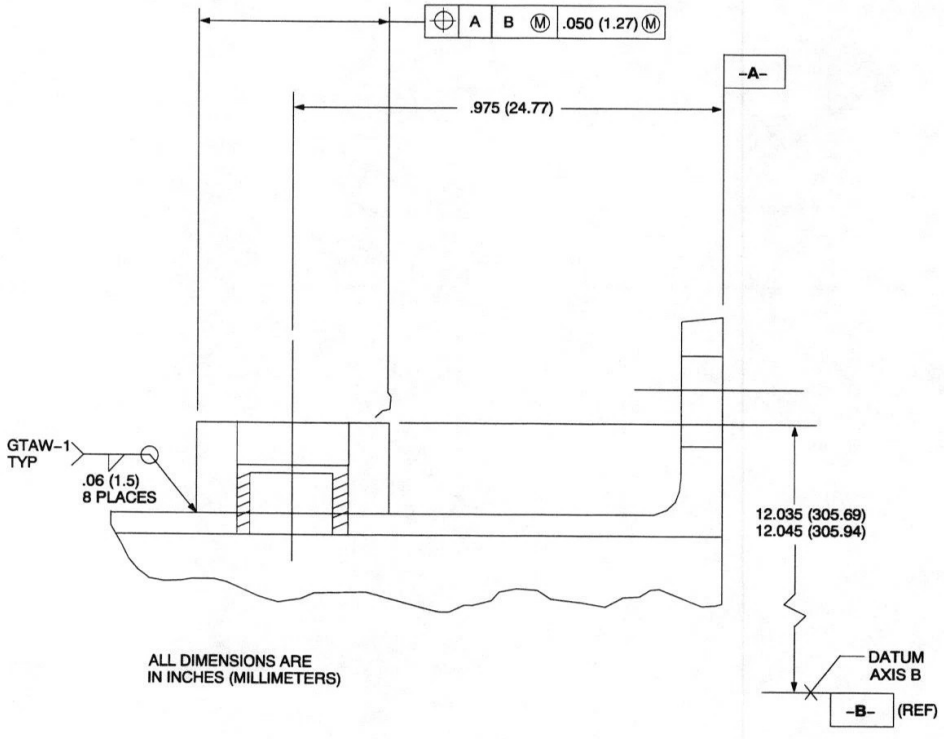
(b) Center boss 2-043-136-02 over hole and using welding wire and fusion welding method, weld boss to vane assembly. (*See Figure 901.*) (Refer to 70 45-01, SPM.)

(c) Machine boss to proper height. (*See Figure 901.*)

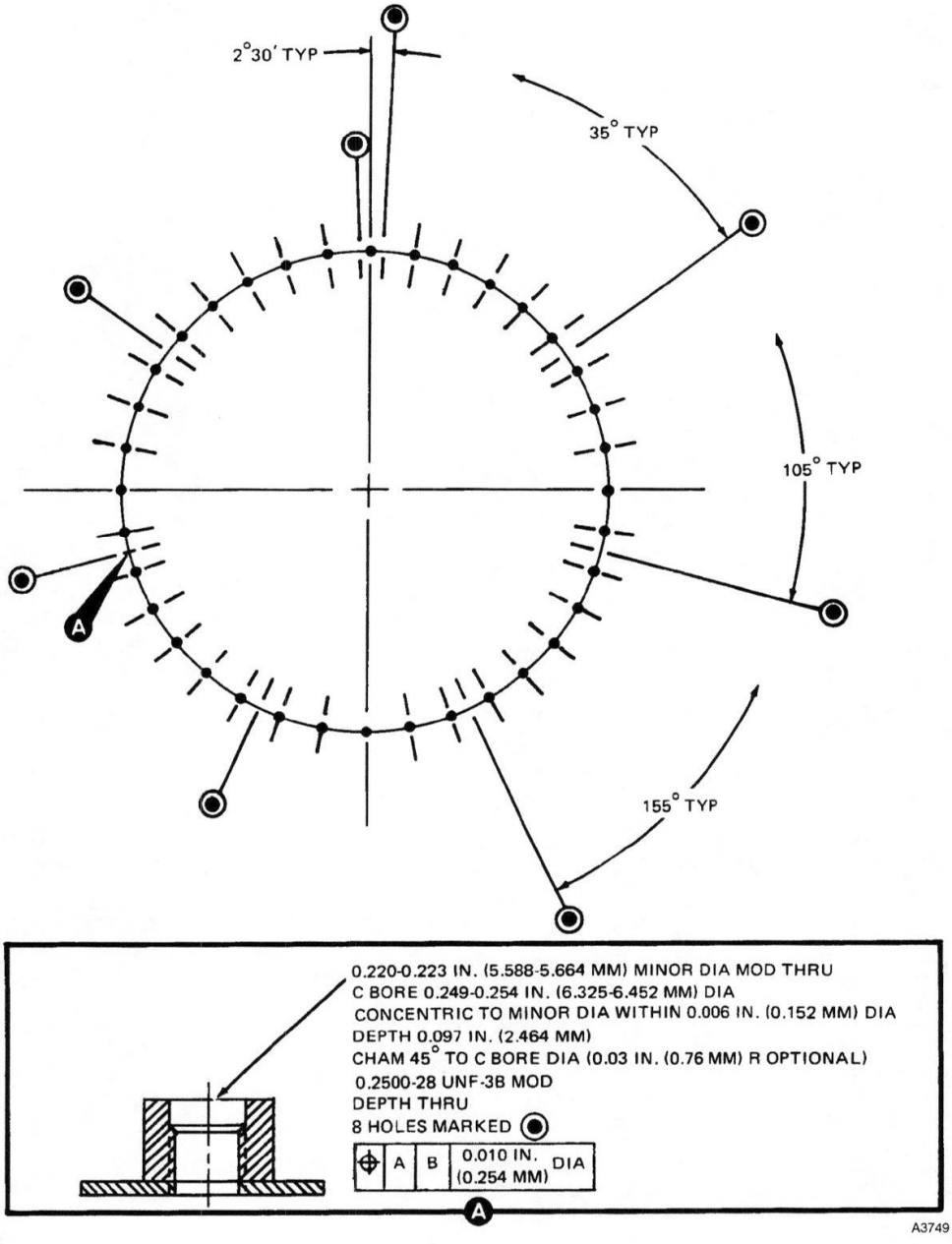
(d) Drill and tap replacement boss. (*See Figure 901.*)



Location and Machining for Threaded Bosses and Inserts
Figure 901 (Sheet 1 of 3)



Location and Machining for Threaded Bosses and Inserts
Figure 901 (Sheet 2)



Location and Machining for Threaded Bosses and Inserts
Figure 901 (Sheet 3)

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-03

1. Repair Rubs on Aft Face of Inner Support – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

(1) Using welding wire and fusion welding method, build-up rubs that exceed inspection limits. (Refer to 70-45-01, SPM.)

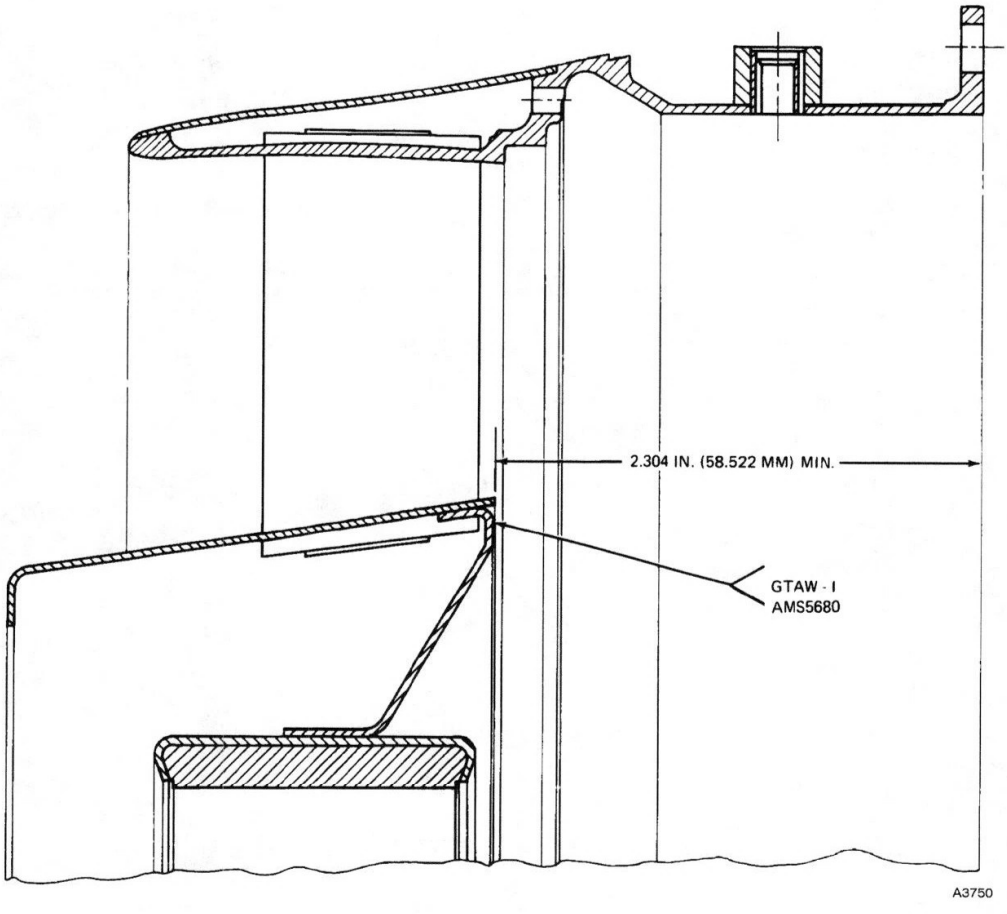
(2) Blend aft face of support to a smooth contour. Do not reduce base metal.

(3) Dimensionally inspect. (*See Figure 901.*) Requirements must be met.

(4) Visually and fluorescent-penetrant inspect weld-repair area to Class I criteria. (Refer to 70-20-02 and 70-20-03, SPM.)

NOTE: Top and bottom surfaces of welded area shall be inspected.

(5) Inspect to ensure 2.304 inch (58.52 millimeter) dimension is maintained. No radiographic or ultrasonic inspection required.



Stator Vane Assemblies Dimensional Limit
Figure 901

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-04

1. Replacement of Bent and Distorted Vanes – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Brazing Filler Alloy	03-01
Steel	08-36
Welding Wire	03-25

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Vane	2-043-015-03			
Insert	2-043-131-02			

B. Procedure

(1) Using wooden forming blocks, cold straighten damaged vanes.

(2) Fluorescent-penetrant inspect straightened vanes for resultant cracks. (Refer to 70-20-05, SPM.) Cracks are not allowed. Cracks up to 0.125 inch (3.18 millimeter) long shall be blend repaired. (Refer to 70-25-01, SPM.) Length of repair shall be at least twice, but not more than five times repair depth.

(3) Vanes that cannot be repaired by straightening or blending shall be replaced as follows:

(a) Identify vanes to be replaced.

NOTE: Wrapping wire around vanes to be replaced is the recommended method for identification.

CAUTION: WHEN REMOVING FOAM SEAL, DO NOT DAMAGE THE PARENT METAL.

(b) Remove foam seal from vane assembly inner shroud. (Refer to Repair-01.)

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CAUTION: FOR PURPOSES OF RIGIDITY, NO MORE THAN TWO ADJACENT VANES AND NO MORE THAN 50 PERCENT OF THE TOTAL NUMBER OF VANES PER VANE ASSEMBLY MAY BE CUT OR REMOVED AT ANY ONE TIME.

1. B. (3) (c) Remove the mid-span area of those vanes to be replaced from the air flow path.

CAUTION: WHEN REMOVING VANE STUBS, PENETRATION DEPTH OF THE ELECTRODE INTO THE OUTER SHROUD SHALL NOT EXCEED 0.100 INCH (2.45 MILLIMETERS); THIS WILL PREVENT DAMAGE TO OUTER SHROUD. *(SEE FIGURE 901.)*

(d) Install vane assembly in a suitable fixture; then, using suitable shroud electrodes and an electric discharge machine (EDM), remove remaining vane stubs.

(e) Using a fiber brush, clean vane slots in shrouds.

CAUTION: WHEN REMOVING A PORTION OF THE FAIRING, DO NOT DAMAGE THE OUTER SHROUD OR ACCEPTABLE ADJACENT VANES.

(f) Using a thin cutting wheel 0.015 inch (0.38 millimeter) wide or less, remove portion of the fairing to gain access for replacing defective vanes. *(See Figure 902.)* Cut minimum amount necessary to replace vane(s). Do not exceed a circumference of 15 vanes in any one continuous repair area.

(g) Assemble replacement vanes 2-043-015-03 with inserts 2-043-131-02. Using welding wire AMS5680 and fusion welding method, tack-weld inserts to vanes at both ends. (Refer to 70-45-01, SPM and *Figure 903.)*

(h) Install and position replacement vanes in the vane assembly. Using a suitable shim, maintain a 0.002 to 0.005 inch (0.05 to 0.13 millimeter) braze gap at vane to shroud joints. *(See Figure 903.)*

(i) Using welding wire AMS5680, apply weld buildup to areas of the shroud having an excessive gap. (Refer to 70-45-01, SPM.)

(j) Using welding wire AMS5680 and fusion weld method, tack-weld vanes into position at the inner shroud. (Refer to 70-45-01, SPM.)

(k) Inspect replacement vanes for proper vane to shroud geometry. (See *Figure 903,* Sheet 2.)

(l) Using braze alloy AMS4765 and furnace brazing method, braze vanes in place. (Refer to 70-40-01, SPM.)

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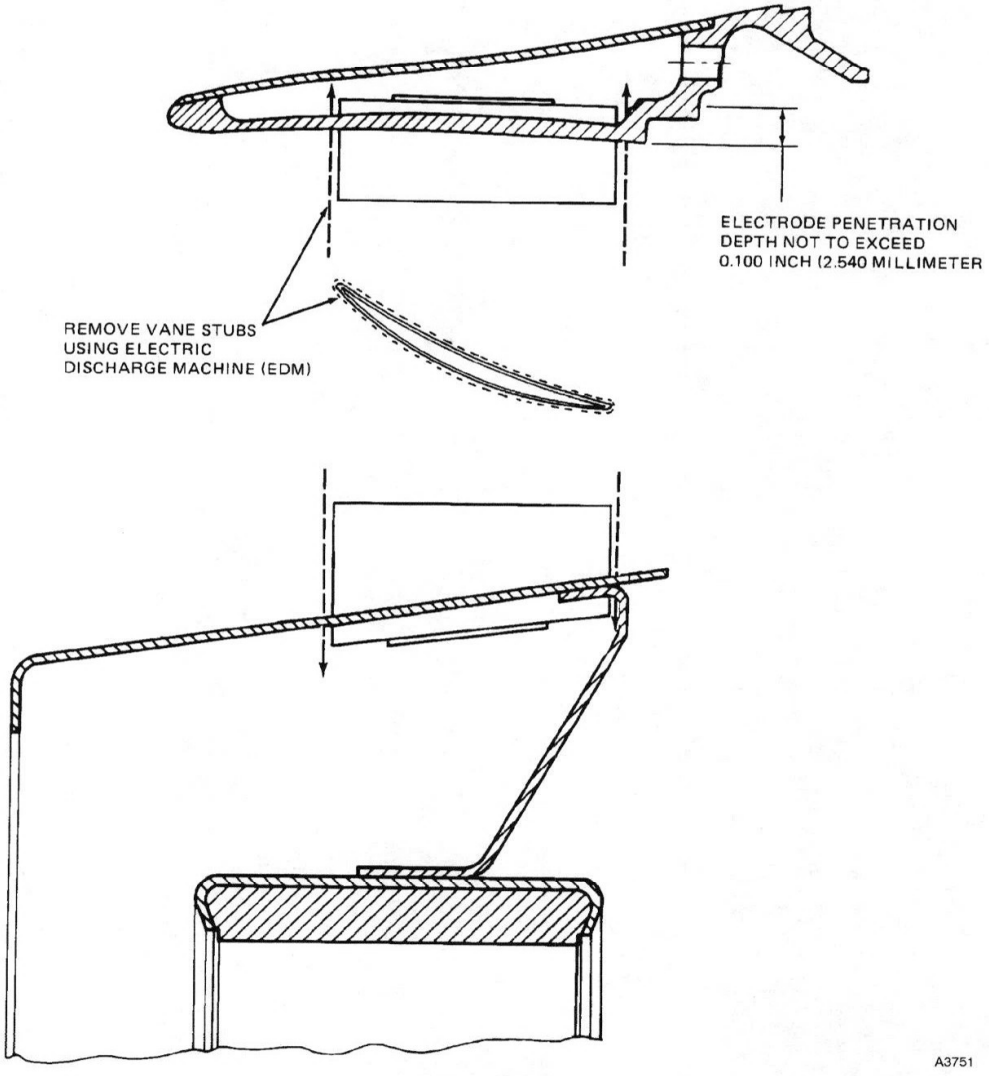

Removal of Vane Stubs
Figure 901

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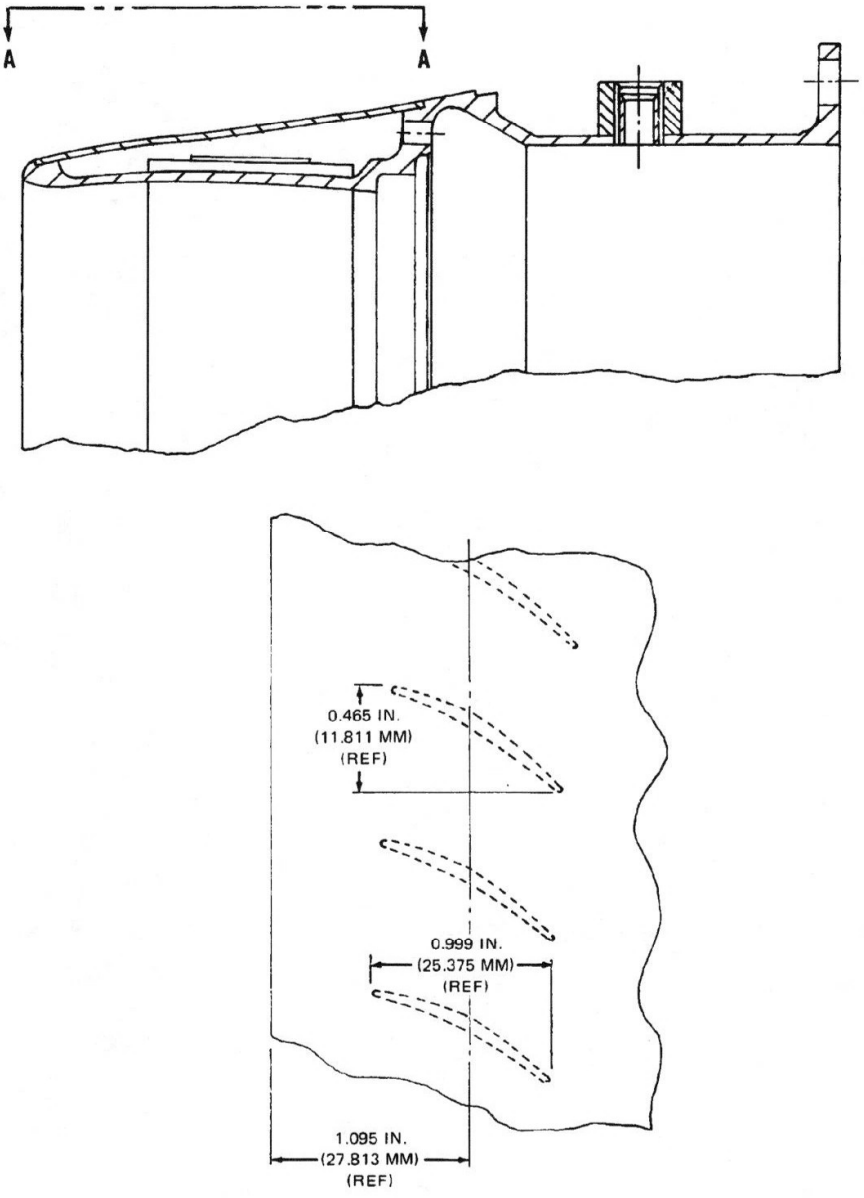

Removal of Vane Fairing
Figure 902

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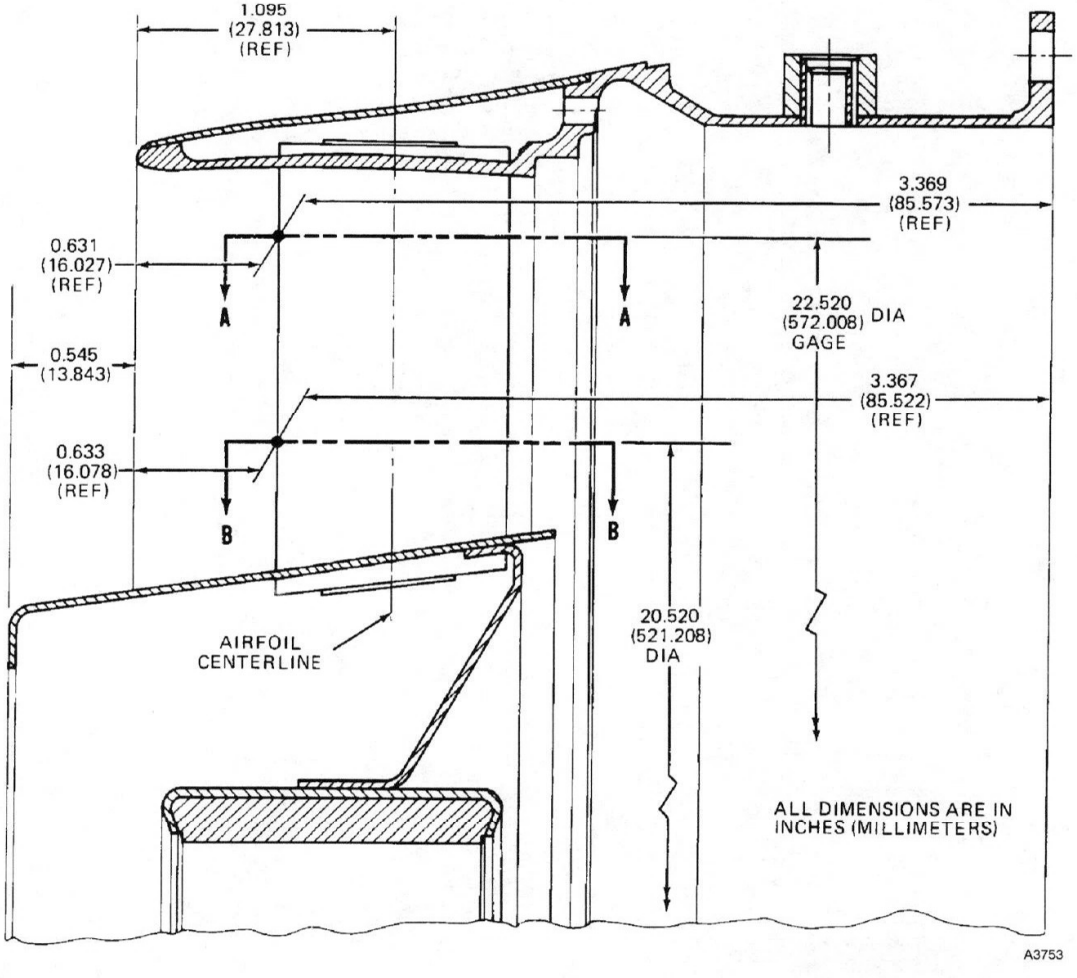

Installation and Positioning of Replacement Vane
Figure 903 (Sheet 1 of 2)

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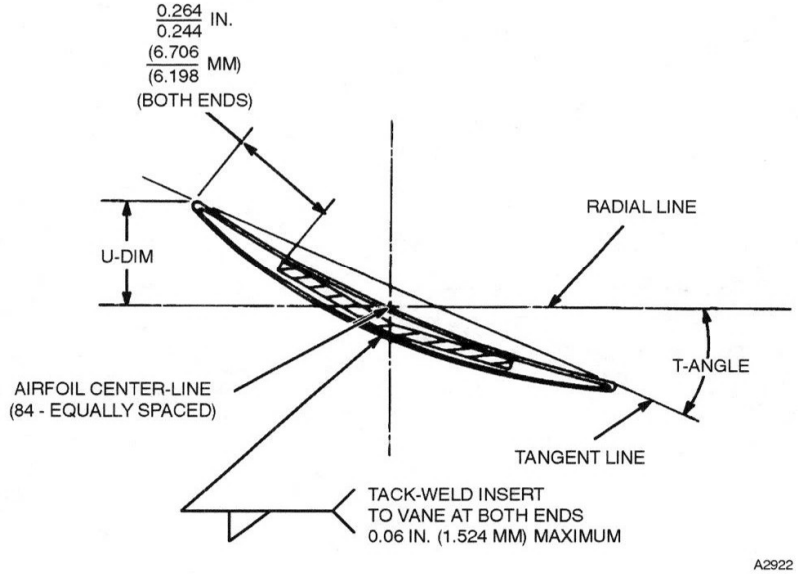
1. B. (3) (m) Fluorescent-penetrant inspect brazed joints (ID gas path/non gas path and OD gas path) on all vanes in accordance with Class II silver braze requirements. (Refer to 70-40-01, SPM.) No voids or cracks allowed.

(n) Visually inspect OD gas path braze joints on all repaired vanes in accordance with Class II requirements. (Refer to 70-40-01, SPM.) No voids or cracks allowed.

NOTE: There are three methods of visual inspection. The first method is through cuts in the fairing. The second method allows visual inspection by borescope examination through holes that are cut in the outer shroud, followed by a water-flow check of the anti-ice passages. The third method is by borescope inserted through the anti-icing inlet holes. The three methods are described and are all equally acceptable.

SECTION	T-ANGLE	U-DIMENSION
A-A	24° 07'	0.302 IN. (7.671 MM)
B-B	24° 41'	0.307 IN. (7.798 MM)



Installation and Positioning of Replacement Vane
Figure 903 (Sheet 2)

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1. B. (3) (o) Visually inspect through the cut fairing as follows:

1 Through the cut fairing, visually inspect the brazed areas in accordance with Class II requirements. (Refer to 70-40-01, SPM.)

2 Braze joint voids up to 0.030 inches (0.76 millimeter) in length that remain after furnace brazing may be filled by torch brazing with filler AMS4765 per SPM 70-40-01. A maximum of three voids per vane, separated by 0.250 inches (6.35 millimeter) or more, may be torch brazed.

NOTE: Torch brazing may not be used to repair cracked braze joints or to repair any defects in vane assemblies that have not first been furnace brazed.

3 Using a bright white light, visually inspect internal passages of replaced vanes to make sure that they are free of foreign matter such as excess weld or braze material. Also inspect for localized distortion that could cause a restriction of the inner vane passage. *(See Figure 904.)* No restriction, crimping or blockage is allowed. Remove obstructions or restrictions, or replace vanes. Repeat this process for any additional vanes requiring replacement.

4 Using steel AMS5510, 0.028 to 0.036 inch (0.71 to 0.91 millimeter) thick, fabricate fairing replacement. *(See Figure 905.)* Edges must be 0.000 to 0.005 inch (0.00 to 0.13 millimeter) loose fit with edges of opening in fairing.

5 Thoroughly clean areas to be welded. (Refer to 70-15-03, SPM.)

6 Using welding wire AMS5680, install patch 0.000 to 0.005 inch (0.00 to 0.13 millimeter) above the existing surfaces and tack weld. (Refer to 70-45-01, SPM.)

7 Using welding wire AMS5680 and gas tungsten-arc fusion welding process, butt weld the fairing replacement with full joint penetration. (Refer to 70-45-01, SPM.) Use argon purge/backup. Fixture as necessary to prevent distortion.

8 Blend to remove excess weld deposit. Blend within 0.000 to 0.005 inch (0.00 to 0.13 millimeter) of original contour. Do not reduce base metal thickness.

9 Visually and fluorescent-penetrant inspect fairing welds in accordance with Class II requirements specified in 70-45-01, SPM. (Refer to 70-20-02 and 70-20-05, SPM.) Distortion from welding shall not exceed 0.030 inch (0.76 millimeter) from adjacent undistorted areas.

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1. B. (3) (p) Alternate visual inspection of brazed areas by borescope. Inspect through electro-discharge machined (EDM) holes in the outer shroud as follows:

NOTE: A third method of inspection is to pass a suitable borescope through the anti-icing inlet holes, which will preclude the need to EDM holes in the outer shroud.

1 Install the stator assembly in a holding fixture to secure the shroud orientation during the EDM process.

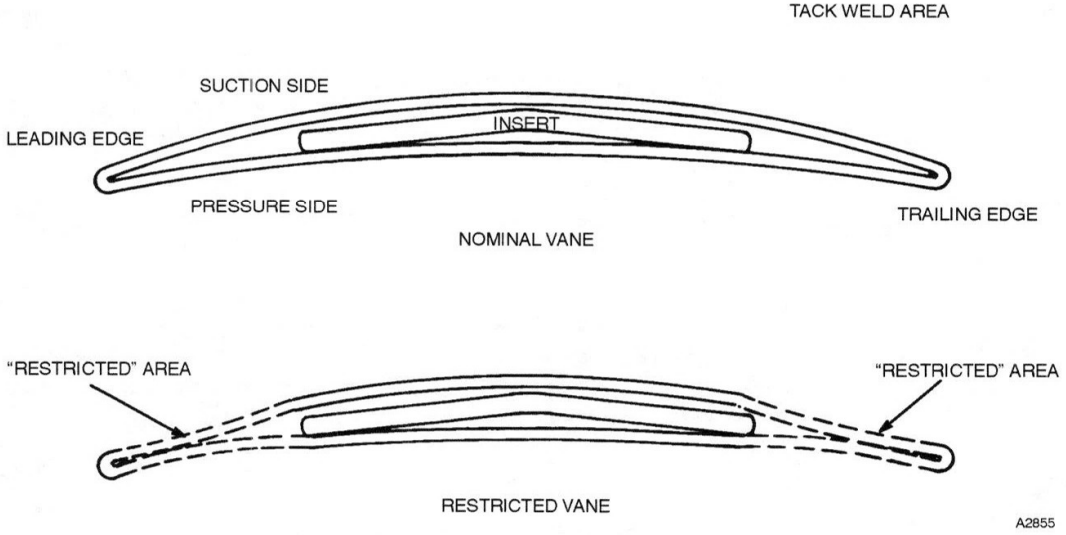
CAUTION: MAKE SURE THAT NO CHIPS, DUE TO EDM OR EDGE BREAKING, ENTER THE OUTER SHROUD INNER CAVITY.

2 EDM 0.095 to 0.110 inch (2.41 to 2.79 millimeter) diameter holes in the outer shroud on both sides of all repaired vanes. *(See Figure 906.)*

3 Break sharp edges to avoid causing damage to the borescope.

4 By borescope examination, visually inspect the braze joints in accordance with Class II requirements. (Refer to 70-40-01, SPM.) Verify braze penetration on all repaired vanes.

5 By borescope examination, visually inspect the non-repaired vanes of nearest neighbors in accordance with Class II requirements (Refer to 70-40-01, SPM) and identify if any braze defects have occurred during furnace brazing.



Inspection of Vane Passages
Figure 904

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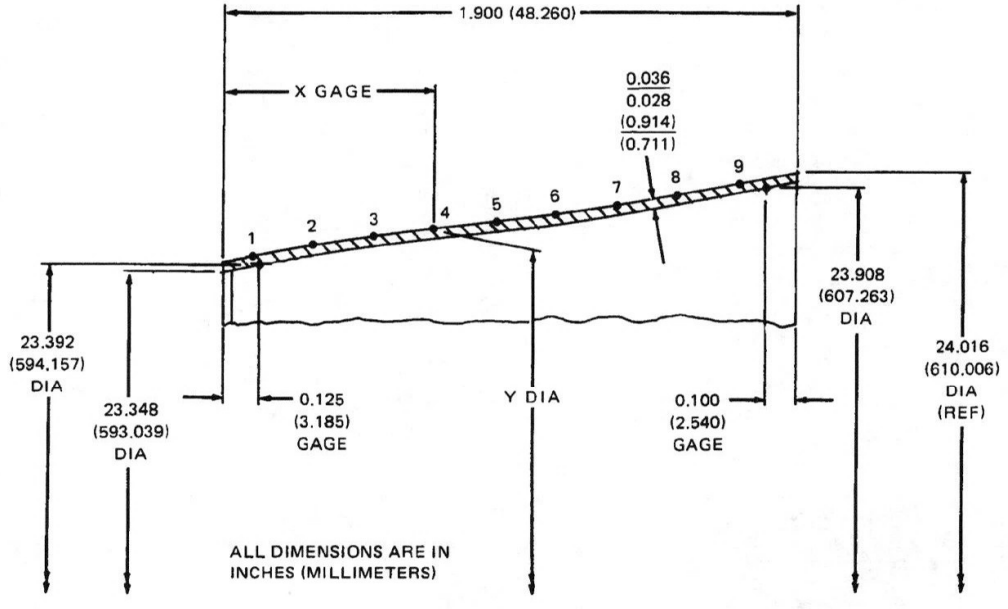
1. B. (3) (p) 6 Braze joint voids up to 0.030 inches (0.76 millimeter) in length that remain after furnace brazing may be filled by torch brazing with filler AMS4765 per SPM 70-40-01. A maximum of three voids per vane, separated by 0.250 inch (6.35 millimeter) or more, may be torch brazed.

NOTE: Torch brazing may not be used to repair cracked braze joints or to repair any defects in vane assemblies that have not first been furnace brazed.

STATION	1	2	3	4	5	6	7	8	9
X GAGE	0.100 (2.540)	0.300 (7.620)	0.500 (12.700)	0.700 (17.780)	0.900 (22.860)	1.100 (27.940)	1.300 (33.020)	1.500 (38.100)	1.700 (43.180)
Y DIA	23.450 (595.630)	23.522 (597.459)	23.578 (598.881)	23.630 (600.202)	23.678 (601.421)	23.728 (602.691)	23.786 (604.164)	23.856 (605.942)	23.934 (607.924)



Fabrication of Fairing Replacement Patch
Figure 905

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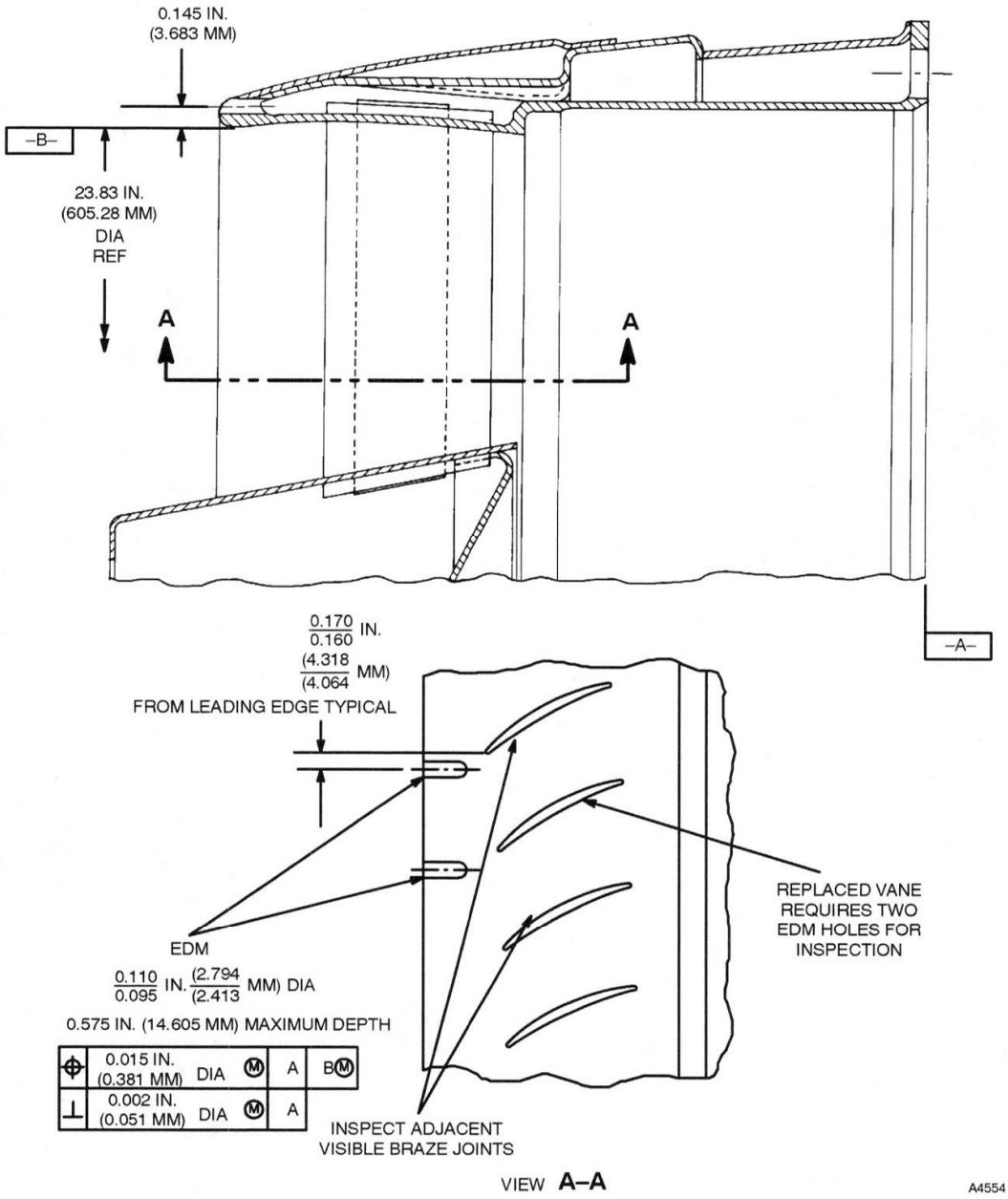

EDM Inspection Hole Locations
Figure 906

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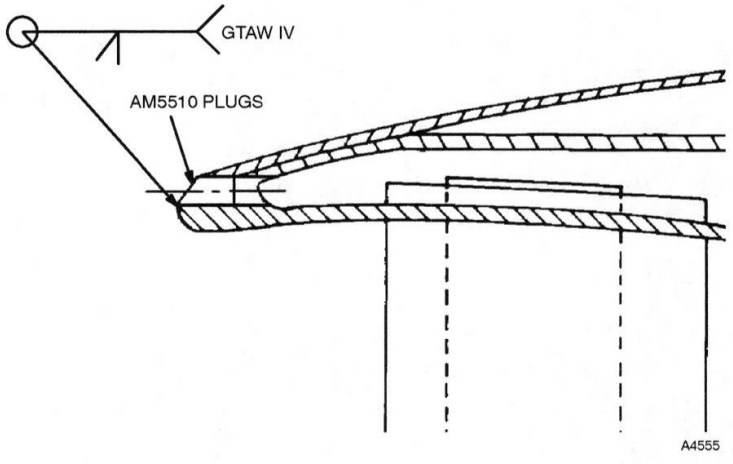
1. B. (3) (p) 7 Fabricate custom-fit plugs from AMS5510. Hand file the EDM holes to remove the recast layer and press the lugs into the EDM holes. Weld the plugs into the holes by gas tungsten-arc fusion welding to Class IV weld requirements (Refer to 70-45-01, SPM) using AMS5680 weld wire. *(See Figure 907.)*

8 Blend all plug welds on the outer shroud to original contours within 0.005 inch (0.13 millimeter). When blending, do not reduce parent metal thickness.

9 Fluorescent-penetrant inspect the plug welds for cracks. No cracks are allowed. (Refer to 70-20-05, SPM.)

10 Braze deposits in the vane-to-shroud gas path areas must clear a 0.030 inch (0.76 millimeter) radius gage. Excess braze deposits shall be ground smooth to clear a 0.031 inch (0.79 millimeter) radius gage. Grinding of vane or shroud parent metal is not permissible.



Plug EDM Inspection Holes
Figure 907

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1. B. (3) (p) 11 Dimensionally inspect the vane assembly. *(See Figure 908.)*

12 Make sure all vane anti-ice passages are open as follows:

a Modify standard water nozzles to mount flush with one outer shroud air port located on the aft face.

b Block off the remaining three ports with a suitable fixture.

c Connect the filtered shop water source regulated to 30 to 40 psi (207 to 276 kN/m^2) to the vane assembly.

d Connect the output hose to the nozzle and turn on the water supply.

e Apply water pressure and verify water flows freely from all vanes. Make sure that water does not jet from the outer shroud braze joints. The center passage of the vane shall not be blocked. The entire vane is considered blocked if the center passage, or the center and additional passages (leading edge/trailing edge), show significant flow restriction when compared with other vanes in the same assembly. No more than 5 vanes per assembly and no adjacent vanes may be blocked. If necessary, a probe having a maximum diameter of 0.010 inch (0.25 millimeter) may be used to gently clear any loose obstructions.

f Air dry the assembly.

(q) Fluorescent-penetrant inspect repaired areas for cracks. Cracks are not allowed. Braze deposits in the vane to shroud areas cleared by an 0.031 inch (0.787 millimeter) radius gage are acceptable. Grind smooth any excess braze deposits.

(r) Reapply foam seal in vane assembly inner shroud. (Refer to Repair-01.)

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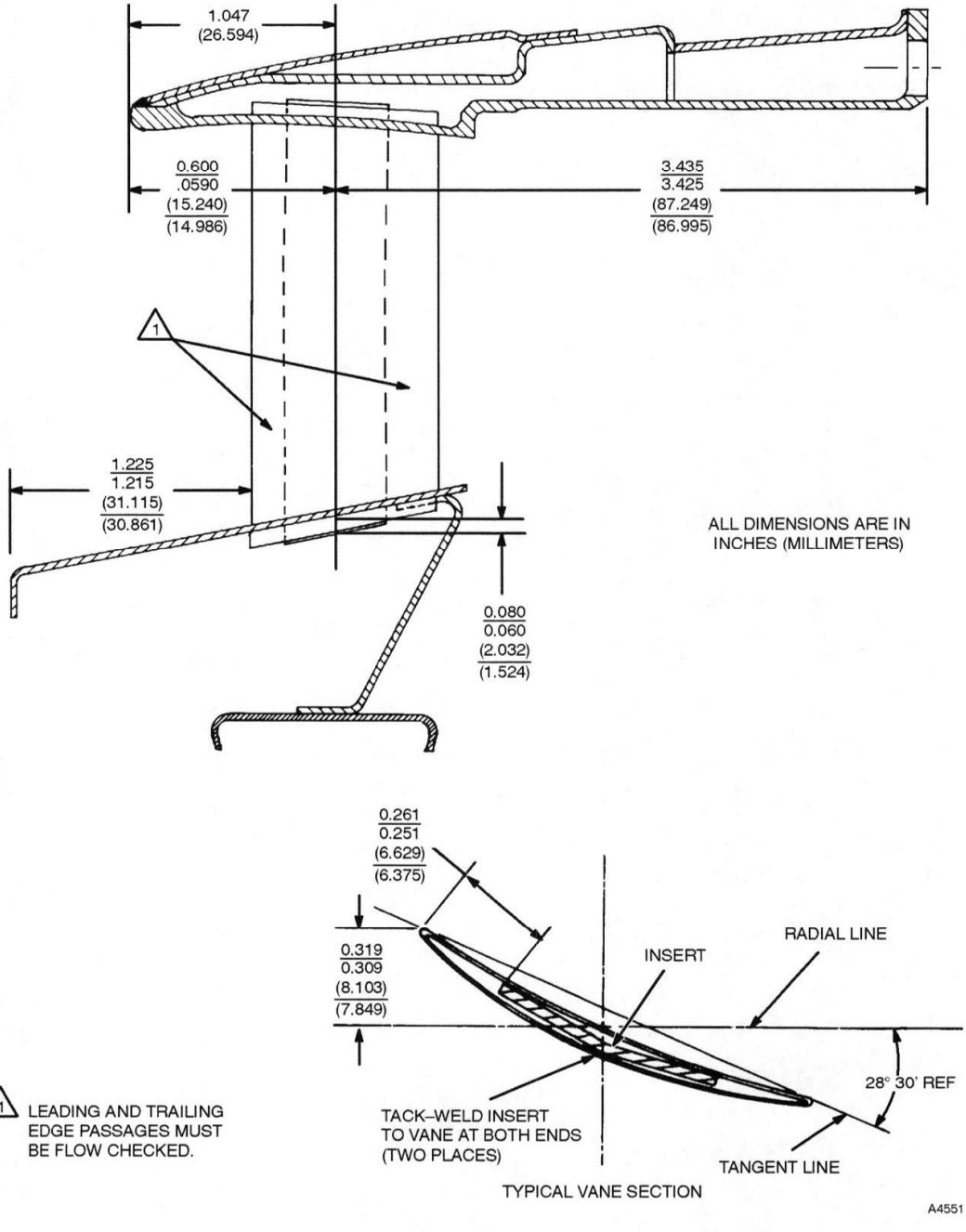

1 LEADING AND TRAILING EDGE PASSAGES MUST BE FLOW CHECKED.

Dimensional Inspection
Figure 908

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FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-05

1. Repair of Damaged Inner and/or Outer Shrouds – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Braze Alloy	03-01
Braze Alloy	03-05
Weld Wire	03-25

B. Procedure

(1) Using wooden forming blocks and soft mallet, cold straighten distorted shrouds as required to original positions.

(2) Fluorescent-penetrant inspect shrouds for cracks, particularly in areas that are cold straightened. (Refer to, 70-20-05, SPM.) Cracks are not allowed. If cracks are noted, proceed as follows:

(a) If weld repairs of the inner shroud foam seal area are required, remove foam seal as follows:

1 Mechanically remove all foam from seal area.

2 Vapor-degrease vane assembly. (Refer to 70-15-01, SPM.)

3 Lightly abrasive blast vane assembly foam seal area.

CAUTION: USE ACETONE IN A WELL VENTILATED AREA. AVOID PROLONGED INHALATION OF VAPORS.

4 Wipe the affected area clean with acetone (O-A-51), or equivalent, to ensure removal of abrasive materials.

5 After repair has been completed, reapply foam seal. (Refer to 72-31-16, Repair-01.)

1. B. (2) (b) Using welding wire AMS5680 and fusion welding method, repair cracked shrouds. (Refer to 70-45-01, SPM.)

NOTE: Weld repairs within 1/4 inch (6.35 millimeters) of a brazed joint are allowed provided the braze is inspected visually and by fluorescent-penetrant method (Refer to 70-20-05, SPM) to Class II requirements specified in 70-40-01, SPM.

(c) If required, using brazing alloy AMS4765 or AMS4772, rebraze affected areas. (Refer to 70-40-01, SPM.)

CAUTION: WHEN REMOVING FOAM SEAL, DO NOT DAMAGE SHROUD PARENT METAL. DURING BLENDING, DO NOT REDUCE PARENT METAL THICKNESS.

(d) Blend any welds in the flow path to original parent metal contour. (Refer to 70-25-01, SPM.)

(e) Fluorescent-penetrant inspect all weld repaired areas. (Refer to 70-20-05, SPM.) Cracks are not allowed.

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-06

1. Repair of Discrepant Clearance Dimension Between Aft End of Outer Shroud and Aft End of Inner Shroud – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Plasma-Spray Powder	06-24
Silicone Carbide Grit (No. 36)	05-15

B. Procedure

(1) Measure axial dimension. (*Refer to Table 901.*)

(2) If axial dimension is less than 2.299 inch (58.40 millimeter) minimum requirement (*Table 901*), restore clearance dimension by machining step at the aft end of inner shroud as follows.

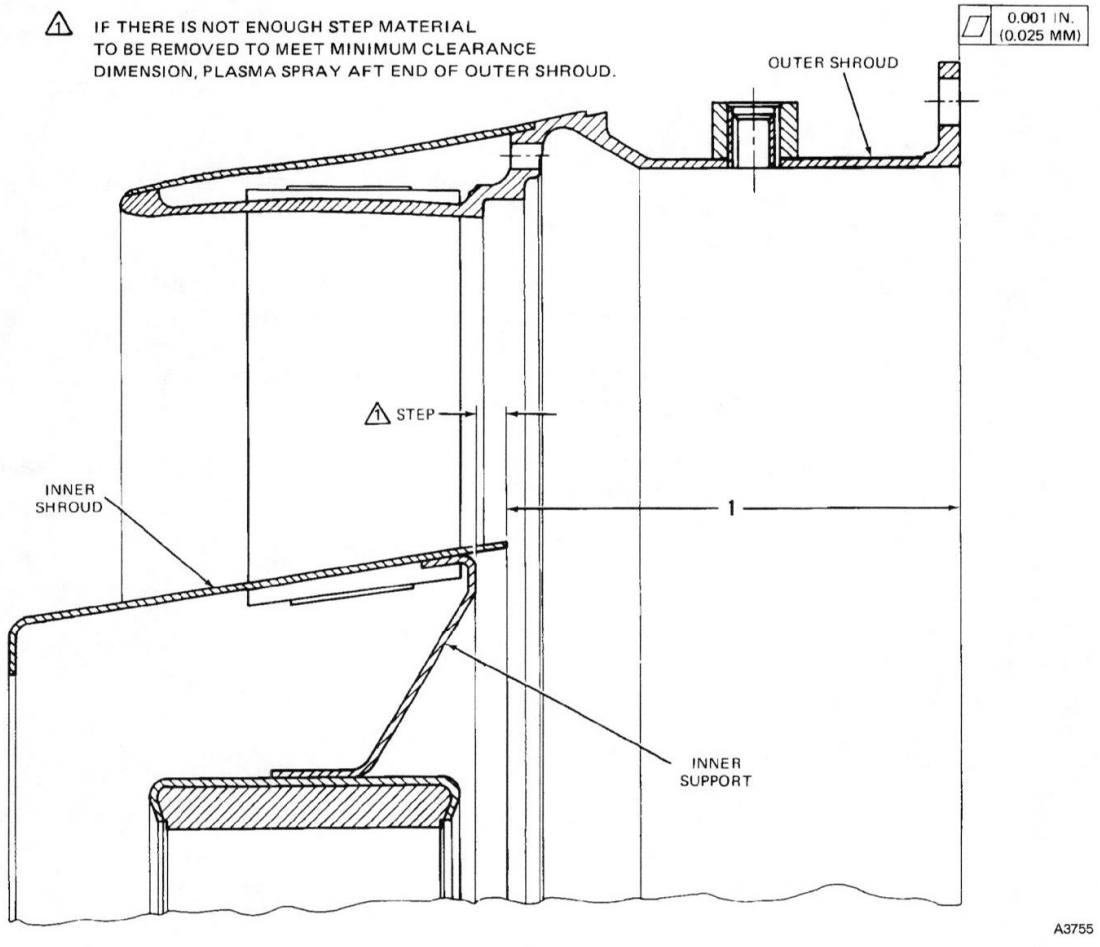
CAUTION: DO NOT MACHINE STEP AT THE AFT END OF INNER SHROUD MORE THAN FLUSH WITH AFT FACE OF INNER SUPPORT. DO NOT CUT INTO INNER SUPPORT; MACHINE CUTS IN AFT FACE OF INNER SUPPORT ARE NOT ACCEPTABLE.

(a) Machine step at the aft end of inner shroud to attain assembly clearance requirement. (*Refer to Table 901 and Figure 901.*)

(b) Deburr machined surfaces. Break all sharp edges.

Table 901. Stator Vane Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
Axial*	2.299 (58.40)	2.309 (58.65)			**901** 1
*To meet assembly fit and clearance requirements refer to 72-01-00.					



Stator Vane Assembly Dimensional Limit
Figure 901

1. B. (3) If there is not enough step material to be removed to obtain minimum clearance dimension (*Table 901*), restore clearance dimension by plasma-spraying aft end of outer shroud as follows:

CAUTION: PLASMA-SPRAY COATING SHALL NOT BE APPLIED TO A SURFACE ALREADY SPRAYED UNLESS PRIOR PLASMA-SPRAY COATING IS COMPLETELY REMOVED.

(a) Prepare aft end of outer shroud to be plasma-spray coated. (Refer to 70-50-01, SPM.)

(b) Clean vane assembly by vapor degreasing method (Refer to 70-15-01, SPM); then mask areas not to be coated, and using silicon carbide grit at 55 to 65 psi (379 to 448 kN/m^2), grit-blast. Remove all silicone carbide particles.

NOTE: The abraded surface shall be kept clean and shall be plasma-sprayed within 2 hours after cleaning and grit blasting. Surface preparation shall be repeated if 2 hour time limit is exceeded.

(c) Immediately after performing preceding Step (b), plasma-spray outer shroud using plasma-spray powder of sufficient thickness to allow a 0.020 to 0.028 inch (0.51 to 0.71 millimeter) coating thickness after final machining. (*Refer to Table 901 and Figure 901.*)

(d) Machine outer shroud as specified. (*Refer to Table 901 and Figure 901.*)

FIRST LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-07

1. Replacement of Vanes – Repair-07

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Braze Alloy	03-08
Welding wire	03-25

Repair Parts:

Name	Part Number	Quantity
Insert	2-043-131-02	AR
Replacement Vanes	2-043-015-03	AR

B. Procedure

(1) Identify vanes to be replaced by wrapping wire around the vanes.

(2) Remove foam seal from vane assembly inner shroud. (Refer to Repair-01.)

(3) Remove from the air flow path the mid-span area of those vanes to be replaced. *(See Figure 901.)*

CAUTION: LIMIT ELECTRODE TRAVEL ON OUTER SHROUD TO PREVENT DAMAGE TO THE OUTER SHROUD BAFFLE.

(4) Install vane assembly in a suitable fixture. Then, using suitable electrodes and an electric discharge machine (EDM), remove remaining vane stubs.

(5) Visually inspect outer shroud baffle to make sure that it was not damaged during vane stub removal.

(6) Assemble replacement vanes and inserts. Using welding wire and fusion welding method, tack weld inserts to vanes at both ends. (Refer to 70-45-01, SPM.)

(7) Install and position the replacement vanes in the vane assembly. Using a suitable shim, maintain a 0.002 to 0.005 inch (0.05 to 0.13 millimeter) braze gap at the vane-to-shroud joints.

(8) Using welding wire, apply weld buildup to areas of the shroud having an excessive gap. (Refer to 70-45-01, SPM.)

(9) Inspect replacement vanes for proper geometry. *(See Figure 902.)*

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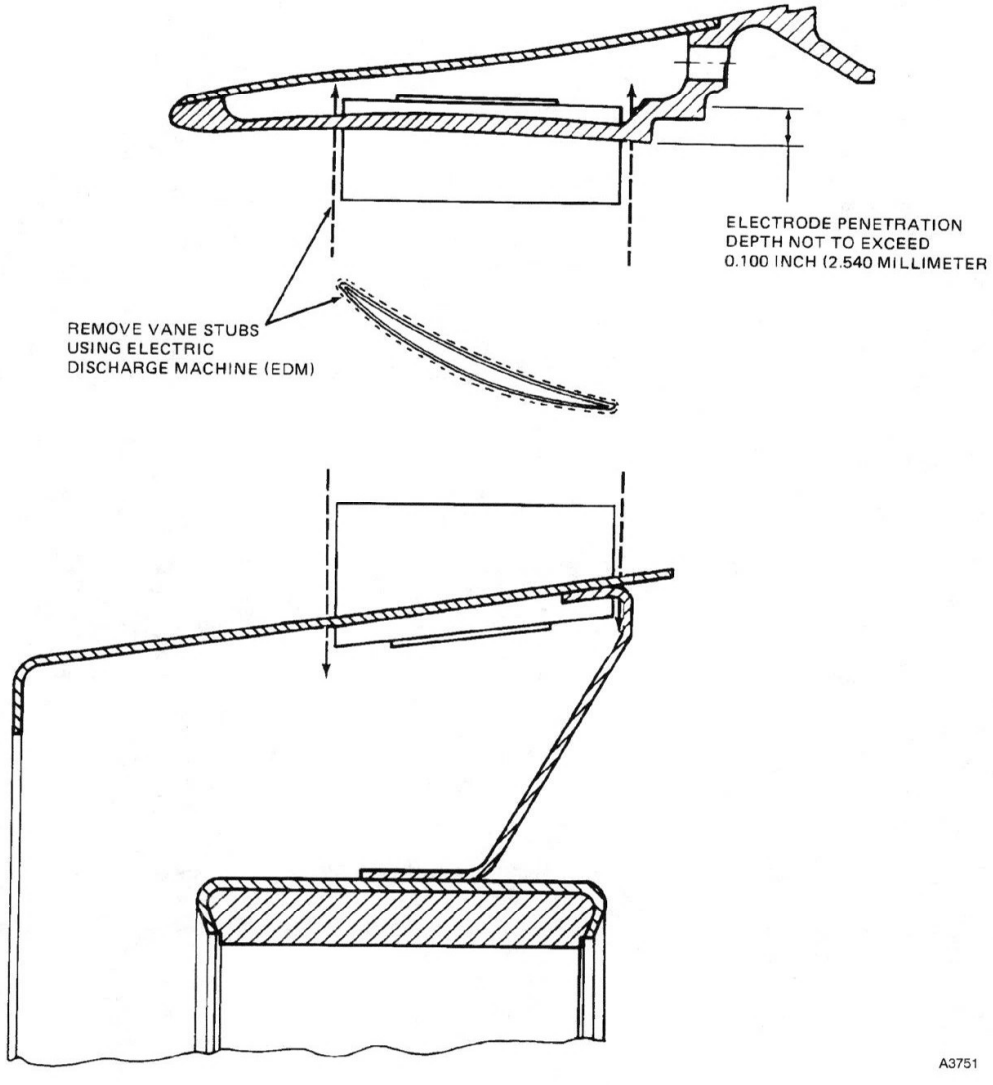

Removal of Vane Stubs
Figure 901

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1. B. (10) Using braze alloy and furnace brazing method, braze vanes in place. (Refer to 70-40-02, SPM.)

(11) Visually and fluorescent-penetrant inspect accessible areas of braze joints in accordance with Class II requirements. Use a suitable borescope, introduced through the anti-icing air entrance holes on the aft side of the outer shroud, to visually inspect braze joints in the outer shroud cavity to Class II requirements. (Refer to 70-40-02, SPM.)

(12) Visually inspect vanes for localized distortion that could cause restriction of the inner vane passage. *(See Figure 903.)* No restriction or crimping is allowed. Correct this condition or replace vanes as required.

(13) Apply water pressure and verify water flows freely from all vanes. Make sure that water does not jet from the outer shroud braze joints. The center passage of the vane shall not be blocked. The entire vane is considered blocked if the center passage, or the center and additional passages (leading edge/trailing edge), show significant flow restriction when compared with other vanes in the same assembly. No more than 5 vanes per assembly and no adjacent vanes may be blocked. If necessary, a probe having a maximum diameter of 0.010 inch (0.25 millimeter) may be used to gently clear any loose obstructions.

(14) Reapply foam seal in vane assembly inner shroud. (Refer to Repair-01.)

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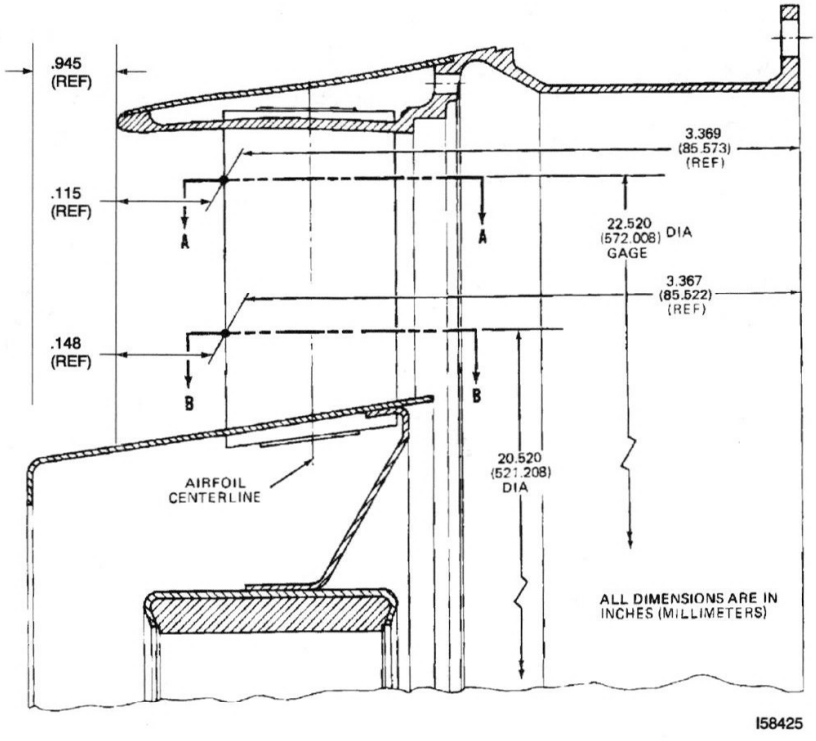

Installation and Positioning of Replacement Vane
Figure 902 (Sheet 1 of 2)

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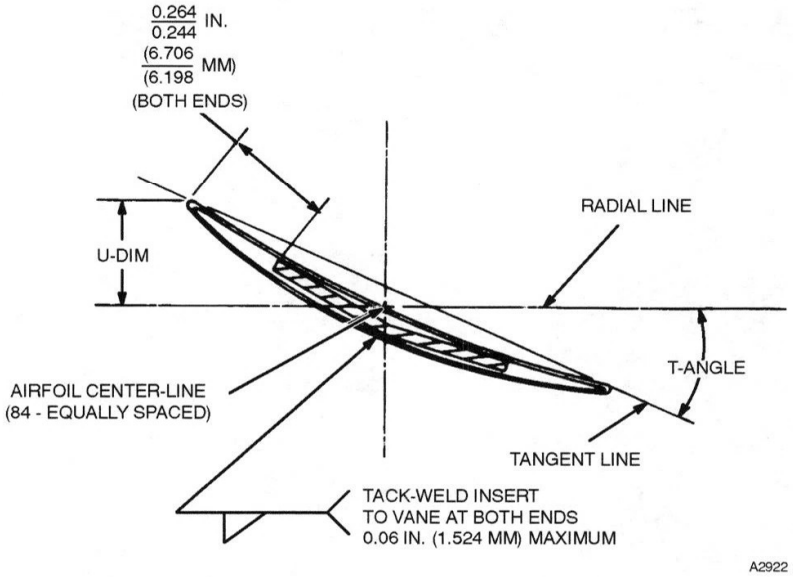
SECTION	T-ANGLE	U-DIMENSION
A-A	24° 07'	0.302 IN. (7.671 MM)
B-B	24° 41'	0.307 IN. (7.798 MM)



Installation and Positioning of Replacement Vane
Figure 902 (Sheet 2)

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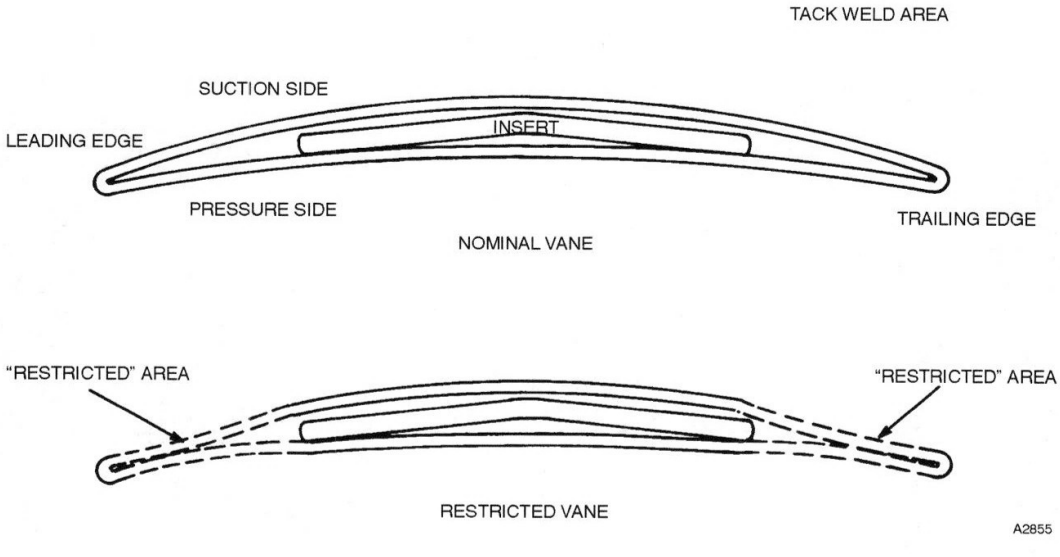

Inspection of Vane Passages
Figure 903

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SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – CLEANING

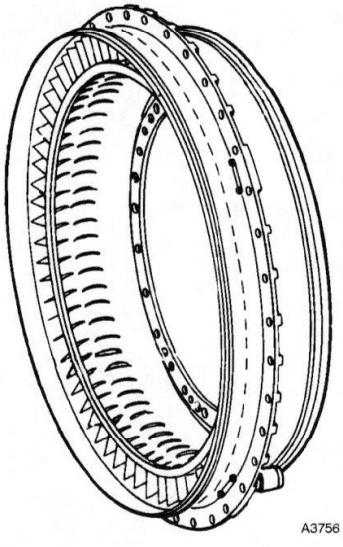
1. Second Low Pressure Compressor Vane Assembly (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Second Low Pressure Compressor Vane Assembly
Figure 601

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – INSPECTION/CHECK

1. Second Low Pressure Compressor Vane Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks and dents on vanes. Nicks and dents on vanes are permitted on leading and trailing edges, provided that after repair, they do not exceed a depth of 0.125 inch (3.18 millimeter). Length of repair shall be at least twice, but not more than five times repair depth. Blend-repair defects. (Refer to 70-25-01, SPM.) Blend width shall be at least twice, but no more than five times the depth.

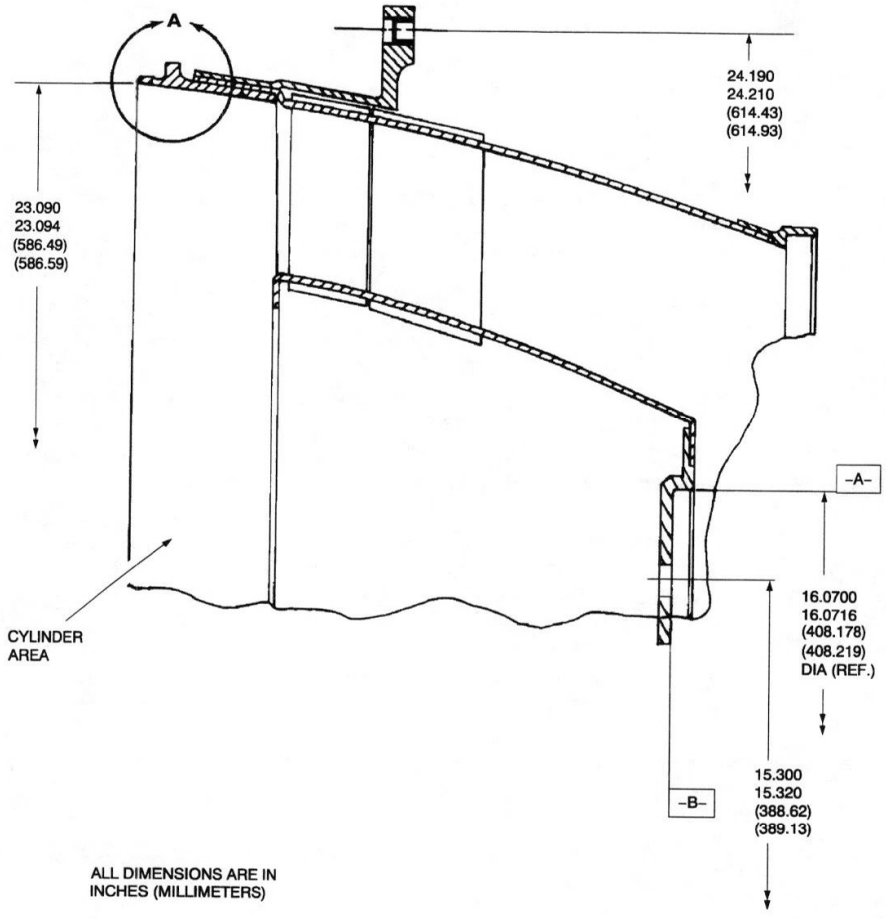
         (b) Nicks and dents in vane airfoil surfaces (sides). Smooth nicks or dents are acceptable without repair. Nicks or dents that are not smooth may be blend repaired (Refer to 70-25-01, SPM) provided a minimum of 2/3 vane thickness remains after blend repair. Total area of nicks and/or dents may not exceed 0.200 square inch (129.04 square millimeter) per vane. Total area may not exceed 2.0 square inches (12904 square millimeters) per vane assembly. Replace vanes that exceed limits. (Refer to Repair-02.)

         (c) Bending and distortion of vanes. Minor bending and distortion is acceptable. Straighten or replace badly bent and distorted vanes. (Refer to Repair-02.) Cracks generated by straightening are not acceptable unless they can be blend repaired within allowable nick and dent repair limits.

         (d) Damaged or eroded plasma spray coating on vane assembly cylinder area. Not acceptable. Repair. (Refer to Repair-01.)

         (e) Damaged inner and/or outer shrouds. Not acceptable. Repair. (Refer to Repair-03.)

         (f) Damaged or missing adapters on 2-043-138-03. Not acceptable. Replace. (Refer to Repair-07.)

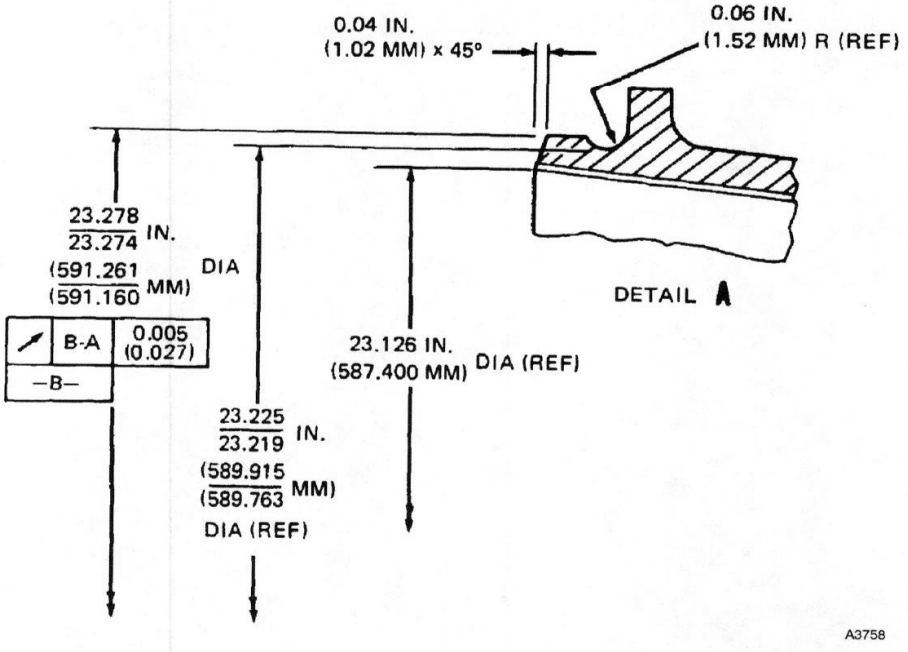


Dimensional Inspection of Second Low Pressure Compressor Vane Assembly
Figure 801 (Sheet 1 of 2)

1. B. (2) Dimensionally inspect. (*See Figure 801.*) If limits are exceeded, repair. (Refer to Repair-04 and Repair-08.)

NOTE: Dimensionally inspect only if visual inspection indicates obvious damage.

(3) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Cracks in parent metal are acceptable only if they can be blended out within acceptable limits. Cracks in inner and outer shroud to vane brazements, which do not extend into parent metal, are permitted provided they do not exceed 0.125 inch (3.18 millimeter) in length. Brazement voids are acceptable. Blend-repair minor cracks. (Refer to 70-25-01, SPM.) If brazement crack limits are exceeded, repair vane assembly. (Refer to Repair-03.)



Dimensional Inspection of Second Low Pressure Compressor Vane Assembly
Figure 801 (Sheet 2)

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-320-04	-01 thru -09	None
2-043-320-14	-01 thru -03, -05 thru -07	None
2-043-320-19	-01, -03 thru -06, -09	ALF/LF 72-1020

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-01

1. Repair of Plasma-Spray Coating on Cylinder Area – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Oxide Abrasive (70 to 80 Grit)	05-11
Plasma-Spray Powder (No. 601)	06-23
Silicone Carbide Grit (No. 24)	05-15

B. Procedure

CAUTION: PLASMA-SPRAY COATING SHALL NOT BE APPLIED TO A SURFACE ALREADY SPRAYED UNLESS PRIOR PLASMA-SPRAY COATING IS COMPLETELY REMOVED. ABRASIVE GRIT-BLAST MAY BE USED AS AN ALTERNATE TO MACHINING TO REMOVE PRIOR PLASMA-SPRAY COATING. EXTREME CAUTION MUST BE USED WHEN GRIT BLASTING TO PREVENT DISTORTION OF PARENT METAL.

WHEN REMOVING EXISTING COATING FROM CYLINDER AREA, DO NOT MACHINE INTO PARENT METAL.

(1) Remove all existing plasma-spray coating from cylinder area by machining or abrasive grit-blast. (*See Figure 901.*) An alternate method is to strip using Hot Alkali Soak Method No. 2. (Refer to 70-15-07, SPM.)

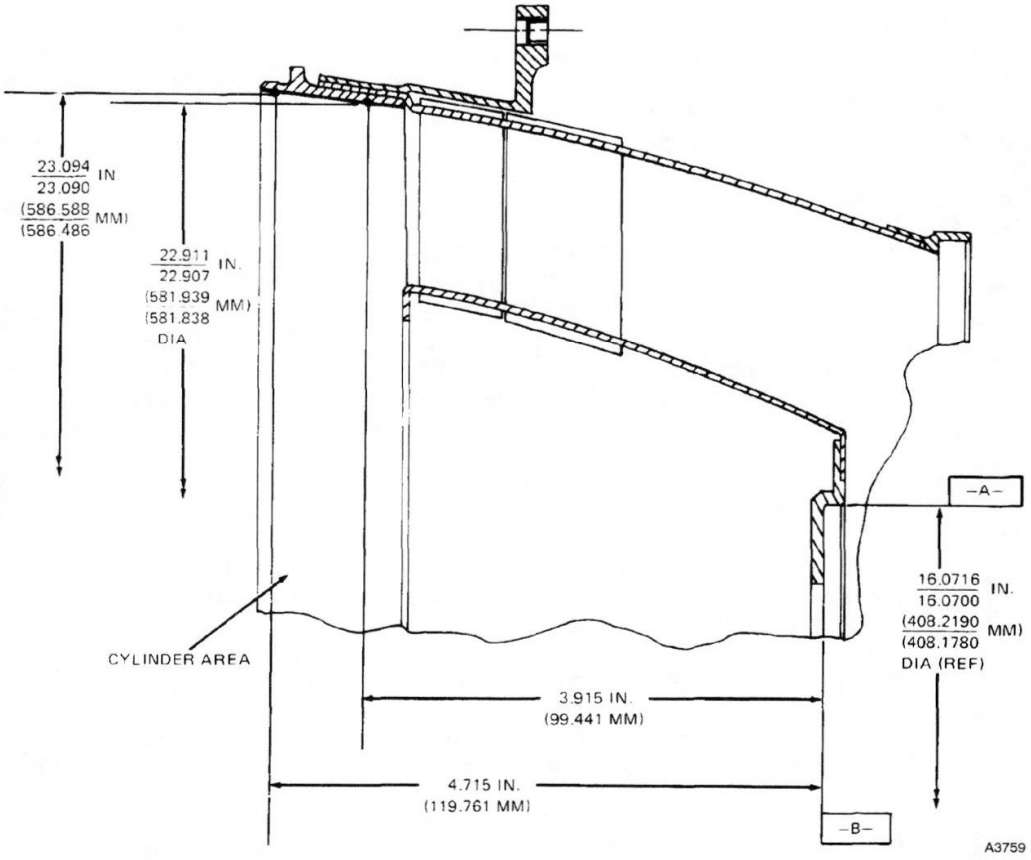
(2) Prepare area to be plasma-spray coated. (Refer to 70-50-01, SPM.)

(3) Clean vane assembly by vapor degreasing method (Refer to 70-15-01, SPM); then mask areas not to be coated, and using silicon carbide grit at 50 to 70 psi (345 to 483 kN/m^2), gritblast.

NOTE: The abraded surface shall be kept clean and shall be plasma-sprayed within 2 hours after cleaning and grit blasting. Surface preparation shall be repeated if 2-hour time limit is exceeded.

(4) Immediately after performing preceding Step (3), plasma-spray cylinder area using plasma-spray powder of sufficient thickness to allow a 0.020 to 0.028 inch (0.51 to 0.71 millimeter) coating thickness after final machining. (*See Figure 901.*)

(5) Machine cylinder taper as specified. (*See Figure 901.*)



Machining of Cylinder Taper
Figure 901

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-02

1. Repair of Damaged Vanes – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Brazing Alloy	03-08
Welding Wire	03-25

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Vane, First Row	2-043-022-02/-03			
Vane, Second Row	2-043-023-04			

B. Procedure

(1) Using wooden forming blocks and a soft mallet, cold straighten distorted vanes.

(2) Visually inspect straightened vanes for resultant cracks. Cracks up to 0.125 inch (3.18 millimeter) long shall be blend repaired. (Refer to 70-25-01, SPM.) Length of repair shall be at least twice, but not more than five times repair depth.

(3) Vanes that cannot be repaired by straightening or blending shall be replaced as follows:

(a) Identify vanes to be replaced.

NOTE: Wrapping wire around vanes to be replaced is the recommended method for identification.

(b) Remove plasma-spray coating from vane assembly cylinder area. (Refer to 72-31-17, Repair-01.)

CAUTION: FOR PURPOSES OF RIGIDITY, NO MORE THAN TWO ADJACENT VANES AND NO MORE THAN 50 PERCENT OF THE TOTAL NUMBER OF VANES PER VANE ASSEMBLY MAY BE CUT OR STRIPPED AT ONE TIME.

(c) Remove midspan area of those vanes to be replaced from flowpath.

CAUTION: WHEN REMOVING VANE STUBS, PENETRATION DEPTH OF ELECTRODE INTO OUTER SHROUD SHALL NOT EXCEED 0.100 INCH (2.45 MILLIMETER); THIS WILL PREVENT DAMAGE TO OUTER SHROUD BAFFLE. (*SEE FIGURE 901.*)

1. B. (3) (d) Install vane assembly in a suitable fixture; then, using suitable shroud electrodes and electric discharge machine, remove remaining vane stubs.

CAUTION: WHEN REMOVING VANE SEGMENTS, CARE SHALL BE TAKEN TO PREVENT SHROUD DISTORTION.

(e) Remove vane segments.

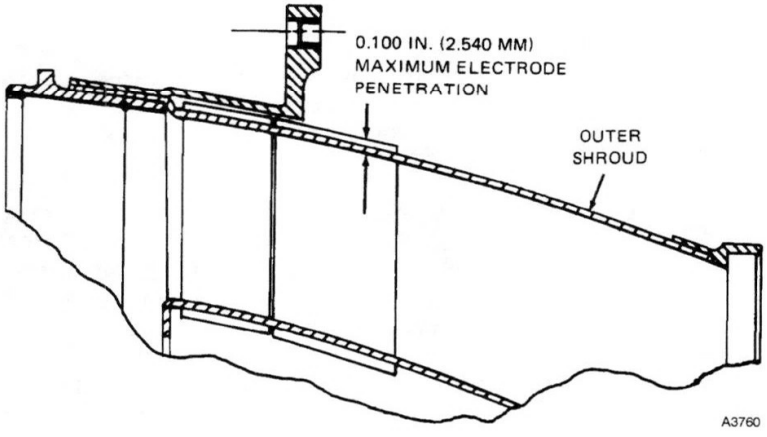
(f) Using a fiber brush, clean vane slots in shrouds.

(g) Install and position replacement vanes, maintaining a 0.002 to 0.005 inch (0.05 to 0.13 millimeter) braze gap.

NOTE: On vane assembly 2-043-320-04, use first row vane 2-043-022-02, or on vane assembly 2-043-320-14, use first row vane 2-043-022-03. On vane assemblies 2-043-320-04/-14, use second row vane 2-043-023-04.

Vane peg should properly engage inner shroud, and vane-to-shroud geometry should be as specified in *Figure 902.*

(h) Using welding wire and fusion-weld method, tack-weld vane at inner shroud. (Refer to 70-45-01, SPM.)



Removal of Vane Stubs
Figure 901

1. B. (3) (i) Inspect for proper vane-to-shroud geometry. (*See Figure 902.*)

(j) Using brazing alloy, braze vanes in place. (Refer to 70-40-02, SPM.)

(k) If additional vanes require replacement, repeat preceding Steps (c) thru (j).

(l) Heat treat vane assembly as follows:

1 Heat assembly to 936 to 965°F (502 to 518°C) and hold at heat for 4 hours.

2 After 4 hours have elapsed, allow assembly to cool in air.

(m) Verify inner shroud mounting flange hardness. Hardness shall be HRC 37 to 44.

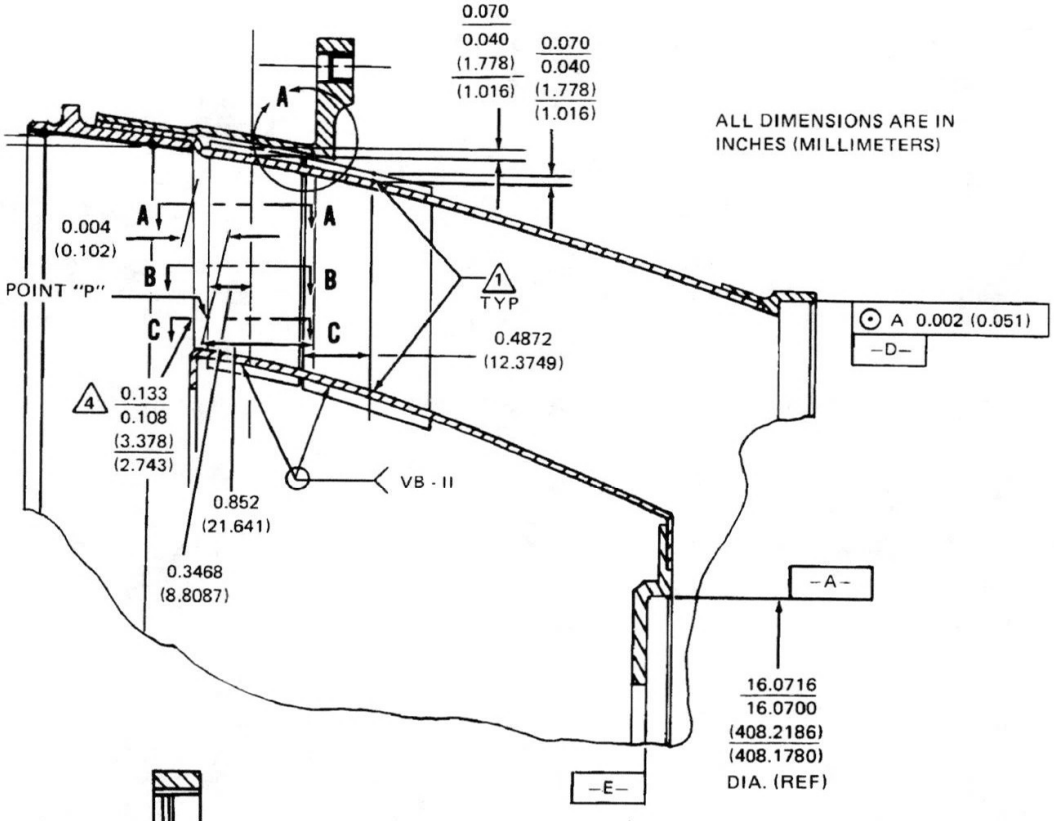
(n) Using fluorescent-penetrant inspection method (Refer to 70-20-05, SPM), inspect repaired areas to Class II acceptance criteria specified in 70-40-02, SPM. Braze deposits in vane to shroud areas cleared by an 0.062 inch (1.58 millimeter) radius are acceptable.

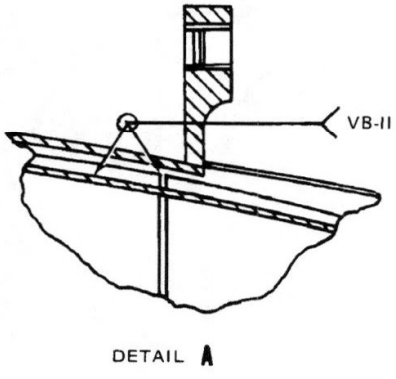
CAUTION: GRINDING INTO VANE OR SHROUD PARENT METAL IS NOT PERMITTED.

(o) Grind smooth any excess braze deposits.

(p) Reapply plasma-spray coating to vane assembly cylinder area. (Refer to Repair-01.)

(4) Dimensionally inspect. (Refer to Inspection/Check.)



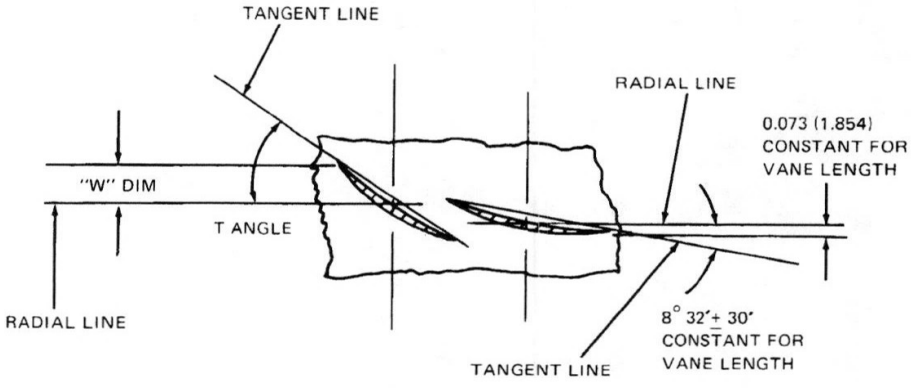


DETAIL A

SECTION	DIAMETER GAGE	T ANGLE ± 1° 0'	W DIMENSION
A-A	21.740 (552.196)	29° 01'	0.224 (5.690)
B-B	20.940 (531.876)	29° 21'	–
C-C	20.540 (521.716)	29° 41'	0.230 (5.842)

A3761

Installation and Positioning of Replacement Vane
Figure 902 (Sheet 1 of 2)



TYPICAL VANE SECTIONED

ALL DIMENSIONS ARE
IN INCHES (MILLIMETERS)

⚠1 BRAZE DEPOSITS AT JUNCTION OF SHROUDS AND VANES PERMISSIBLE WITHIN AN AREA CLEARED BY AN 0.062 (1.575) RADIUS GAGE. NO UNDERCUTTING OF VANES OR SHROUDS IS PERMISSIBLE. EXCESS BRAZE WHEN MACHINED MUST BE SMOOTH ON BOTH INNER AND OUTER SHROUDS.

2 TACK WELDING OF VANES BEFORE BRAZING IS PERMISSIBLE.

3 RADIOGRAPHIC INSPECTION IS NOT REQUIRED.

⚠4 POINT P ON ALL FIRST ROW VANES IS IN THE SAME PLANE WITHIN 0.020 (0.508).

5 ALL DIMENSIONS TO BE INSPECTED WITH PART RESTRAINED AS FOLLOWS:

SURFACE –E– CLAMPED FLAT ON FACE
SURFACE –A– MOUNTED ON 16.067 - 16.069 (408.102 - 408.153) DIA.
SURFACE –D– MOUNTED ON 20.657 - 20.659 (524.688 - 524.739) DIA.

FIXTURE DIAMETERS TO BE CONCENTRIC TO EACH OTHER WITHIN 0.002 (0.051) DIAMETER AND PERPENDICULAR TO FLAT SURFACE WITHIN 0.002 (0.051).

A3762

Installation and Positioning of Replacement Vane
Figure 902 (Sheet 2)

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-03

1. Repair of Damaged Inner and Outer Shrouds and Cracked Brazements – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-30
Welding Wire	03-25

B. Procedure

(1) Using wooden blocks and a soft mallet, cold straighten distorted shrouds as required.

(2) Using fluorescent-penetrant inspection method, inspect shrouds and brazements for cracks. (Refer to 70-20-05, SPM.) Cracks are not allowed. If cracks are noted, proceed as follows:

(a) Cracks up to 0.125 inch (3.18 millimeter) in length shall be blend or weld repaired. (Refer to 70-25-01 and 70-45-01, SPM.)

(b) Cracks exceeding 0.125 inch (3.18 millimeter) shall be repaired using welding wire and fusion welding method in accordance with 70-45-01, SPM, and as follows:

CAUTION: DURING BLENDING, DO NOT REDUCE PARENT METAL THICKNESS.

1 Blend all welds located in flow path to original contour.

2 If weld is to be located within 1/2 inch (12.7 millimeter) of abradable coating, prior removal of abradable coating is required. (Refer to 72-31-17, Repair-01.)

3 Fluorescent-penetrant inspect all weld repairs using Class IV acceptance criteria. (Refer to 70-20-05 and 70-45-01, SPM.)

4 Using welding wire AMS5786, fusion-weld all cracks in existing nickel braze joints. (Refer to 70-45-01, SPM.)

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-04

1. Repair of Discrepant 23.274 to 23.278 Inch (591.16 to 591.26 Millimeter) Diameter – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Oxide Abrasive (70 to 80 Grit)	05-11
Plasma-Spray Powder	06-23
Silicone Carbide Grit (20 to 600 Grit)	05-15

B. Procedure

(1) If necessary, machine diameter to obtain 0.003 to 0.010 inch (0.08 to 0.25 millimeter) plasma-spray coating buildup thickness after final machining. (*See Figure 901.*)

NOTE: When machining, removal of parent material shall be minimal.

(2) If diameter is out of round, mechanically resize to achieve 0.005 inch (0.13 millimeter) maximum runout while maintaining dimensions specified in *Figure 901.*

(3) If resizing was done, fluorescent-penetrant inspect part. (Refer to 70-20-05, SPM.) Cracks are not allowed.

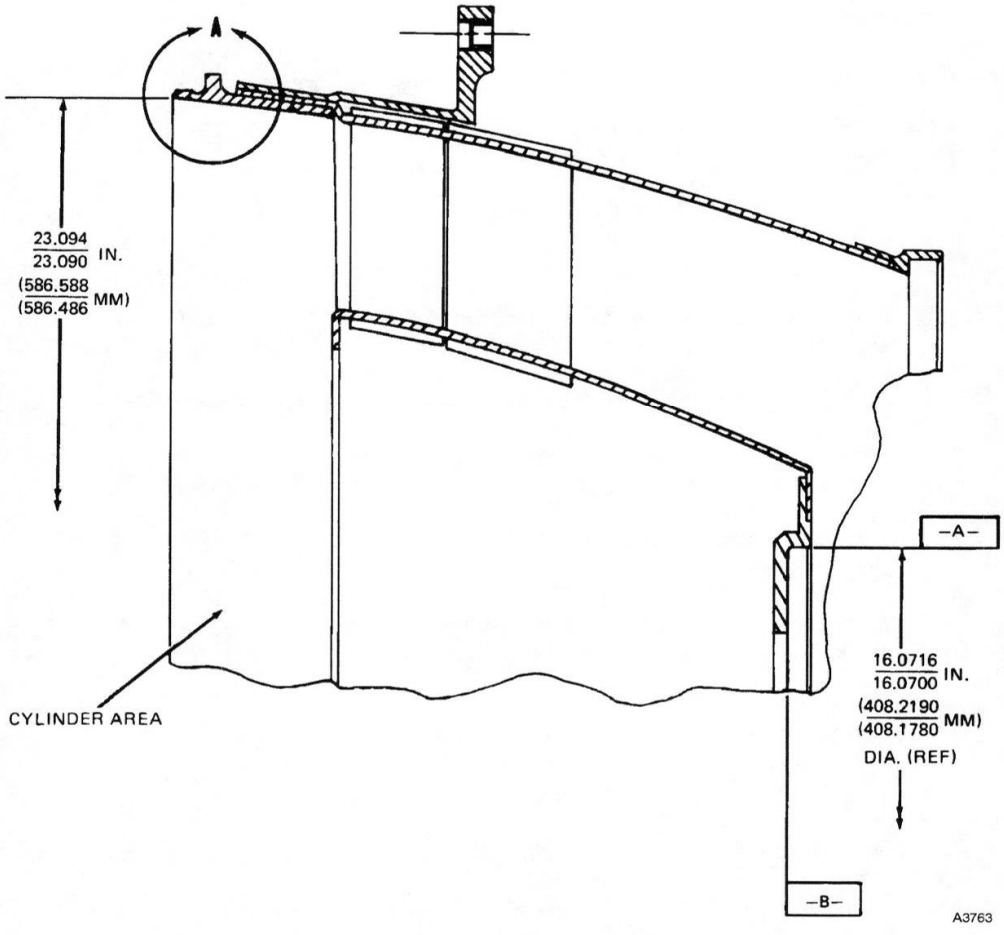
(4) Clean vane assembly by vapor degreasing method (Refer to 70-15-01, SPM); then mask areas not to be coated, and using silicon carbide grit at 50 to 70 psi (345 to 483 kN/m^2), grit-blast.

NOTE: The abraded surface shall be kept clean and shall be plasma-sprayed within 2 hours after cleaning and grit blasting. Surface preparation shall be repeated if 2-hour time limit is exceeded.

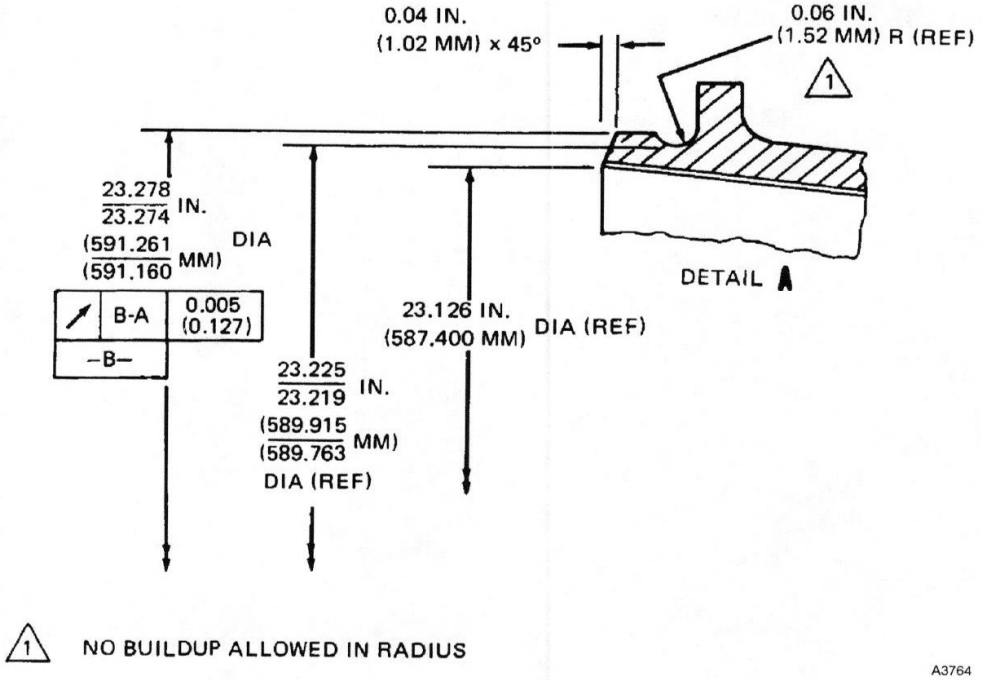
(5) Remove all silicon carbide particles by blasting with clean, dry, filtered air.

(6) Prepare area to be plasma-sprayed coated, then using plasma-spray powder, plasma-spray machined area. (Refer to 70-50-01, SPM.)

(7) Finish-machine diameter to specified dimensions. (*See Figure 901.*)



Dimensional Requirements for Second Low Pressure Compressor Vane Assembly
Figure 901 (Sheet 1 of 2)



1 NO BUILDUP ALLOWED IN RADIUS

A3764

Dimensional Requirements for Second Low Pressure Compressor Vane Assembly
Figure 901 (Sheet 2)

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-05

1. Repair of Stripped 1/4 - 28 Tapped Holes – Repair-05

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      Stripped 1/4 - 28 tapped holes may be repaired by using inserts in accordance with 70-25-03, SPM.

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-06

1. Repair of Discrepant 20.661 to 20.664 Inch (524.79 to 524.87 Millimeter) Diameter – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Plasma-Spray Powder	06-19, -24

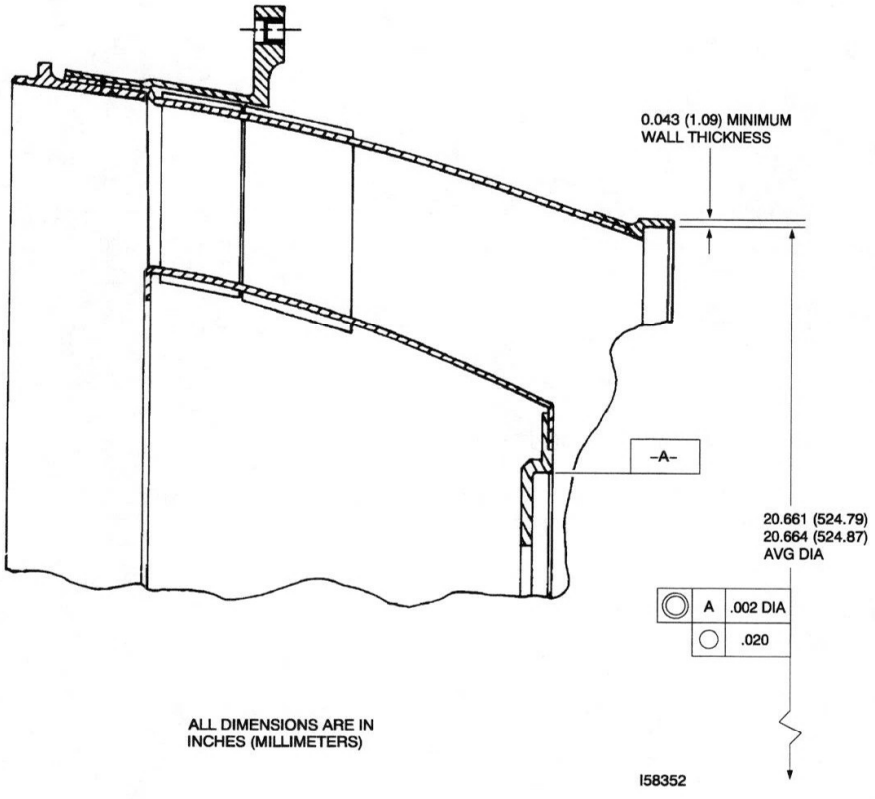
B. Procedure

(1) Machine the 20.661 to 20.664 inch (524.79 to 524.87 millimeter) diameter to remove fretting damage and obtain a 0.002 to 0.010 inch (0.051 to 0.25 millimeter) coating thickness after final machining. Do not remove more parent material than necessary to clean up damage. Observe the 0.043-inch (1.09-millimeter) minimum wall thickness requirement. (*See Figure 901.*)

(2) Fluorescent-penetrant inspect. (Refer to 70-20-05, SPM.)

(3) Clean, mask, grit blast, and metal spray the machined surface (Refer to 70-50-01, SPM) using plasma-spray powder. The machined surface shall be metal sprayed within two hours after grit blasting.

(4) Final machine in accordance with *Figure 901.*



Final Machined Dimensions
Figure 901

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-07

1. Repair of Damaged or Missing Adapters – Repair-07

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Repair Parts:

Name	Part Number	Quantity
Adapter	2-043-138-03	1
Bolts	STD3061-4	2
Close Out Plate	2-043-178-01	1
Gasket	2-043-139-01	1
Lockwire	MS20995C32	AR

B. Procedure

(1) Install gaskets and adapter or close out plate and secure with bolts. Torque bolts in accordance with 70-55-06, SPM.

(2) Lockwire bolts in accordance with 70-55-09, SPM.

SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-08

1. Replacement of Forward Flange – Repair-08

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: The establishment of repair requirements for reworked parts is based, among other things, on the assumption that rework is accomplished strictly in accordance with Honeywell rework procedures by qualified rework sources. This fact, together with the need to maintain a high degree of engine reliability, make it necessary that rework source capabilities be confirmed. Rework source approval may be obtained from Honeywell by directing correspondence to the following:

      Honeywell Engines, Systems & Services
      Customer Support Center
      P.O. Box 29003
      M/S 26-06/2102-323
      Phoenix, AZ 85038-9003
      Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
      FAX: 1-602-365-3343

      The following source(s) have been approved:

      Global Turbine Component Technologies
      519 Nutmeg Road North
      South Windsor, CT 06074

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SECOND LOW PRESSURE COMPRESSOR VANE ASSEMBLY – REPAIR-09

1. Repair of Aft Flange – Repair-09

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Alcohol	07-19
Silicon Carbide Grit (No. 24)	05-15
Steel ring	08-49

B. Procedure

(1) Remove existing flange by machining. *(See Figure 901.)*

(2) Round up the outer shroud using a standard roller. *(See Figure 902.)* Use minimal pressure to avoid collapsing the shroud. Maintain all dimensional requirements shown.

NOTE: Inspection or verification of dimensional requirements is required prior to removing the part from the machine.

(3) Fabricate a replacement aft flange from a ring forging of AMS5645. Machine as shown in *Figure 903, Figure 904,* and *Figure 905.* Break all sharp edges 0.005 to 0.015 inch (0.13 to 0.38 millimeter) radius and hand finish.

NOTE: Inspection or verification of dimensional requirements is required prior to removing the part from the machine.

(4) Clean the outer shroud and the replacement aft flange using Hot Alkali Soak No. 2 (Refer to 70-15-02, SPM) followed by emulsion degreasing (Refer to 70-15-14, SPM).

NOTE: Handle the parts with clean, lint-free cotton or latex gloves.

(5) Abrasive blast clean the aft flange and outer shroud using silicon carbide grit at a pressure of 50 to 60 psi (345 to 414 kN/m^2). Remove blast residue with clean, filtered shop air. Wipe the faying surfaces with a clean cloth moistened with ethyl alcohol and allow to dry.

(6) Assemble the outer shroud and the replacement aft flange. *(See Figure 906.)* Resistance spot weld in 3 to 6 places as required. (Refer to 70-45-02, SPM.)

(7) Resistance seam weld the outer shroud to the replacement aft flange to Class II requirements as shown in *Figure 907.* (Refer to 70-45-02, SPM.) Nugget size shall be approximately 0.13 inch (3.3 millimeter).

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1. B. (8) Finish machine the aft flange. *(See Figure 908.)*

NOTE: Inspection or verification of dimensional requirements is required prior to removing the part from the machine.

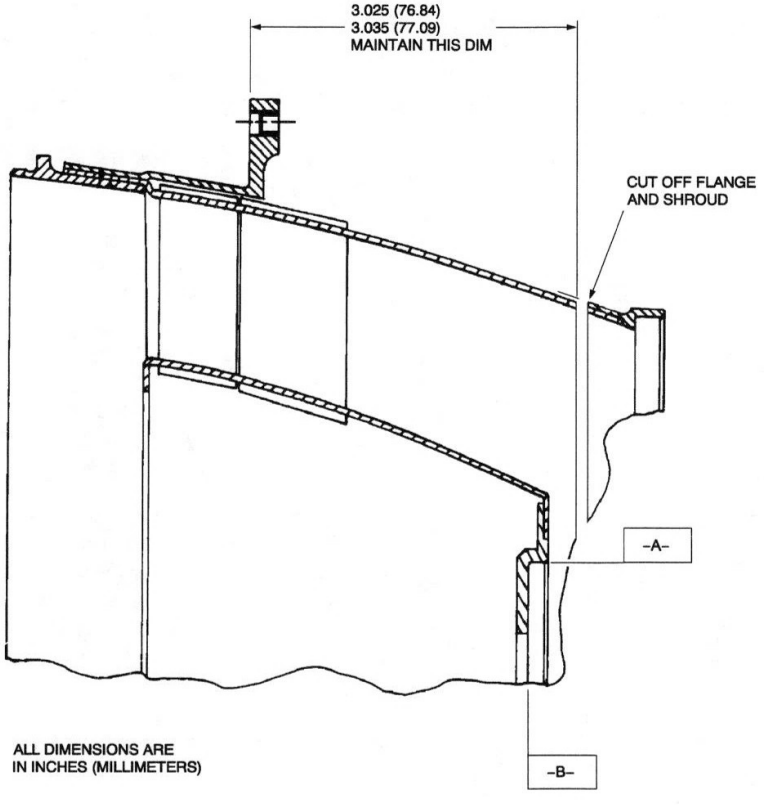
(9) Emulsion degrease the assembly. (Refer to 70-15-14, SPM.)

(10) Fluorescent-penetrant inspect to Class II requirements (Refer to 70-45-02, SPM), Type I, Method A, Level 3.

(11) Emulsion degrease the assembly. (Refer to 70-15-14, SPM.)

(12) Radiographic inspect to Class II requirements. (Refer to 70-45-02, SPM.)

(13) Reidentify the part by vibro-etching the part number and the serial number onto the aft flange.



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Removal of Aft Flange
Figure 901

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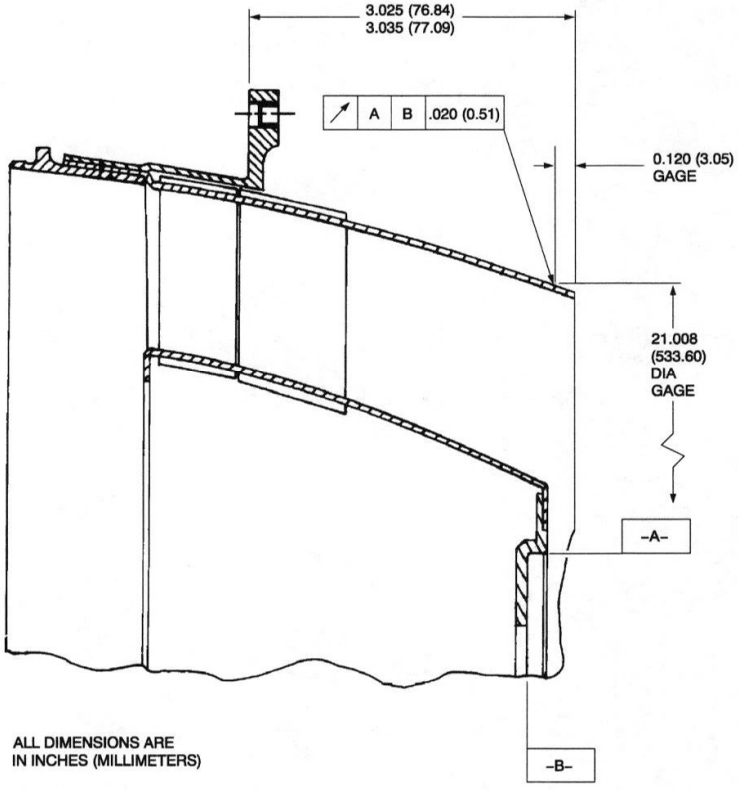

Rounding Up of Outer Shroud
Figure 902

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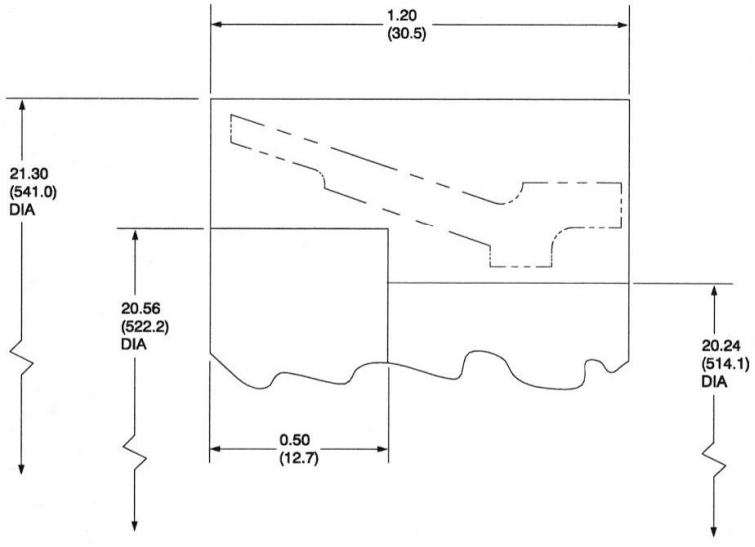
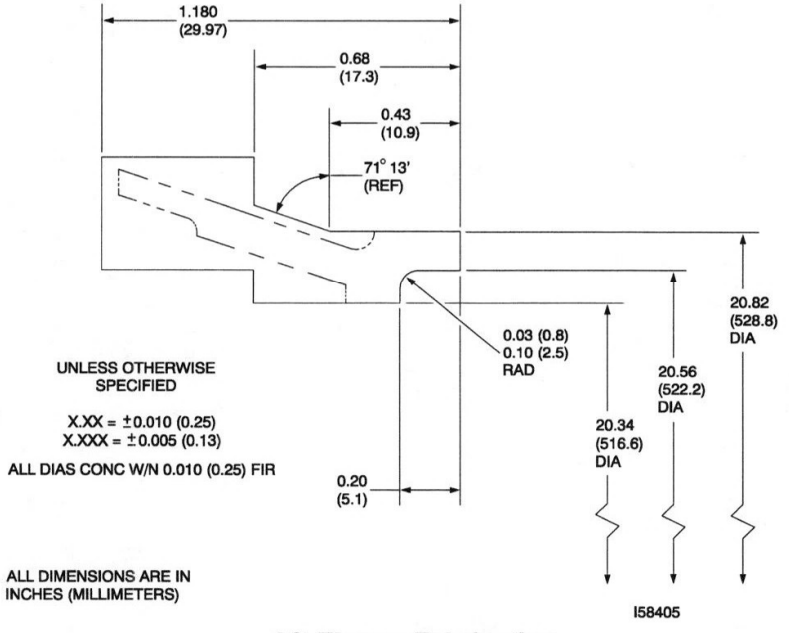


Aft Flange Fabrication (Rough Dimensions)
Figure 903



Aft Flange Fabrication
Figure 904

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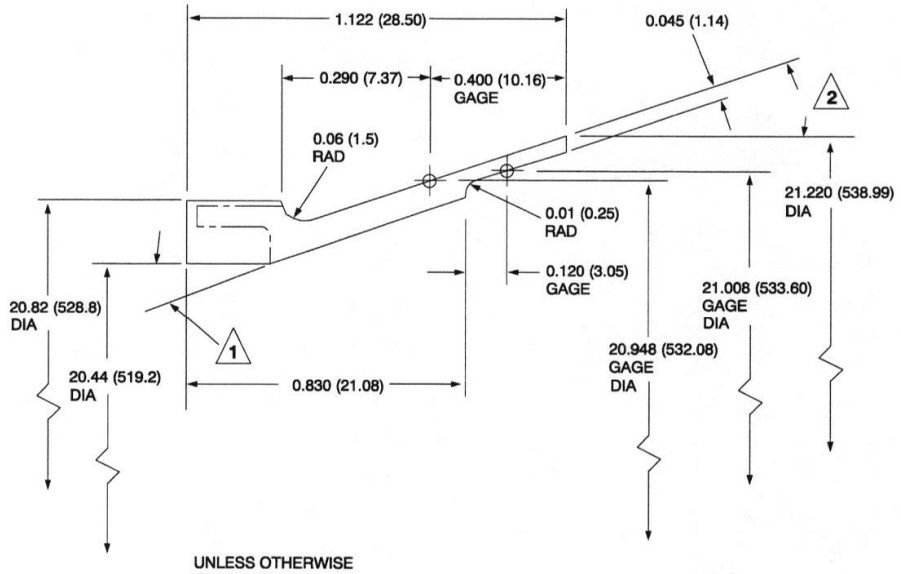

UNLESS OTHERWISE SPECIFIED

X.XX = ± 0.010 (0.25)
X.XXX = ± 0.005 (0.13)
ANGLES = ±1

ALL DIAMETERS CONC W/N 0.010 (0.25) FIR

1 20° PRE SB ALF/LF 72-1020
19° POST SB ALF/LF 72-1020

2 20° PRE SB ALF/LF 72-1020
19° POST SB ALF/LF 72-1020

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

I58406

Aft Flange Finish Dimensions
Figure 905

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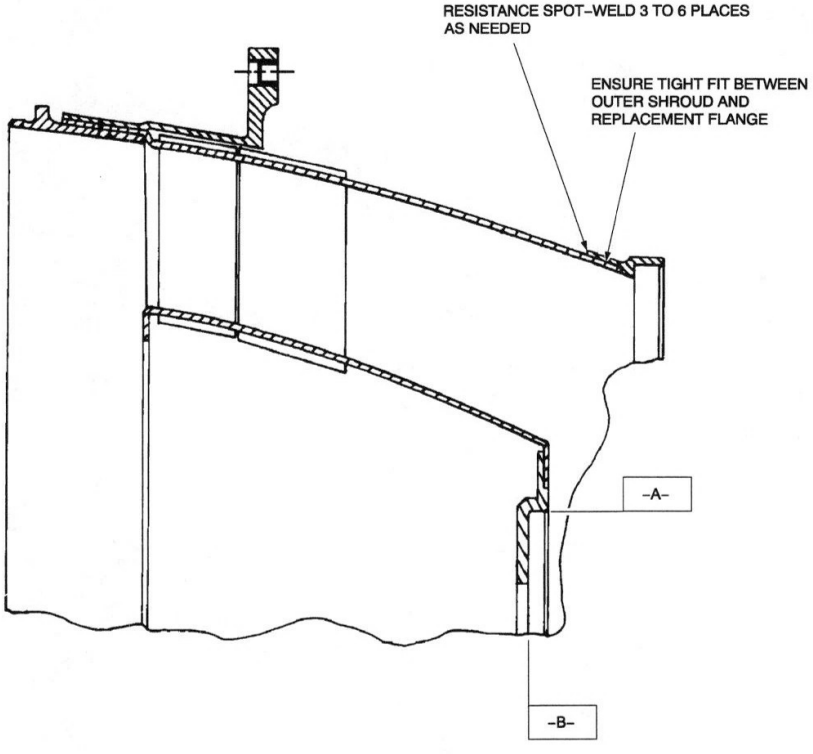

Assembly of Outer Shroud and Aft Flange
Figure 906

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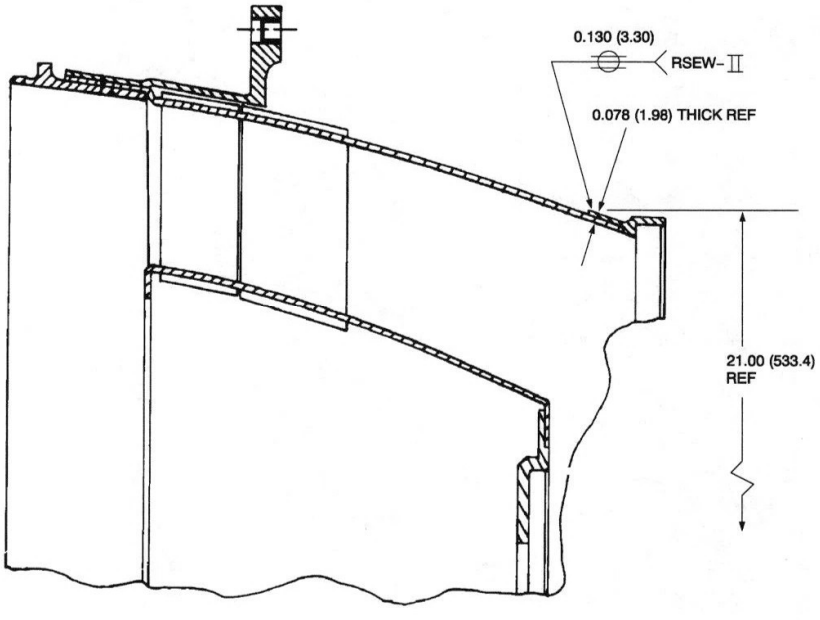

ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)

I58408

Resistance Seam Weld of Aft Flange
Figure 907

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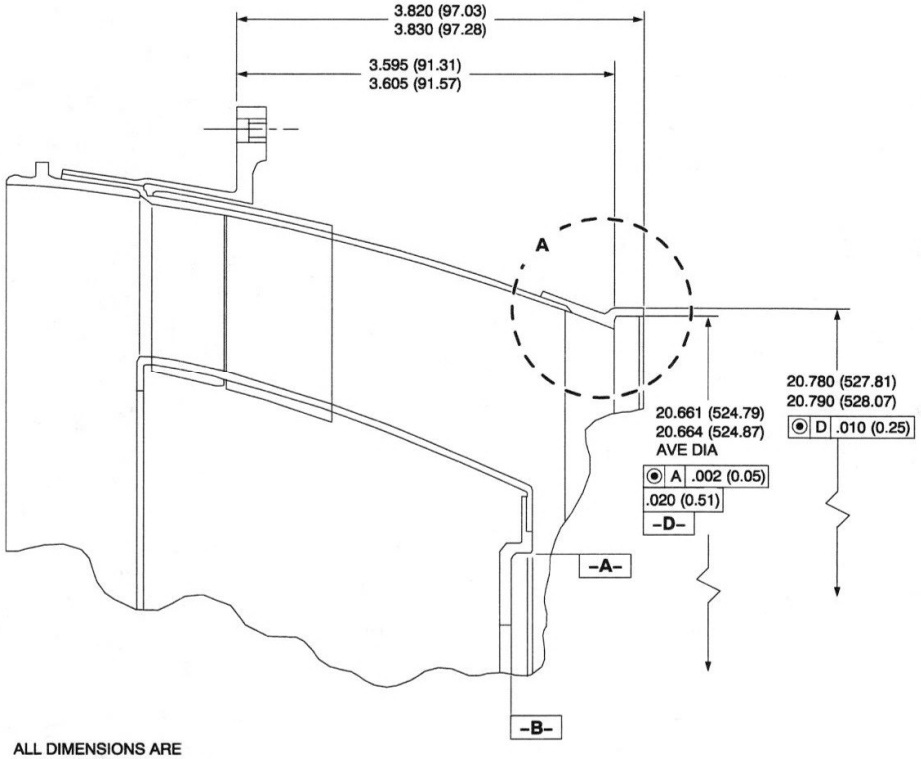

Aft Flange Final Machining
Figure 908 (Sheet 1 of 2)

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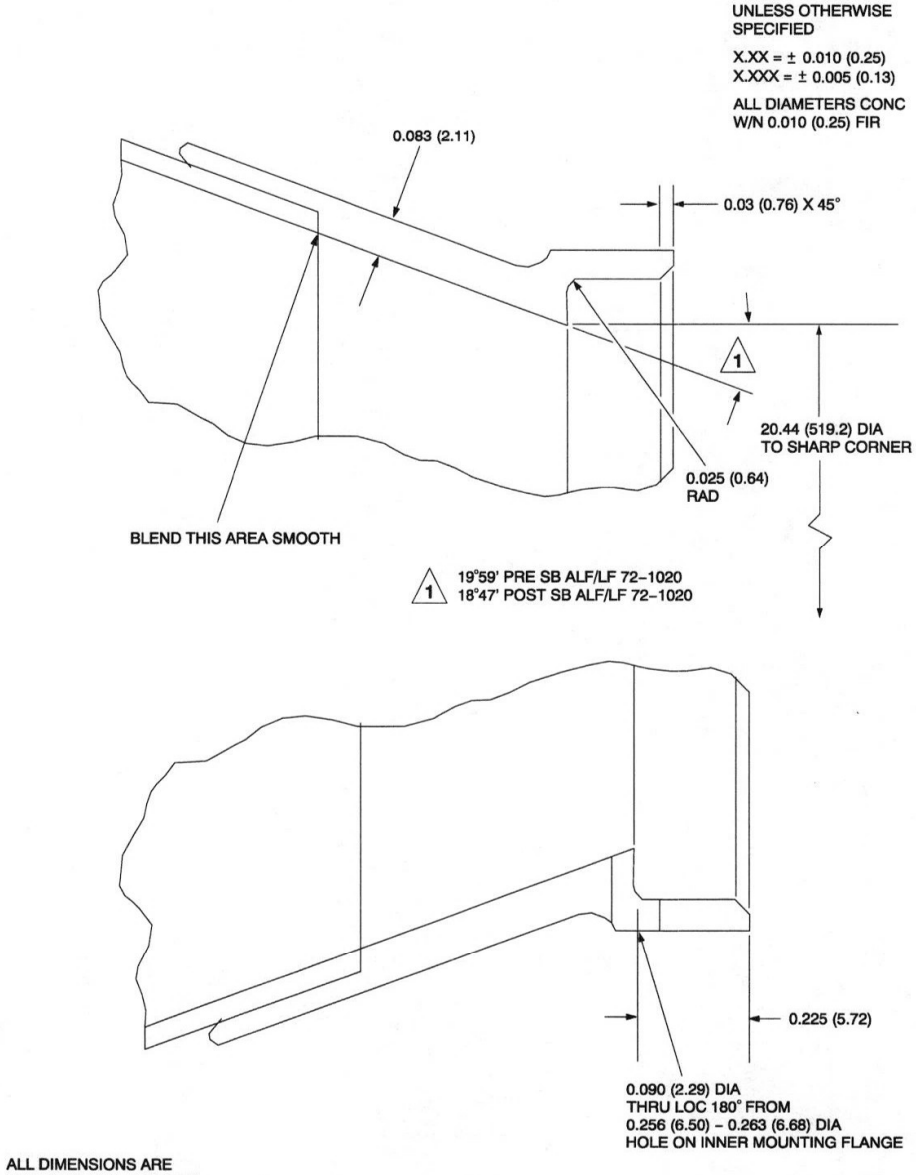

Aft Flange Final Machining
Figure 908 (Sheet 2)

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OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – CLEANING

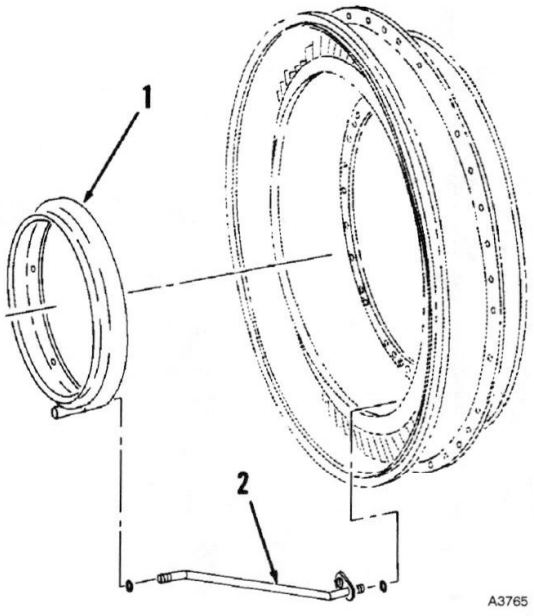
1. Oil Trap Assembly and Oil Trap Tube Assembly (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



1. OIL TRAP ASSEMBLY
2. OIL TRAP TUBE ASSEMBLY

Oil Trap Assembly and Oil Trap Tube Assembly
Figure 601

OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – INSPECTION CHECK

1. Oil Trap Assembly and Oil Trap Tube Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect parts for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Replace distorted parts. Repair cracked parts. (Refer to 72-31-18, Repair-02.)

      (2) Visually inspect oil trap assembly for cracking and broken out or missing material emanating from mounting hole locations. If condition exists, repair. (Refer to Repair-02 and -03.)

      (3) Inspect oil trap tube assembly for clogging by pressure flushing. Repair tube assembly. (Refer to Repair-01.)

OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-110-01	-01 and -02	None
2-023-100-01	-02 and -03	None

OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – REPAIR-01

1. Repair Clogged Oil Trap Tube Assembly – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B

B. Procedure

Using dry cleaning solvent and air at 70 to 80 psi (483 to 552 kN/m^2) pressure, pressure flush clogged oil trap tube assembly.

OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – REPAIR-02

1. Repair of Cracks – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-19

B. Procedure

(1) Using wire brush, locally clean cracked area.

(2) Using welding wire and fusion welding method, repair cracks. (Refer to 70-45-01, SPM.)

(3) Blend-repair area to parent metal. (Refer to 70-25-01, SPM.)

(4) Inspect welds in accordance with Class III parameters of fusion welding procedure. (Refer to 70-45-01, SPM.)

NOTE: No radiographic or ultrasonic inspection required.

(5) Using brush-on application method, apply chemical-film coating to weld area(s). (Refer to 70-30-07, SPM.)

OIL TRAP ASSEMBLY AND OIL TRAP TUBE ASSEMBLY – REPAIR-03

1. Repair of Broken Out or Missing Material Emanating from Mounting Holes – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Sheeting	08-02
Welding Wire	03-19

B. Procedure

(1) Using thin cutoff wheel and wire brush, remove jagged edges from defect then prepare area for patching.

(2) Using aluminum sheeting, fabricate a replacement patch section to conform to assembly inside diameter.

(3) Using welding wire and fusion welding method, weld patch on oil trap assembly. (Refer to 72-45-01, SPM.)

(4) Blend area repaired around mating surfaces of bolt circle flush to parent metal; undercutting is not permitted.

(5) Inspect welds to Class III parameters of fusion welding procedure. (Refer to 72-45-01, SPM.)

(6) Using brush-on application method, apply chemical-film coating to patch and weld areas. (Refer to 70-30-07, SPM.)

CHAPTER 72 – FAN OUTER CASES SECTION

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COWL SUPPORT ASSEMBLY	72-32-01		
Cowl Support Assembly – Cleaning		601	ALL
Cowl Support Assembly – Inspection/Check		801	ALL
Repair/Part Number Index – Repair-00		901	ALL
Replacement of Damaged or Missing Brackets or Fan Module Identification Plate – Repair-01		901	ALL
Replace Damaged or Missing Nut Plates – Repair-02		901	ALL
Repair of Cracks in Bracket Weldments or Parent Metal – Repair-03		901	ALL
Repair-04		Deleted	
Replacement of Engine Data Plate – Repair-05		901	ALL
Repair of Cracks in Parent Metal or Tank Support Bracket Along Seam Weld Area – Repair-06		901	ALL
Repair of Damaged or Cracked Parent Metal in Cowl Support – Repair-07		901	ALL
Securing of Bracket That Has One of Its Attachment Legs Separated From Cowl Support Parent Metal – Repair-08		901	ALL
Securing of Bracket That Has Pulled Cowl Support Parent Metal From Cowl Support Surface at a Bracket Attachment Leg – Repair-09		901	ALL
Repair of Damaged, Broken, or Missing Electrical Connector Spring Clips – Repair-10		901	ALL
Installation of Boron Fiber Doublers on Cowl Support Assembly – Repair-11		901	ALL
Replacement of Oil Tank Support Padding – Repair-12		901	ALL

CHAPTER 72 – FAN OUTER CASES SECTION

TABLE OF CONTENTS (CONT)

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ENGINE	72-00-00		
FAN ROTOR SHROUD ASSEMBLY	72-32-02		
Fan Rotor Shroud Assembly – Cleaning		601	ALL
Fan Rotor Shroud Assembly – Inspection/Check		801	ALL
Repair/Part Number Index – Repair-00		901	ALL
Repair of Fan Rotor Shroud Assembly That is Out of Limits or Has Flaked-Out Areas or Rubs – Repair-01		901	ALL
Repair of Discrepant 39.850 to 39.855 Inch (1012.19 to 1012.32 Millimeter) Diameter – Repair-02		901	ALL
Cold Straighten Buckling in Area Aft of Rub Coating – Repair-03		901	ALL
Repair of Scoring or Gouging at the Plasma-Sprayed or Silicone Abradable Material to Aluminum Interface (Leading Edge) – Repair-04		901	ALL
Repair Damaged Silicone Abradable Material – Repair-05		901	ALL
FAN EXIT VANE ASSEMBLY	72-32-03		
Fan Exit Vane Assembly – Disassembly		501	ALL
Fan Exit Vane Assembly – Cleaning		601	ALL
Fan Exit Vane Assembly – Inspection/Check		801	ALL
Repair/Part Number Index – Repair-00		901	ALL
Replacement of Damaged Rubber Caps on Outer Shroud – Repair-01		901	ALL
Repair of Cracks in Inner and Outer Shroud – Repair-02		901	ALL
Repair Cracks in Fan Exit Vane Assembly Inner Shroud Mounting Flange – Repair-03		901	ALL

CHAPTER 72 – FAN OUTER CASES SECTION

TABLE OF CONTENTS (CONT)

SUBJECT	CHAPTER/ SECTION/ SUBJECT	PAGE	EFFECTIVITY
ENGINE	72-00-00		
FAN EXIT VANE ASSEMBLY (CONT)	72-32-03		
Repair Cracks or Replace Mounting Bosses on Fan Exit Vane – Repair-04		901	ALL
Repair Cracks in Inner Shroud Mounting Flange – Repair-05		901	ALL
Replacement of Inner Shroud Mounting Flange – Repair-06		901	ALL
Fan Exit Vane Assembly – Assembly		1001	ALL
SUPPORT FRAME ASSEMBLY	72-32-04		
Support Frame Assembly – Disassembly		501	ALL
Support Frame Assembly – Cleaning		601	ALL
Support Frame Assembly – Inspection/Check		801	ALL
Repair/Part Number Index – Repair-00		901	ALL
Repair Nicks, Burrs, Scratches, Minor Cracks, or Other Surface Defects – Repair-01		901	ALL
Repair Engine Mounting Pad Pilot Corrosion by Epoxy Filling – Repair-02		901	ALL
Replacement of Corroded or Loose Rosan Inserts and Lock Rings in Engine Mount Pads – Repair-03		901	ALL
Repair of Corrosion Damaged to Engine Mount Pad, Pilots, and Engine to Airframe Mating Surfaces – Repair-04		901	ALL
Replacement of Stripped or Loose Rosan Inserts That Secure No. 12 Bearing Assembly to Support Frame Assembly – Repair-05		901	ALL
Repair of Stripped No. 12 Bearing Assembly Support Holes – Repair-06		901	ALL

CHAPTER 72 – FAN OUTER CASES SECTION

TABLE OF CONTENTS (CONT)

SUBJECT	CHAPTER/ SECTION/ SUBJECT	PAGE	EFFECTIVITY
ENGINE	72-00-00		
SUPPORT FRAME ASSEMBLY (CONT)	72-32-04		
Repair of Stripped or Loose Rosan Inserts That are Used to Secure Accessory Drive Gearbox Module to Support Frame Assembly – Repair-07		901	ALL
Repair Discrepant 4.400 to 4.401 Inch (11.76 to 11.79 Millimeter) Diameter – Repair-08		901	ALL
Repair of 0.101 to 0.107 Inch (2.57 to 2.72 Millimeter) Deep Shoulder – Repair-09		901	ALL
Repair or Replacement of Loose Locating Pins – Repair-10		901	ALL
Repair of Corrosion and Fretting on Accessory Gearbox Mounting Pad Contact Surface at the 21.297 to 21.303 Inch (540.09 to 541.10 Millimeter Dimension – Repair-11		901	ALL
Repair of Stripped No. 12 Bearing Assembly Support Holes Using Plugs – Repair-12		901	ALL
Repair of 1.430 to 1.434 Inch (36.32 to 36.42 Millimeter) Diameter No. 12 Bearing Support Hole Using a Plug – Repair-13		901	ALL
Repair of Holes in Inner Struts – Repair-14		901	ALL
Repair of Minor Wear to Carrier Contact Surface – Repair-15		901	ALL
Repair of 13.338 to 13.340 Inch (338.79 to 338.84 Millimeter) Reduction Gear Carrier and Carrier Retaining Spring Pilot Diameter – Repair-16		901	ALL
Repair of Discrepant 0.90 to 0.98 Inch (22.9 to 24.9 Millimeter) Depth of 0.640 to 0.649 Inch (16.26 to 16.49 Millimeter) Diameter Holes in Engine Mount Pad – Repair-17		901	ALL
Repair of a Cracked or Deformed Engine Mount Pilot – Repair-18		901	ALL

CHAPTER 72 – FAN OUTER CASES SECTION

TABLE OF CONTENTS (CONT)

SUBJECT	CHAPTER/ SECTION/ SUBJECT	PAGE	EFFECTIVITY
ENGINE	72-00-00		
SUPPORT FRAME ASSEMBLY (CONT)	72-32-04		
Repair of Oil Transfer Hole When Depth of Damage is Between 0.035 to 0.258 Inch (0.889 to 6.553 Millimeters) – Repair-19		901	ALL
Repair of Oil Transfer Hole When Wear Depth is Less than 0.035 Inch (0.889 Millimeter) – Repair-20		901	ALL
Repair of Corrosion and Fretting on the Outer Accessory Gearbox Mounting Pad Contact Surface at the 0.999 to 1.001 Inch (25.375 to 25.425 Millimeter) Dimension – Repair-21		901	ALL
Repair of Worn Frame Coupling Anti-Rotation Pin Slot Area in the No. 4 Strut Tube Assembly – Repair-22		901	ALL
Repair of Worn Frame Coupling Anti-Rotation Pin Slot Area in the No. 6 Strut Tube Assembly – Repair-23		901	ALL
Removal/Prevention of Corrosion in Thru Holes at No. 6 Strut – Repair-24		901	ALL
Repair of Oil Transfer Tube Hole With Sleeve Insert – Repair-25		901	ALL
Repair of Cracks Adjacent to Reduction Gear Carrier Assembly Locating Pins – Repair-26		901	ALL
Repair of Corrosion and Fretting of the 26.989 to 26.999 Inch (685.521 to 685.775 Millimeter) Diameter Flange – Repair-27		901	ALL
Repainting of Fan Frame – Repair-28		901	ALL
Weld Repair of Fan Frame – Repair-29		901	ALL
Inhibiting Erosion on Fan Frame leading Edges Using Viton Rubber Paint (Chemtac 20) – Repair-30		901	ALL
Support Frame Assembly – Assembly		1001	ALL
Support Frame Assembly – Testing		1301	ALL

COWL SUPPORT ASSEMBLY – CLEANING

1. Cowl Support Assembly (*See Figure 601*) – Cleaning

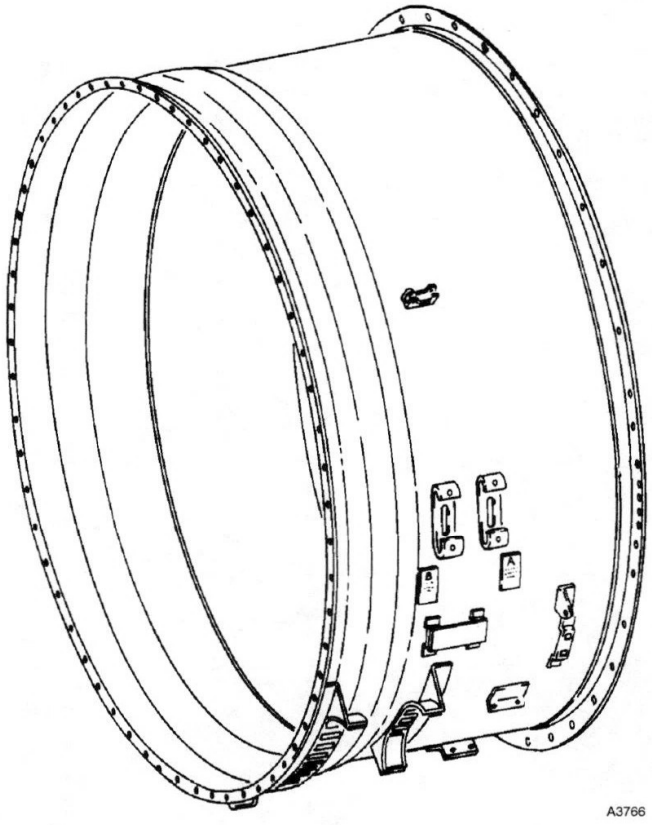
   A. Equipment and Materials

   Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49

   B. Cleaning

   Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Cowl Support Assembly
Figure 601

COWL SUPPORT ASSEMBLY – INSPECTION/CHECK

1. Cowl Support Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks, burrs, and dents. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (b) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (c) Cracks, distortion, or chafing of fan blade containment shroud. Not acceptable. Replace.

         (d) Damaged or missing brackets and fan module identification plate. Replace. (Refer to 72-32-01, Repair-01.)

         (e) Damaged, illegible, or missing engine data plate. Replace. (Refer to Repair-05.)

         (f) Damaged or missing nut plates. Replace. (Refer to Repair-02.)

         (g) Cracks in parent metal or oil tank support bracket along seam weld. Repair cracks. (Refer to Repair-06.)

         (h) Bracket(s) that are pulled or separated from parent metal. (Refer to Repair-08 or -09.)

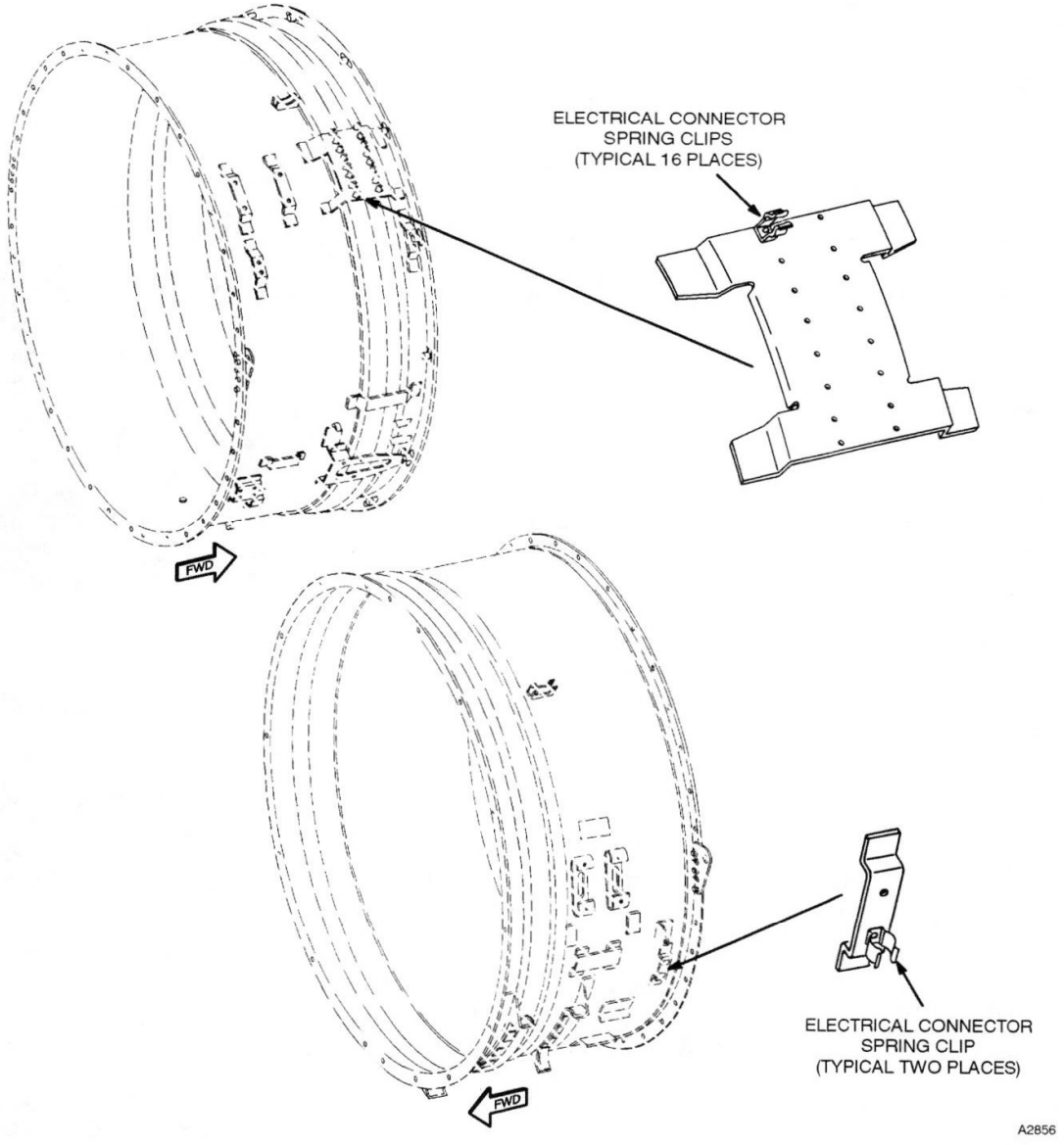
         (i) Damaged, broken or missing electrical connector spring clips. (*See Figure 801.*) Replace defective or missing clips. (Refer to Repair-10.)

         (j) Loose, thinned, or missing viton padding on oil tank supports. If padding is loose or missing, repair. (Refer to Repair-12.)

            NOTE: If the thinned area is smooth bottomed and the parent material thickness is at least 0.030 inch (0.76 millimeter), repair may be postponed until the next time that the cowl support is stripped of all accessories.

         (k) Corrosion or non-conductive coatings on mounting surfaces of the overspeed controller bracket. Not acceptable. Remove corrosion or coatings from bracket mounting surfaces. (Refer to 70-25-01, SPM.)

      (2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) No cracks allowed. Weld-repair cracks. (Refer to Repair-03.) Patch repair cracks and damage that exceeds 0.100 inch (2.54 millimeter) in width. (Refer to Repair-07.)



Electrical Connector Locations
Figure 801

COWL SUPPORT ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-180-14/-26/R28	-01 thru -12	ALF502R 72-153
2-043-180-19/-27	-01 thru -12	ALF502R 72-325

COWL SUPPORT ASSEMBLY – REPAIR-01

1. Replacement of Damaged or Missing Brackets or Fan Module Identification Plate – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

Obtain replacement data plate from:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

CAUTION: TO PREVENT DAMAGE, DO NOT GRIND INTO PARENT METAL.

(1) Remove damaged bracket or identification plate by grinding.

(2) Abrade cowl support surface around bracket or plate location.

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

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1. B. (3) Using welding wire and fusion welding method, secure new bracket or plate to cowl support. (Refer to 70-45-01, SPM.) Fluorescent-penetrant inspect weld to Class IV requirements. (Refer to 70-20-05 and 70-45-01, SPM.)

NOTE: During weld operation, provide adequate argon gas backup to other side of weld.

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COWL SUPPORT ASSEMBLY – REPAIR-02

1. Replace Damaged or Missing Nut Plates – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

NOTE: Use standard practices to replace nut plates riveted to fan cowl support and brackets.

This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

CAUTION: TO PREVENT DAMAGE, DO NOT GRIND INTO PARENT METAL.

(1) Remove damaged nut plate by grinding.

(2) Abrade cowl support surface around plate location.

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(3) Using welding wire and fusion welding method, secure new nut plate to cowl support. (Refer to 70-45-01, SPM.) Inspect weld to Class IV requirements. (Refer to 70-45-01, SPM.)

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COWL SUPPORT ASSEMBLY – REPAIR-03

1. Repair of Cracks in Bracket Weldments or Parent Metal – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

CAUTION: TO PREVENT DAMAGE, DO NOT GRIND INTO PARENT METAL.

CRACKS IN FAN CONTAINMENT RING DETAIL ARE NOT ALLOWABLE, NOR ARE THEY REPAIRABLE. WELDING IN COWL SUPPORT PARENT METAL IS ALLOWED UP TO AFT EDGE OF CONTAINMENT RING DETAIL.

(1) Clean and rout cracks.

NOTE: Cracks or damage that exceeds 0.100 inch (2.54 millimeter) width may be patch repaired. (Refer to Repair-07.)

Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(2) Using welding wire and fusion welding method, weld repair cracks. (Refer to 70-45-01, SPM.) Inspect weld to Class IV requirements. (Refer to 70-45-01, SPM.)

NOTE: During weld operation, provide adequate argon gas backup to other side of weld.

Fixture cracked edges that are mismatched or radially deformed so that edge mismatch is not more than 0.010 inch (0.25 millimeter). Tack-weld longer cracks at 1.0 inch (25 millimeter) intervals prior to welding.

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COWL SUPPORT ASSEMBLY – REPAIR-04

This repair is deleted.

COWL SUPPORT ASSEMBLY – REPAIR-05

1. Replacement of Engine Data Plate – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Epoxy Adhesive	01-14

B. Procedure

(1) If engine data plate becomes damaged, illegible, or lost, a new data plate is available. Make a log book entry covering condition, and if possible, forward old data plate, along with justification for removal, to:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

(2) Upon receipt of information and/or data plate, Engines, Systems & Services will issue a new plate for attachment to engine. Rivet new data plate to engine in its original position.

NOTE: Epoxy adhesive RTV 106 may be used as a alternate method of attaching data plate to engine.

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COWL SUPPORT ASSEMBLY – REPAIR-06

1. Repair of Cracks in Parent Metal or Oil Tank Support Bracket Along Seam Weld Area – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

CAUTION: CRACKS IN FAN CONTAINMENT RING DETAIL ARE NOT ALLOWABLE, NOR ARE THEY REPAIRABLE. WELDING ON COWL SUPPORT PARENT METAL IS ALLOWED UP TO AFT EDGE OF CONTAINMENT RING DETAIL.

(1) Clean and rout cracks. For cracks in the seam weld of the forward oil tank support bracket, fluorescent-penetrant inspect (70-20-05, SPM) to assure that the crack has been completely removed. Cracks that have propagated into the parent material of the containment ring are not acceptable or repairable.

(2) Using dry cleaning solvent method, clean area to be welded. (Refer to 70-15-03, SPM.)

(3) Using wire brush, remove all surface oxides from area to be repaired.

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per SB ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(4) Using welding wire AMS5680 and fusion welding method, weld-repair cracks. (Refer to 70-45-01, SPM.) Visually and fluorescent-penetrant inspect welds to Class III requirements specified in 70-45-01, SPM. (Refer to 70-20-02 and 70-20-05, SPM.)

NOTE: During weld operation, provide adequate argon gas backup to other side of weld.

For cracks in the seam weld of the forward oil tank support bracket, a heat sink shall be used during the welding operation to minimize heat input to the containment ring.

(5) Blend excess weld fillet smooth. (Refer to 70-25-01, SPM.)

COWL SUPPORT ASSEMBLY – REPAIR-07

1. Repair of Damaged or Cracked Parent Metal in Cowl Support – Repair-07

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49
Steel	08-36
Welding Wire	03-25

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

Cracks may be weld repaired up to aft edge of containment ring detail using welding wire and fusion welding method. (Refer to 70-45-01, SPM.)

Fixture cracked edges that are mismatched or radially deformed so that edge mismatch is not more than 0.010 inch (0.25 millimeter). Tack-weld longer cracks at 1.0 inch (25 millimeter) intervals prior to welding. (Refer to 72-32-01, Repair-03.)

Use following patch repair procedure to repair damage and cracks that exceed 0.100 inch (2.540 millimeter) in width.

Chaffed and thinned ares up to 0.5 by 0.5 inch (13 by 13 millimeter) and aft of the containment ring may be repaired by puddle welding without patching (70-45-01, SPM). Chaffed areas over 0.5 by 0.5 inch (13 by 13 millimeter) may be puddle welded and patched as described in the following procedure. After puddle welding, the repaired area shall be blended to fair smoothly with the parent material.

(1) Using dry cleaning solvent or equivalent, degrease repair area. (Refer to 70-15-03, SPM.)

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CAUTION: DO NOT REDUCE PARENT METAL THICKNESS.

1. B. (2) Rout damaged area to remove all sharp edges. Remove bracket if necessary to facilitate welding, marking its original location.

(3) Stop-drill all cracks.

(4) Using a wire brush, remove all surface oxides from repair area.

(5) Fabricate a patch as required to fit repair area from 0.028 to 0.032 inch (0.71 to 0.81 millimeter) thick steel material.

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(6) Using welding wire and fusion welding method, weld patch to cowl support. (Refer to 70-45-01, SPM.)

NOTE: During weld operation, provide adequate argon gas backup to other side of weld.

(7) If bracket was removed to facilitate repair, place bracket in original position and secure by using welding wire and fusion welding method. (Refer to 70-45-01, SPM.)

(8) Fluorescent-penetrant inspect all repaired areas to Class III requirements specified in 70-45-01, SPM. (Refer to 70-20-05, SPM.)

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COWL SUPPORT ASSEMBLY – REPAIR-08

1. Securing of Bracket That Has One of Its Attachment Legs Separated From Cowl Support Parent Metal – Repair-08

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

Inspect cowl support parent metal underlying bracket attachment area for cracks or damage. Repair parent metal damage as needed prior to reattaching bracket leg. (Refer to 72-32-01, Repair-03 or -07.)

(1) Abrade bracket attachment leg and cowl support surfaces to be welded.

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(2) Fixture bracket attachment leg to cowl support and secure using welding wire and fusion welding method. (Refer to 70-45-01, SPM.) Inspect weld to Class IV requirements. (Refer to 70-45-01, SPM.)

NOTE: During weld operation, provide adequate argon gas backup to other side of weld.

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COWL SUPPORT ASSEMBLY – REPAIR-09

1. Securing of Bracket That Has Pulled Cowl Support Parent Metal From Cowl Support Surface at a Bracket Attachment Leg – Repair-09

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Rout damaged areas to remove sharp edges and provide clean parent metal for welding.

(2) Fixture bracket to cowl support so that parent metal edges are flush to within ±0.010 inch (0.25 millimeter), and tack-weld in place prior to welding. *(See Figure 901.)*

NOTE: Prior to welding, visually inspect the cowl support assembly for boron fiber reinforcement doublers that have been applied per Service Bulletin ALF502R 72-325 or Repair-11. Remove the boron fiber reinforcement doublers, as required, per Repair-11.

(3) Weld using welding wire and fusion welding method. (Refer to 70-45-01, SPM.) Inspect weld to Class IV requirements. (Refer to 70-45-01, SPM.)

NOTE: During welding operation, provide adequate argon gas backup to other side of weld.

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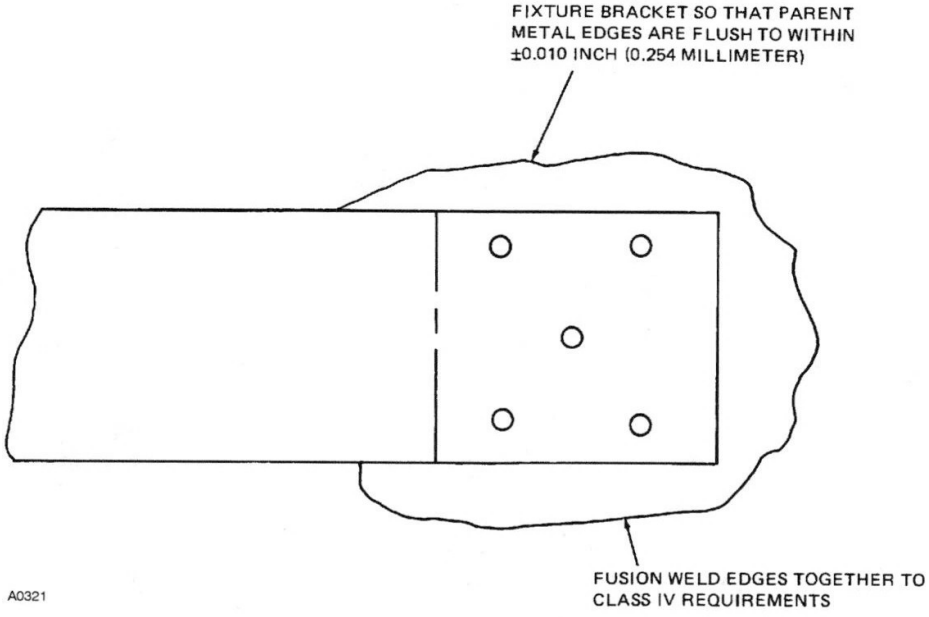

Typical Bracket Attachment Leg
Figure 901

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COWL SUPPORT ASSEMBLY – REPAIR-10

1. Repair of Damaged, Broken, or Missing Electrical Connector Spring Clips – Repair-10

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Spring Clips	MIL-C-24066/2-11	72-32	1	60
Spring Clips	MIL-C-24066/2-11	72-32	5	20A
Rivets	NAS 1738B4-2			

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) If required, machine rivet to remove defective spring clips from supporting bracket.

(2) Using a No. 26 (0.147 inch [3.74 millimeter] diameter) drill, enlarge the existing rivet hole on the bracket and remove burrs and sharp edges.

(3) Using a No. 26 (0.147 inch [3.74 millimeter] diameter) drill, enlarge the existing rivet hole on the new spring clips and remove burrs and sharp edges.

(4) Using NAS 1738B4-2 blind rivet and rivet gun, attach spring clip to bracket.

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COWL SUPPORT ASSEMBLY – REPAIR-11

1. Installation of Boron Fiber Doublers on Cowl Support Assembly – Repair-11

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
Model HCS 8500 or Model HCS 9000	Composite Repair Console (Heatcon Composite Systems, Seattle, WA)
Model HC1000100E51	Heating Blanket (500 Watt) (Heatcon Composite Systems, Seattle, WA
Model HCS2015-05	Vacuum Hose Assembly (Heatcon Composite Systems, Seattle, WA
Model HCS2010-01	Thermocouple (10) Type J, 24 Gauge (Heatcon Composite Systems, Seattle, WA
Model USD-10	Ultrasonic Instrument (Aerotech Krautkramer Branson (Lewistown, PA)
P/N 224-000	Ultrasonic Instrument (Aerotech Krautkramer Branson (Lewistown, PA)
P/N C-012	Ultrasonic Instrument (Aerotech Krautkramer Branson (Lewistown, PA)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Oxide 90-12 Grit	05-11
Aluminum Oxide Cloth (40 Grit)	05-06
Boron Epoxy Prepreg Tape	10-42
Breather/Bleeder Cloth	10-39
Ethyl Alcohol	07-19
High Temperature Pressure Sensitive Tape	10-44
Masking Tape	10-22
Nylon Bagging Film	10-37
Porous Teflon Coated Fiberglass	10-38
Sealant Tape	10-41
Structural Adhesive Film	10-43
Structural Adhesive Primer	01-37
Ultrasonic Couplant	09-14
112 Type Fiberglass Fabric	10-40

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1. B. Procedure

NOTE: All cracks in the cowl support assembly must be repaired before installing boron patches. (Refer to 72-32-01, Inspection/Check and Repair.)

Rework source capability must be confirmed by Engines, Systems & Services before performance of this repair. Rework source approval may be obtained by directing correspondence to:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

(1) Schedule the console programming controller as follows:

(a) Begin cure at 70°F (21°C).

(b) Ramp up to 350°F (177°C) cure temperature at a rate of 4 to 6°F (2 to 3°C) per minute.

(c) Hold at 350°F (177°C) for 90 to 120 minutes.

(d) Ramp down to 140°F (60°C) at a rate of 4 to 6°F (2 to 3°C) per minute.

(e) End cure.

(2) Using emulsion-degreasing method or equivalent, clean cowl support assembly. (Refer to 70-15-14, SPM.)

(3) Using masking tape, mask six boundary areas in preparation for abrasive cleaning. *(See Figure 901, Figure 902, and Figure 903.)*

NOTE: Patches are to be applied to the inside diameter of the cowl support assembly.

The boundary zone is identified as a 1 inch (25 millimeter) perimeter surrounding the area in which the reinforcement patch is to be applied.

(4) Using aluminum oxide grit at 40 to 50 psi (276 to 345 kN/m^2), grit blast boundary zone.

(5) Using clean dry air blast, remove all residue.

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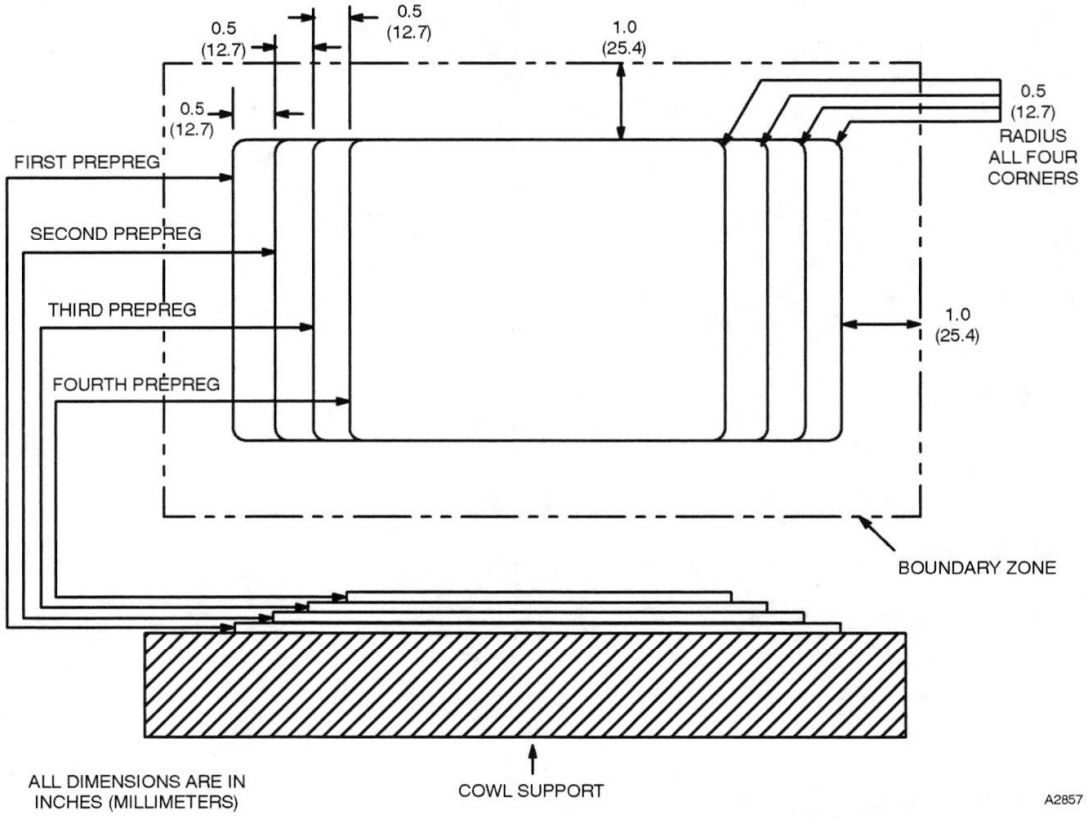
1. B. (6) Remove masking tape and using ethyl alcohol or equivalent, thoroughly clean surface.

(7) Using a brush applicator, apply a thin coat of primer and dry at room temperature for 60 minutes; then, using a hand held blow dryer or heat lamp, cure at 140 to 160°F (60 to 71°C) for one hour.



Boron Fiber Patch Lay-Up Requirements
Figure 901

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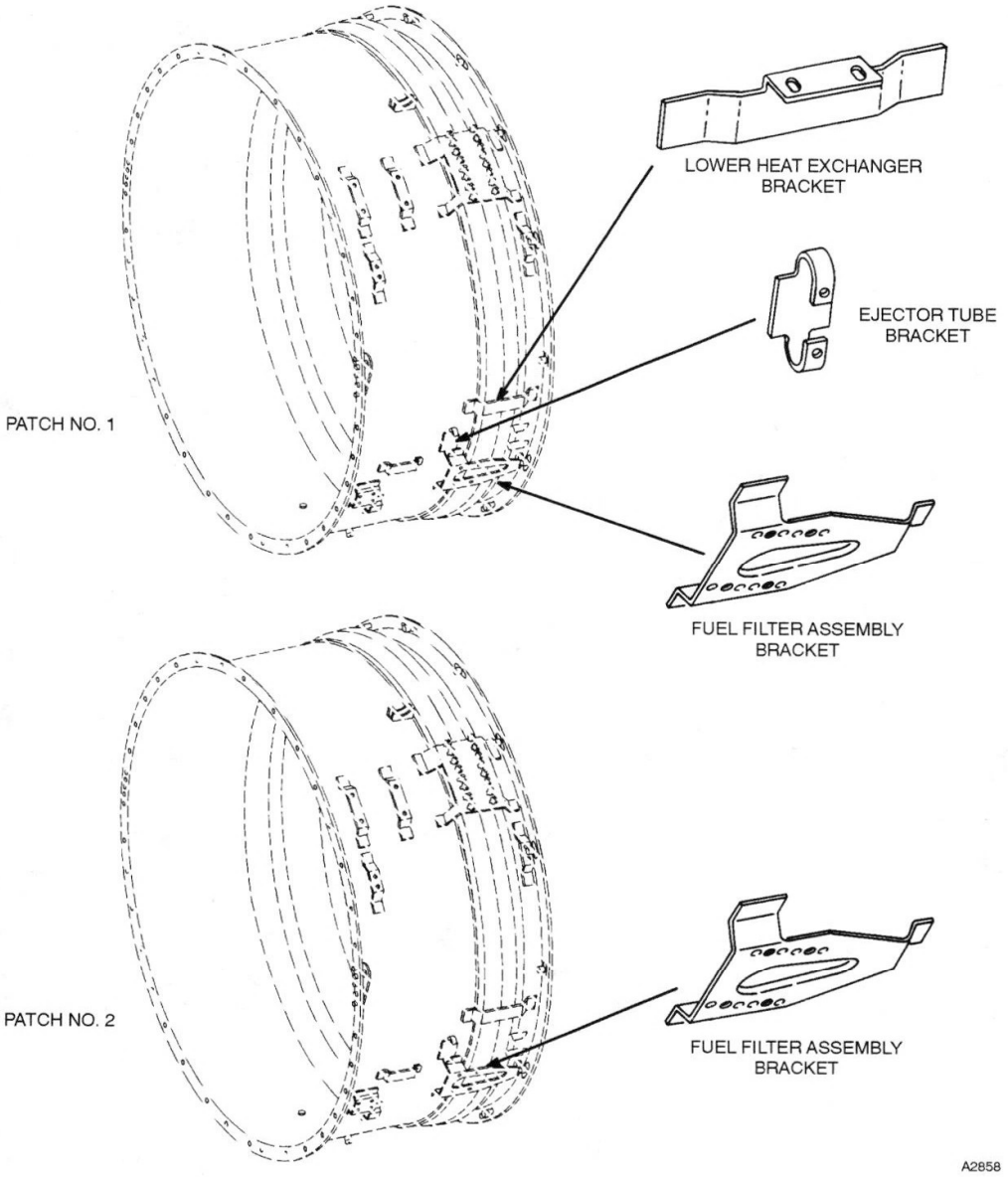

Cowl Support Assembly Bracket Locations
Figure 902 (Sheet 1 of 3)

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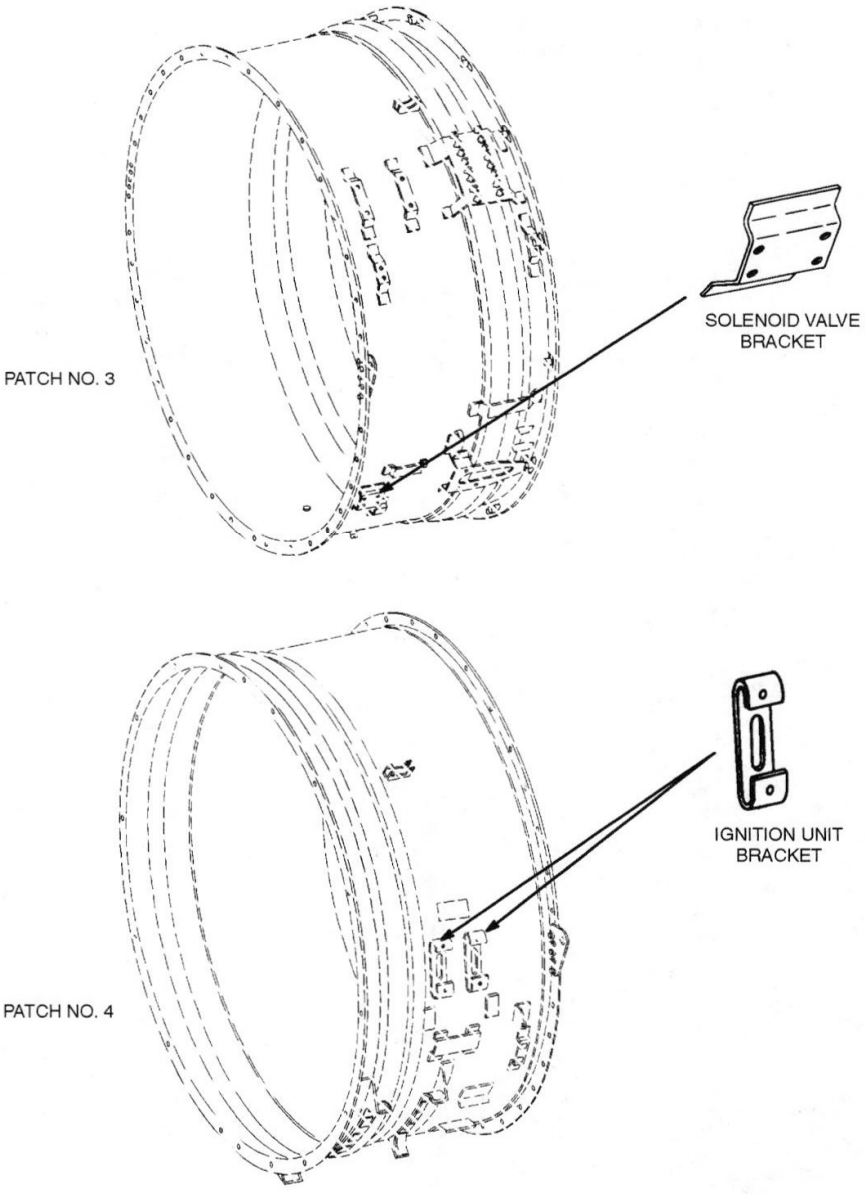

Cowl Support Assembly Bracket Locations
Figure 902 (Sheet 2)

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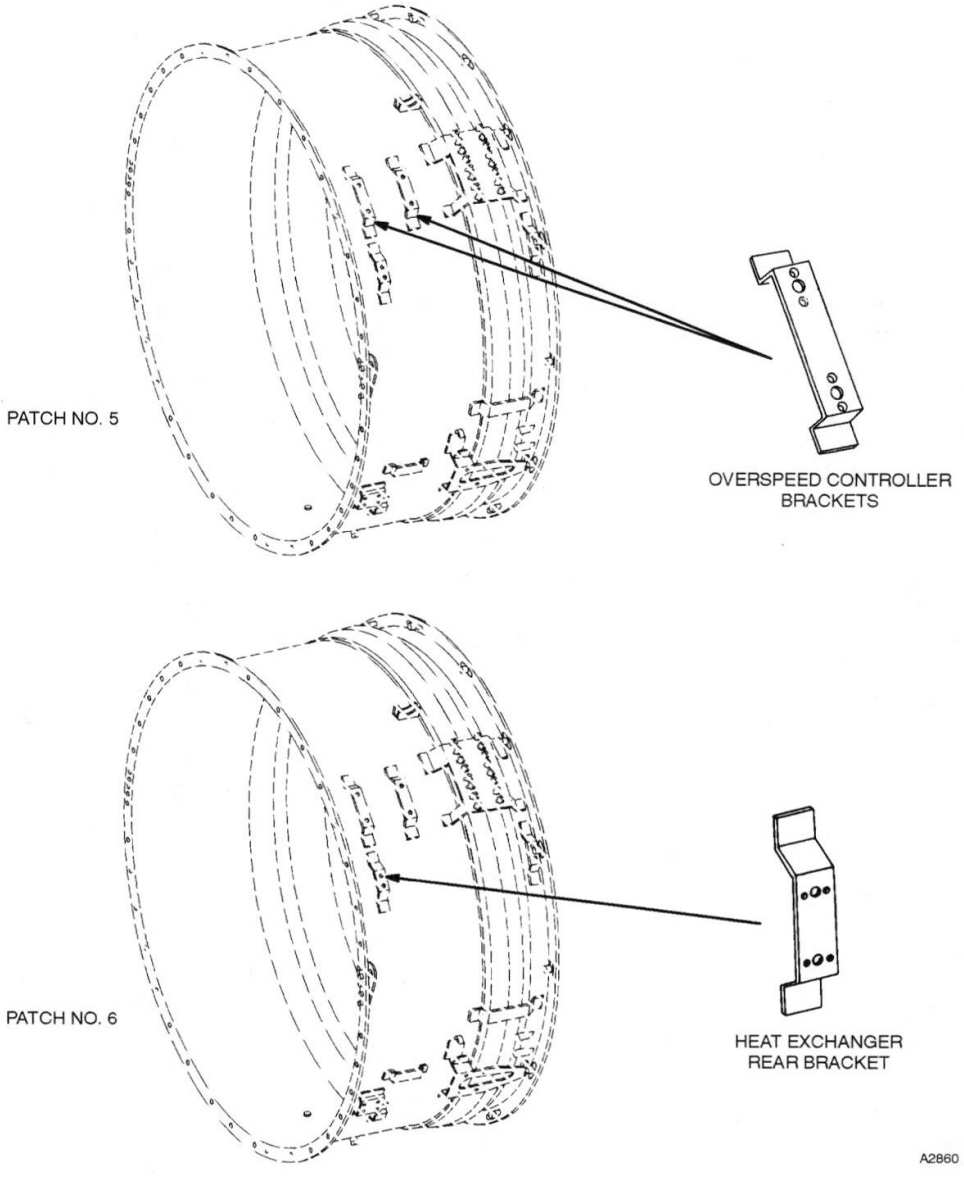

Cowl Support Assembly Bracket Locations
Figure 902 (Sheet 3)

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CAUTION: HANDLE BORON EPOXY PREPREG WITH EXTREME CAUTION. BORON EPOXY FIBERS CAN CAUSE SERIOUS INTERNAL AS WELL AS EXTERNAL INJURY. AT A MINIMUM, FACE AND HAND PROTECTION SHOULD BE USED.

1. B. (8) Cut a segment of the film adhesive and a segment of the boron epoxy prepreg into a rectangular shape as specified. *(See Figure 903.)*

NOTE: Install only one patch at a time.

The film adhesive is to extend approximately 0.062 to 0.125 inch (1.58 to 3.18 millimeter) beyond the perimeter of the first prepreg on all four sides.

(9) Place the film adhesive over the area to be strengthened and, using metal roller or teflon paddle, roll or smooth out each layer.

(10) Remove the paper backing and lay out the first boron epoxy prepreg layer on top of the film adhesive; then, using a wooden roller, smooth it out. All fibers are laid circumferentially on the cowl support assembly.

(11) Apply the next three prepreg layers and, using a metal roller or teflon paddle, smooth out each layer.

(12) Place five to ten temperature measuring thermocouples around the laminate and secure with flash-break tape.

(13) Cut a segment of porous teflon coated fiberglass to a dimension approximately 1.0 to 1.5 inch (25 to 38 millimeter) larger on all four sides than the film adhesive, over the prepreg.

(14) Place a cover of 112 fiberglass fabric on top of the teflon coated fiberglass.

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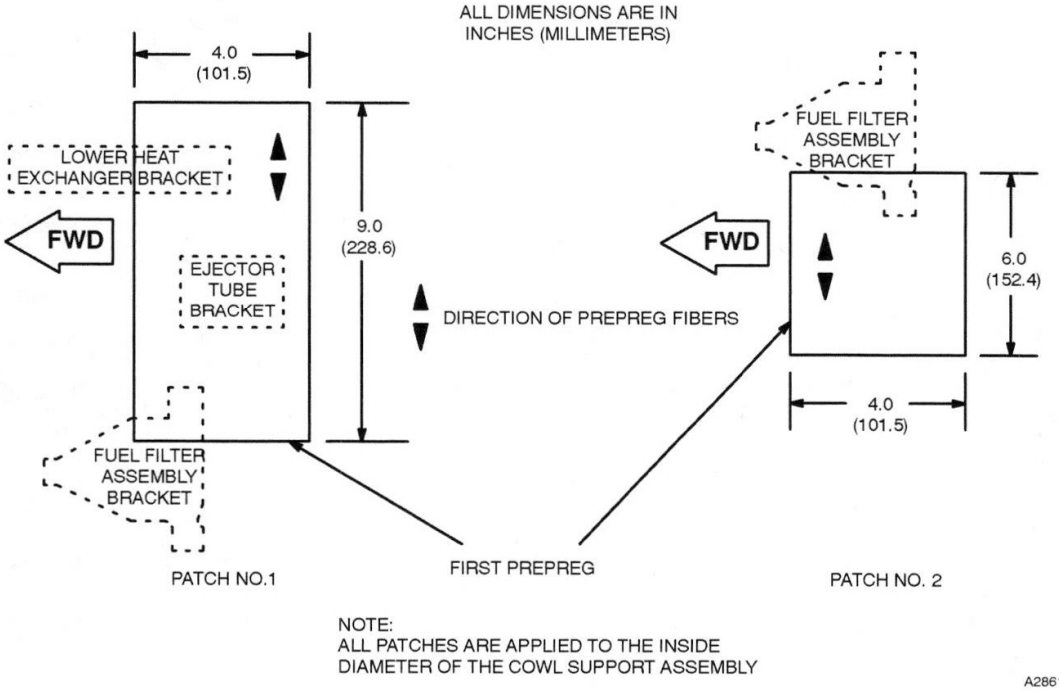

Boron Fiber Patch Dimensional Requirements
Figure 903 (Sheet 1 of 2)

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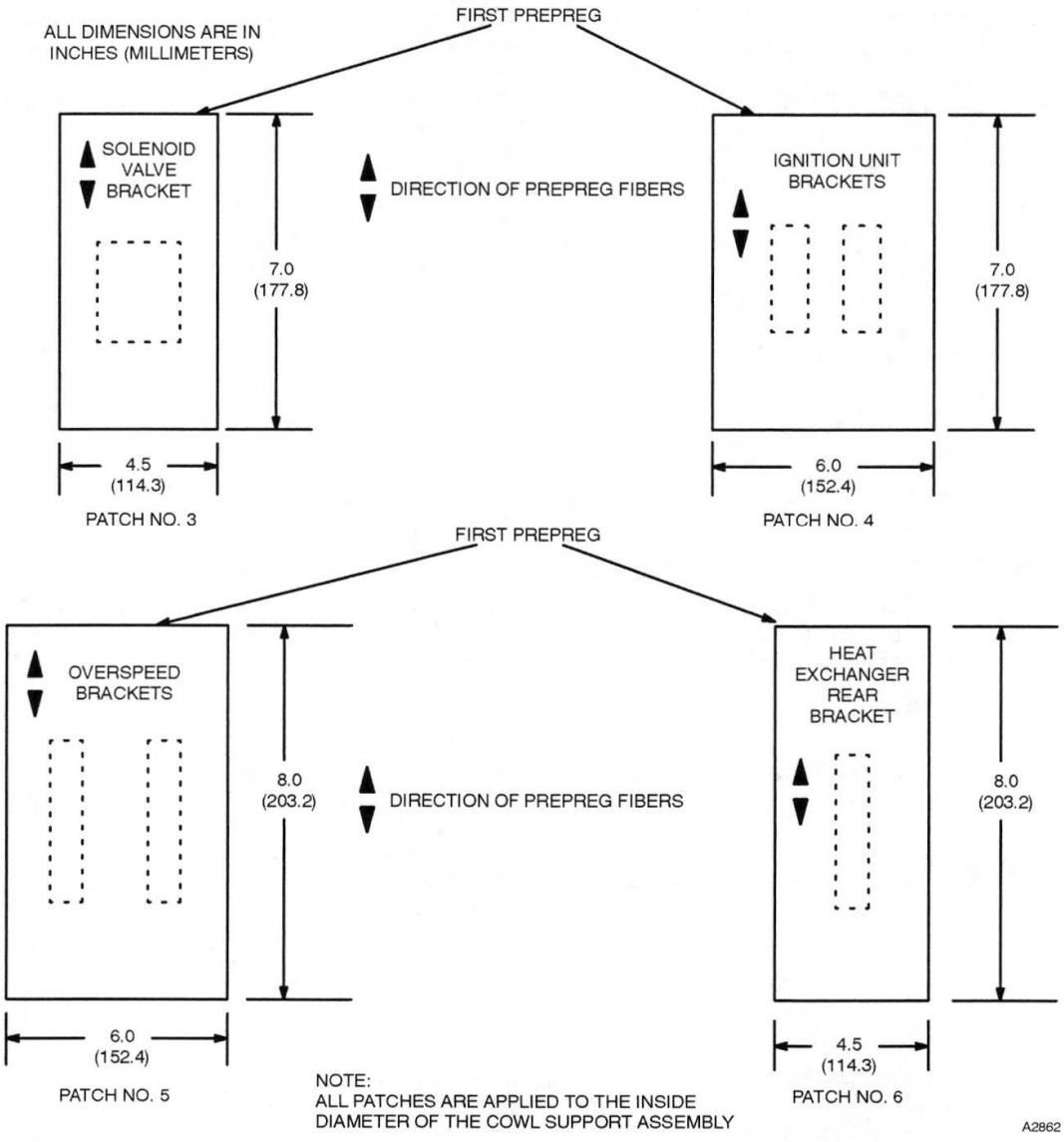

Boron Fiber Patch Dimensional Requirements
Figure 903 (Sheet 2)

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1. B. (15) Place a layer of nylon bagging film over the entire laminate (film adhesive, four prepreg layers, coated fiberglass, and 112 fiberglass) and secure to the cowl parent metal with flash-break tape on all four sides.

(16) Attach the three main thermocouples (temperature controller, chart recorder, and high limit) on the top of the laminate and secure.

(17) Place the heating blanket on top of the laminate and thermocouples; then, plug into the output power cable assembly.

(18) Place one layer of breather/bleeder cloth on top of the heating blanket.

NOTE: Extend the cloth at least 5 inches (127 millimeters) beyond the edge of the blanket on one side for placement of the vacuum sniffer assembly.

(19) Apply the sealant tape to the cowl support assembly forming a border around the area in preparation for the vacuum bag.

(20) Measure the border of the sealant tape and cut the vacuum bag film to size.

(21) On one end of the vacuum bag, cut a slit big enough to install the sniffer assembly.

(22) Install the vacuum bag on the sniffer assembly.

(23) Place the vacuum bag with the sniffer assembly away from the patch area over the breather/bleeder cloth extension; then, apply finger pressure to secure the vacuum bag onto the sealant tape to make sure there is a good vacuum seal.

(24) Attach the vacuum hose of the sniffer to the vacuum console.

(25) Apply 25 inches (635 millimeters) Hg minimum vacuum to the laminate.

(26) Set the manual high limit knob on the console to 370°F (188°C).

(27) Push the chart recorder button to the ON position.

NOTE: An additional heat source such as a heat lamp may be required next to the containment shroud to maintain cure temperature.

(28) Push the RUN button.

(29) Push the reset button to start the high limit backup system.

(30) At the end of the cure cycle, release the vacuum.

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1. B. (31) Disassemble and remove the vacuum bag, breather cloth, heat blanket, and thermocouple.

(32) Carefully peel off the nylon bagging film and the two fiberglass coverings.

(33) Using 40 grit sandpaper, carefully sand the fiber edges to remove any excessive adhesive.

(34) Perform ultrasonic inspection of boron patch for debonding as follows:

NOTE: The ultrasonic inspection system shall be standardized at the start of each shift and verified at least every four hours of equipment use.

Inspection personnel performing this procedure shall meet the requirements of MIL-STD-410 Level II or equivalent.

Before performing calibration, make sure that minimum instrument settings have been accomplished.

Make sure that the surface to be inspected is free of dirt and contaminants and that the course instrument settings have been done before doing the inspection.

(a) Fabricate a section of boron repair patch having the same thickness and bond line as that on the actual part. Standard shall contain reference areas 1.5 inches (38 millimeters) square, which simulate a lack of bond situation for calibration.

(b) Apply couplant to the reference standard.

(c) Position the search unit in the area of the reference standard identified as having a good bond.

(d) Adjust the amplitude so that the ring pattern appearing at "5" on the CRT baseline is at 100 percent screen height.

(e) Reposition the search unit over the area on the reference standard identified as having a lack of bond.

(f) If necessary, repeat Steps (c) through (e) to make sure that the proper response from the reference standard is achieved.

(g) Apply couplant to the patch under inspection and inspect the patch.

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1. B. (34) (h) Course instrument settings for KB USD-10 are as follows:

Delay 0.000
Display Width 16.4
Sound Velocity 787.3
Damping ..... 500 OHM
Reject 0
Pulse Power 1
Probe Delay 1.0

(i) Inspect patches for debonding. If the following limits are exceeded, remove patch by sanding or as described in Step (j), making sure that no base metal is removed.

1 Debond shall not exceed 1.5 inch (38 millimeter) square.

2 Total defect area shall not exceed 10 percent of total patch area.

3 Debond shall not be within 1.0 inch (25 millimeter) of fiber patch edges.

(j) Alternate procedure for removing patches.

1 Using a heat gun, locally heat area of patch until epoxy softens. Maximum allowable temperature is 1100°F (593°C).

2 Using a putty knife or equivalent, separate patch from parent material of cowl support.

3 Mask and locally grit blast the area of patch removal using 90 to 120 grit size aluminum oxide at a pressure of 40 to 50 psia (275.8 to 344.7 kPa). Parent material shall not be thinned during grit blasting.

(35) In the vicinity of the assembly part number, add the identification "Repair-11" using vibropeen method per SAE AS478, Method 2D1.

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COWL SUPPORT ASSEMBLY – REPAIR-12

1. Replacement of Oil Tank Support Padding – Repair-12

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone Cleaner	07-22
Adhesive	01-01
Aluminum Oxide	05-11
Ethyl Alcohol	07-19
Rubber (Viton) Pad	08-22
Silicon Carbide Sandpaper	05-23

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Mark original size and location of pad(s) to be repaired on oil tank support.

(2) Replace damaged or missing pads with rubber (viton) pads, cut to fit the original size determined in preceding Step (1).

NOTE: Thickness of material to be 0.09 to 0.11 inch (2.3 to 2.8 millimeter); width of material to be 0.95 to 1.01 inch (24.1 to 25.7 millimeter). *(See Figure 901.)*

(3) Using ethyl alcohol or acetone cleaner, degrease bonding surfaces.

(4) Using 50 to 80 grit aluminum oxide or silicon carbide sandpaper, thoroughly abrade bonding surfaces of steel and viton within one hour before bonding.

(5) Using ethyl alcohol or acetone cleaner, wash bonding surfaces.

(6) Dry bonding surfaces for ten minutes.

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1. B. (7) Mix adhesive (five parts by volume of Part A [green] to four parts by volume of Part B [white]).

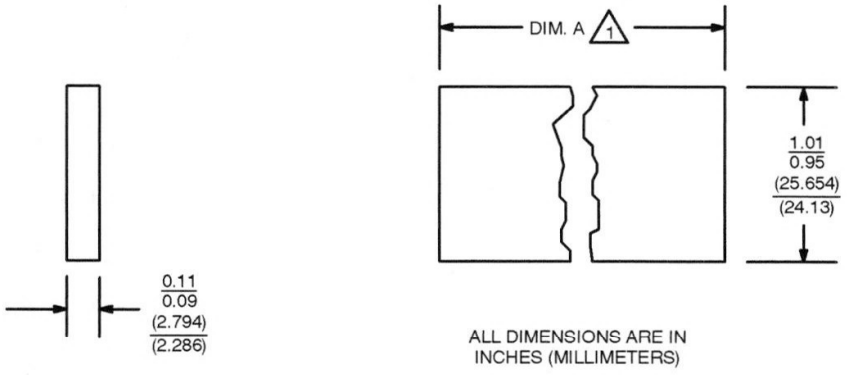
NOTE: Color of adhesive shall be uniform when mixed. Pot life is 45 minutes maximum.

(8) Apply adhesive to both bonding surfaces and join rubber pad to support.

(9) Using ethyl alcohol or acetone cleaner, remove excess adhesive.

(10) Cure adhesive for 12 hours minimum at 65 to 100°F (18.3 to 37.6°C).

NOTE: Heat, up to 250°F (121°C), may be used to cure adhesive. Use heat long enough to harden the adhesive.



1 DIM. A (± 0.03 [0.76]) SHALL BE ONE OF THE FOLLOWING AS REQUIRED:

2–163–278–01 = 0.98 (24.89)
2–163–278–02 = 2.63 (66.80)
2–163–278–03 = 3.16 (80.26)
2–163–278–04 = 4.56 (115.82)

A4557

Oil Tank Support Padding Dimensions
Figure 901

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FAN ROTOR SHROUD ASSEMBLY – CLEANING

1. Fan Rotor Shroud Assembly (*See Figure 601*) – Cleaning

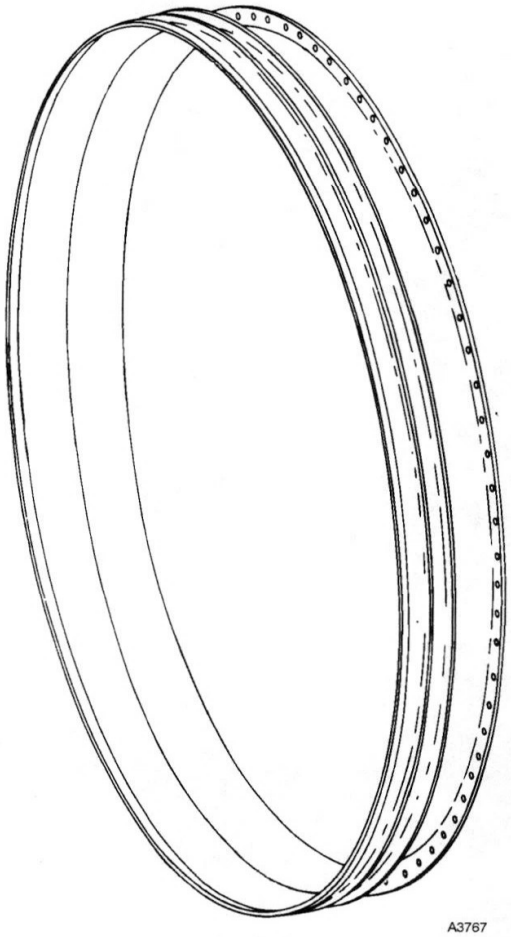
   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)



Fan Rotor Shroud Assembly
Figure 601

FAN ROTOR SHROUD ASSEMBLY – INSPECTION/CHECK

1. Inspection of Fan Rotor Shroud Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks, burrs, and scratches. Blend-repair all projections and sharp edges. (Refer to 70-25-01, SPM.)

         (b) Cracks. None allowed. If circumferential cracks exist, replace.

         (c) Flaked-out areas or rubs in fan blade tip rub material on fan rotor shroud assemblies that use plasma-sprayed abradable material. Flaked out areas shall not exceed 2 square-inches (1290 square-millimeters) in area or have a maximum dimension exceeding 3 inches (76 millimeters). Repair shroud assembly that has flaked-out areas or rubs that exceed limits. (Refer to Repair-01.)

         (d) Damaged or rubbed silicone abradable material. Any amount of rubbing is acceptable provided blade tip clearances are met at assembly and no parent metal is exposed. Repair out-of-limit rubbing or damage. (Refer to Repair-05.)

            1 Overall damaged area shall not exceed 4 square-inches (2580 square-millimeters) in area or have a maximum dimension of 3 inches (76 millimeters).

            2 Exposed parent material shall not exceed 0.25 square-inches (161.3 square-millimeters) in area or have a maximum dimension of 1 inch (25 millimeter).

            3 Total damaged area shall not exceed 25 percent of total fan circumference.

         (e) Distortion and/or bowing of cylinder wall between aft edge of abradable coating and mounting flange. Acceptable, provided:

            1 No cracks exist in defect area.

            2 No metal protrudes into flow path.

            3 Blade tip clearance is maintained.

            4 Distortion (a gradual change in contour) does not exceed 0.150 inch (3.81 millimeter) over 45 degrees of the circumference or 0.300 (7.62 millimeter) locally and no sharp edges exist. (*See A, Figure 801.*) If limits are exceeded, repair. (Refer to Repair-03.)

            5 Dents are smooth bottomed.

1. B. (1) (f) Axial scoring or gouging in shroud parent metal at the plasma-sprayed material (shroud assembly 2-043-150-05), or the silicone abradable material (shroud assembly 2-043-150-15), to aluminum parent metal interface (leading edge).

1 Scoring or gouging up to 0.075 inch (1.91 millimeter) wide by 0.025 inch (0.635 millimeter) deep by 360 degrees is acceptable provided sharp edges are blended (Refer to 70-25-01, SPM) and exposed metal is surface treated (Refer to 70-30-07, SPM). If inspection requirements of preceding Steps (c) or (d) cannot be met, repair. (Refer to Repair-01 for shroud assembly 2-043-150-05 or Repair-05 for shroud assembly 2-043-150-15.)

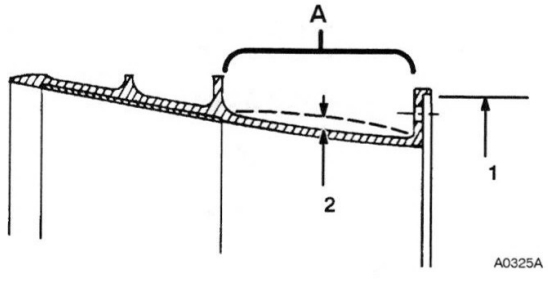
2 Scoring or gouging from 0.075 inch (1.91 millimeter) wide by 0.025 inch (0.635 millimeter) deep by 360 degrees to 0.125 inch (3.175 millimeter) wide by 0.040 inch (1.016 millimeter) deep by 360 degrees shall be repaired in accordance with 72-32-02, Repair-04.

(2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Not acceptable. Replace.

(3) Dimensionally inspect. (*Refer to Table 801.*) Repair (Refer to Repair-02) or replace if limits cannot be met.

Table 801. Fan Rotor Shroud Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		REFER TO FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID	39.850 (1012.19)	39.855 (1012.32)	Clearance at Assembly		**801** 1



2. 0.150 INCH (3.81 MILLIMETER) MAXIMUM DEFLECTION OVER 45°

Fan Rotor Shroud Assembly Dimensional Inspection Location
Figure 801

FAN ROTOR SHROUD ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-150-05	-01 thru -04	None
2-043-150-15/R16	-02 thru -05	None

FAN ROTOR SHROUD ASSEMBLY – REPAIR-01

1. Repair of Fan Rotor Shroud Assembly That is Out of Limits or Has Flaked-Out Areas or Rubs – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Alodine	06-06
Plasma-Spray Powder	06-23

B. Procedure

CAUTION: DO NOT MACHINE INTO PARENT METAL. REMOVE FINAL PLASMA COAT LAYER BY GRIT BLASTING.

(1) Machine to remove all old coating on shroud.

NOTE: Minimum allowable wall thickness shall be 0.070 inch (1.78 millimeter) locally, provided average thickness measured at four equally spaced locations is 0.085 inch (2.16 millimeter).

(2) Clean using vapor degreasing method. (Refer to 70-15-01, SPM.)

(3) Mask and grit-blast area. (Refer to 70-15-05, SPM.)

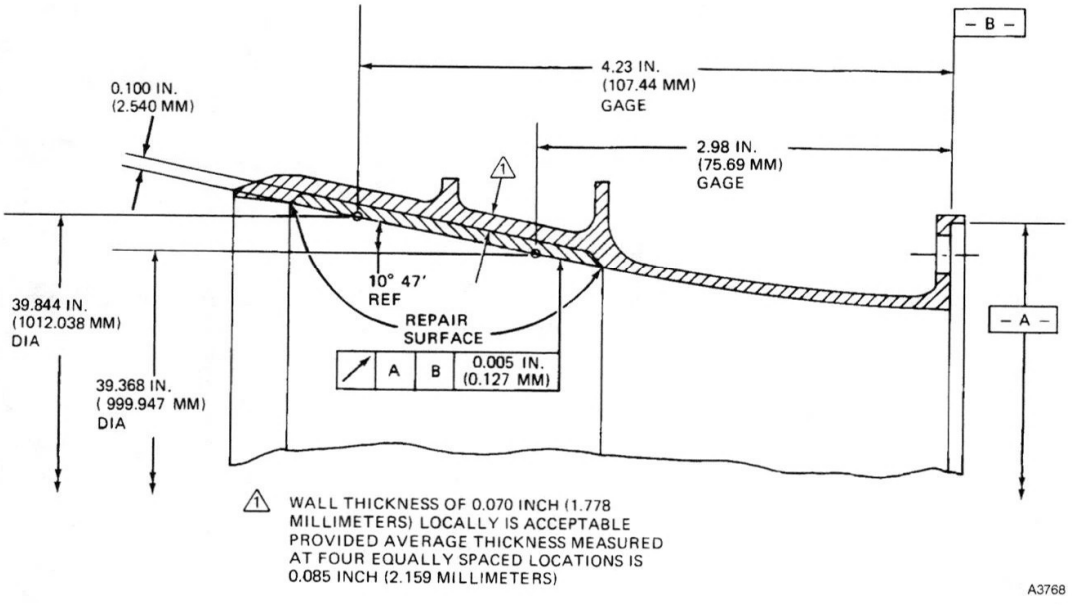
NOTE: 100-percent cleanup of all old coating on shroud must be obtained.

(4) Remove all silicon carbide particles.

(5) Using plasma-spray powder, immediately plasma-spray area. (Refer to 70-50-01, SPM.)

(6) Machine to specified dimensions. (*See Figure 901.*)

(7) Using brush or swab, coat repaired surface with alodine.



Repair of Fan Rotor Shroud Assembly
Figure 901

FAN ROTOR SHROUD ASSEMBLY – REPAIR-02

1. Repair of Discrepant 39.850 to 39.855 Inch (1012.19 to 1012.32 Millimeter) Diameter – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Oxide Abrasive (No. 30 to 40 or 40 to 50 Grit)	05-11
Dry Cleaning Solvent	07-48, -48A, -48B, -49
Plasma-Spray Powder	06-19

B. Procedure

(1) Machine, if necessary, to obtain up to 0.004 inch (0.10 millimeter) maximum buildup thickness.

WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

(2) Clean repair area using dry cleaning solvent.

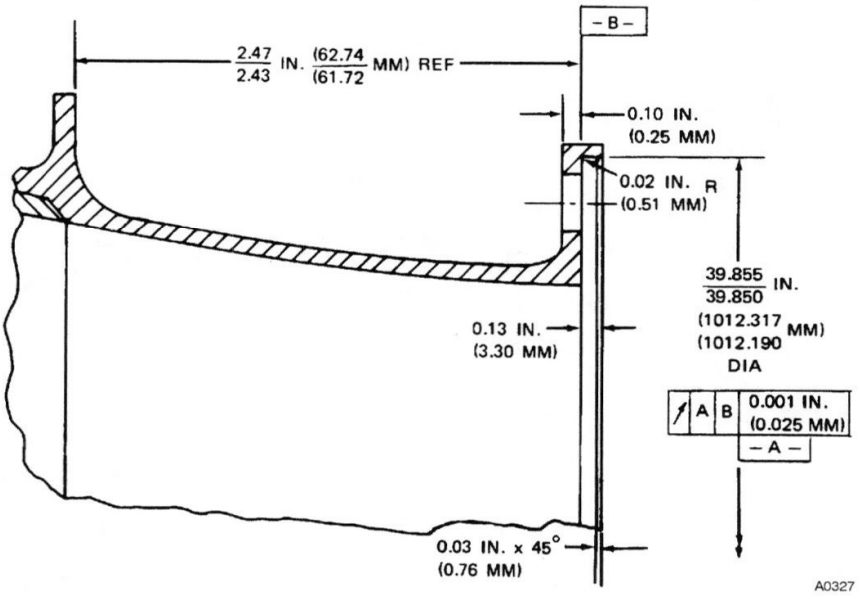
(3) Mask areas not to be plasma-sprayed.

(4) Using aluminum oxide powder at pressure of 60 psi (414 kN/m^2), grit-blast repair area.

(5) Remove all silicon carbide particles.

(6) Using plasma-spray powder, plasma-spray area. (Refer to 70-50-01, SPM.)

(7) Machine to specified dimensions. (*See Figure 901.*)



Repair of Discrepant 39.850 to 39.855 Inch (1012.19 to 1012.32 Millimeter) Diameter
Figure 901

FAN ROTOR SHROUD ASSEMBLY – REPAIR-03

1. Cold Straighten Buckling in Area Aft of Rub Coating – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

NOTE: A part may only be repaired by this method one time. Parts that have been previously repaired by this method are marked "REPAIR" adjacent to the part number and are not eligible for repair.

(1) Using suitable rollers, an expansion press, or equivalent, cold work the bulged area to within 0.020 inch (0.51 millimeter) of the intended contour. *(See Figure 901.)*

NOTE: Hammering or other methods that could introduce excessive cold work are not acceptable straightening techniques.

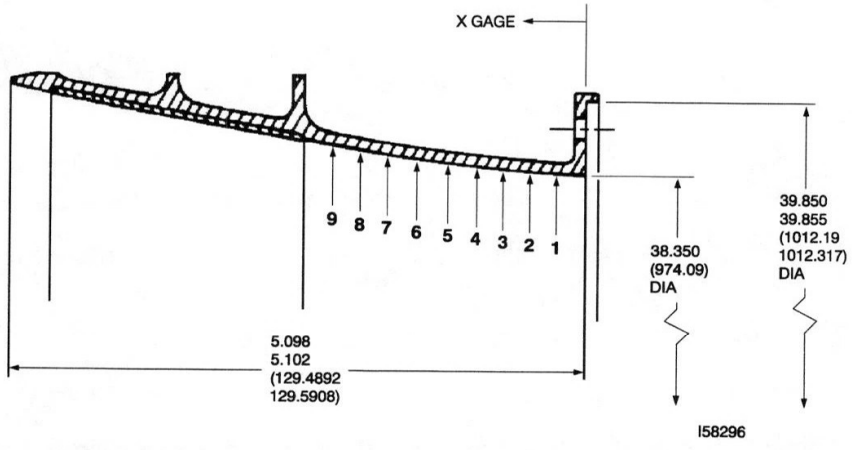
(2) Dimensionally inspect fan rotor shroud. *(See Figure 901.)*

(3) Fluorescent-penetrant inspect per 70-20-05, SPM. No indication permitted.

(4) Visually inspect the rub coating in accordance with Inspection/Check requirements. If damaged, repair per applicable repair procedure.

(5) Vibropeen the word "REPAIR" in the vicinity of the part number.

DIMENSIONS ARE IN INCHES (MILLIMETERS)



Station No.	X-Gage, Inches (Millimeters)	Radius, Inches (Millimeters)
1	0.250 (6.35)	19.298 (490.17)
2	0.500 (12.70)	19.324 (490.83)
3	0.750 (19.05)	19.353 (491.57)
4	1.000 (25.40)	19.384 (492.35)
5	1.250 (31.75)	19.418 (493.22)
6	1.500 (38.10)	19.454 (494.13)
7	1.750 (44.45)	19.492 (495.10)
8	2.000 (50.80)	19.531 (496.10)
9	2.250 (57.15)	19.568 (497.03)

Dimensional Inspection of Fan Shroud
Figure 901

FAN ROTOR SHROUD ASSEMBLY – REPAIR-04

1. Repair of Scoring or Gouging at the Plasma-Sprayed or Silicone Abradable Material to Aluminum Interface (Leading Edge) – Repair-04

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Blend all sharp edges. (Refer to 70-25-01, SPM.)

      (2) Using epoxy compound, fill all scores and gouges. (Refer to 70-30-22, SPM.)

      (3) Using suitable means, blend or machine epoxy compound flush to parent metal.

      (4) Visually inspect reworked area for cracks or voids in epoxy compound. Cracks or voids are not allowed.

      (5) Requalify the 0.120 to 0.130 inch (3.05 to 3.30 millimeter) diameter holes, if necessary. *(See Figure 901.)*

      (6) Visually inspect the plasma-spray or silicone abradable material as specified in 72-32-02, Inspection/Check. If inspection requirements cannot be met, replace the plasma-spray (Refer to Repair-01 for shroud assembly 2-043-150-05) or the silicone abradable material (Refer to Repair-05 for shroud assembly 2-043-150-15).

      (7) Visually and dimensionally inspect the shroud assembly. (Refer to Inspection/Check.) All inspection criteria must be met.

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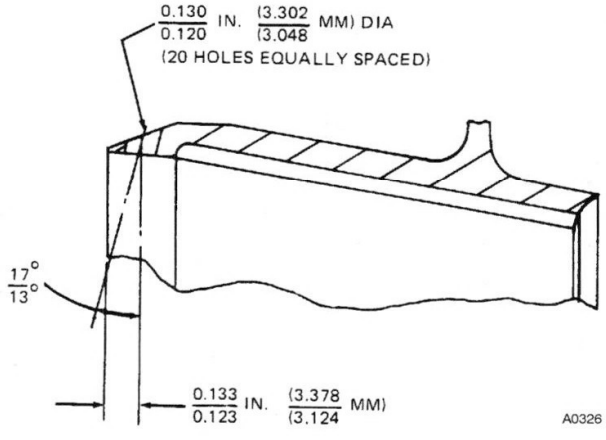

Inspection of Shroud Assembly Holes After Application of Epoxy Compound
Figure 901

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FAN ROTOR SHROUD ASSEMBLY – REPAIR-05

1. Repair Damaged Silicone Abradable Material – Repair-05

NOTE: Refer to Repair -00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Ethyl Alcohol or Acetone	07-19 or 07-22
Glass Microballoons	01-33
Lint-Free Cloth	10-08
Red Primer	01-21 or -34
Silicon Carbide Sandpaper 180 Grit	05-23
Silicone Rubber Filler	01-24
Silicon Rubber Filler (V-695)	

B. Procedure

NOTE: The following repair process is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

Complete replacement of the damaged silicone abradable material is available at:

Quantum
Barnes Industrial Park
Wallingford, CT 06492

If damaged area is accessible, repair may be performed with shroud installed.

If desired, silicone abradable material may be replaced by plasma-spray coating material. (Refer to 72-32-02, Repair-01.)

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WARNING: USE CLEANING SOLUTION IN A WELL VENTILATED AREA. AVOID PROLONGED INHALATION OF FUMES.

1. B. (1) Clean damaged abradable seal surface and exposed parent metal with acetone or equivalent and lint-free cloth.

(2) Using scalpel or razor blade, remove major defects down to parent metal, chamfering edges to approximately a 45 degree angle.

(3) Using a small wire brush, roughen surrounding silicone material and remove remaining silicone material from parent metal in repair area.

(4) Using clean dry shop air, remove any loose silicone particles.

(5) Using cheese cloth saturated with acetone or equivalent, degrease repair area. Continue wiping until all grease is removed.

(6) Using a fiber brush and V06 Primer (when using Loctite V695) or SS4155 Primer (when using RTV630), apply a thin uniform coating of primer to parent metal and adjacent material.

NOTE: If individual repair area exceeds 4.0 square-inches (2581 square-millimeters), 3.0 inches (76 millimeters) in length, or 25 percent of the total fan circumference, V695 silicone rubber filler must be used for repair.

The primer readily absorbs moisture and becomes ineffective. To minimize moisture absorption, new containers of primer larger than 12 ounces shall be divided into small 1-ounce resealable containers. Each container should be used for only one repair and remaining primer disposed of.

(7) Dry for 1 hour at 70°F (21°C) minimum ambient temperature. If necessary, heat lamp may be used to maintain temperature.

(8) Prepare one of the following two abradable compounds:

NOTE: If individual repair area exceeds 4.0 square-inches (2581 square-millimeters), 3.0 inches (76 millimeters) in length, or 25 percent of the total fan circumference, V695 silicone rubber filler must be used for repair.

(a) Mix V695A (100 parts by weight) and Catalyst V695B (10 parts by weight) and stir mixture manually or mechanically until homogenous material is obtained.

NOTE: This mixture must be used within two hours after mixing.

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1. B. (8) (b) Mix Glass microballoons filler (11 parts by weight), RTV630 Part A (100 parts by weight), and RTV630 Part B (10 parts by weight), and stir mixture manually or mechanically until homogenous material is obtained.

NOTE: This mixture must be used within 2 hours after mixing.

(9) Apply silicone rubber filler as follows:

(a) Using hot air gun, preheat repair area holding nozzle 2 inches (51 millimeters) from the surface.

(b) Using spatula and putty knife, apply silicone rubber filler evenly to 1/4 of cavity depth.

NOTE: Limit area of silicone rubber filler to 4.0 square-inches (2581 square-millimeters) or less to allow proper curing. Repair larger areas by starting at one side and working progressively across repair area to make sure that the silicone rubber filler is properly cured.

Application and curing of the silicone rubber filler, especially on vertical and overhead surfaces, takes practice. Proper technique should be developed by performing several trials to familiarize the operator with the material before attempting to repair the actual shroud.

(c) Using hot air gun held approximately 2 inches (51 millimeters) from the surface, uniformly heat repair area to cure silicone rubber filler and prevent running.

(d) Using a small diameter wood or plastic probe or the stick end of a cotton swab, test for cure by gently prodding silicone repair. Curing should take from 5 to 10 minutes.

(e) Repeat Steps (b) thru (d) until cavity is fully repaired.

(f) Using heat gun, perform additional post cure for 10 minutes.

(10) Using abrasive cloth and scalpel, rework repaired areas to the same profile of adjacent areas.

NOTE: As an alternate, grind silicon rubber abradable to dimensions shown in *Figure 901.*

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1. B. (11) Pneumatically test bond between silicone rubber filler and fan shroud parent metal of repair areas greater than 1.0 square-inch (645 square-millimeter) as follows:

(a) Get a test needle that:

1 Is long enough to penetrate silicone rubber filler repair to parent metal.

2 Has an outer diameter of 0.042 inch (1.02 millimeter) and an inner diameter of 0.027 inch (0.09 millimeter) minimum.

3 Is capable of withstanding 410.0 psi (2827 kN/m^2).

4 Has a 45° chamfer at tip.

(b) Index fan shroud as required to permit insertion of test needle into silicone rubber filler at 1.0 inch (25 millimeter) intervals. Do not test within 1/2 inch (12.7 millimeter) of repaired area edges.

(c) Using a pneumatic pressure source, supply test needle with clean, dry filtered air or inert gas at 390 to 410 psi (2689 to 2827 kN/m^2).

(d) Position test needle at 45° angle relative to the silicone rubber filler surface and insert test needle until it bottoms out on the parent metal. *(See Figure 902.)*

(e) Remove test needle from silicone rubber filler repair to clear test needle tip of silicone plug.

(f) Reinsert test needle into hole until it bottoms out on parent metal and hold in position for 3 to 5 seconds.

(g) Remove test needle and advance assembly by prescribed index amount (Refer to Step (b)) and repeat Steps (d) thru (f) until all indexed stops have been pressure tested.

(h) Check for blistering of the silicone rubber filler. If blistering occurs, circle area with an approved marking material to indicate any area requiring rework. No blisters are allowed. Repair.

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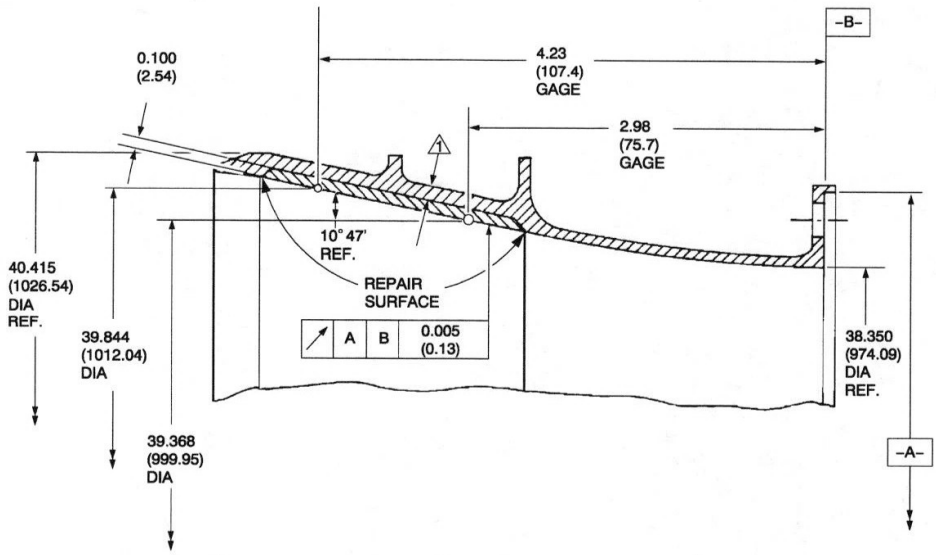

1 WALL THICKNESS OF 0.070 (1.778) LOCALLY IS ACCEPTABLE PROVIDED AVERAGE THICKNESS MEASURED AT FOUR EQUALLY SPACED LOCATIONS IS 0.085 (2.159)

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

I58453

Repair of Fan Rotor Shroud Assembly
Figure 901

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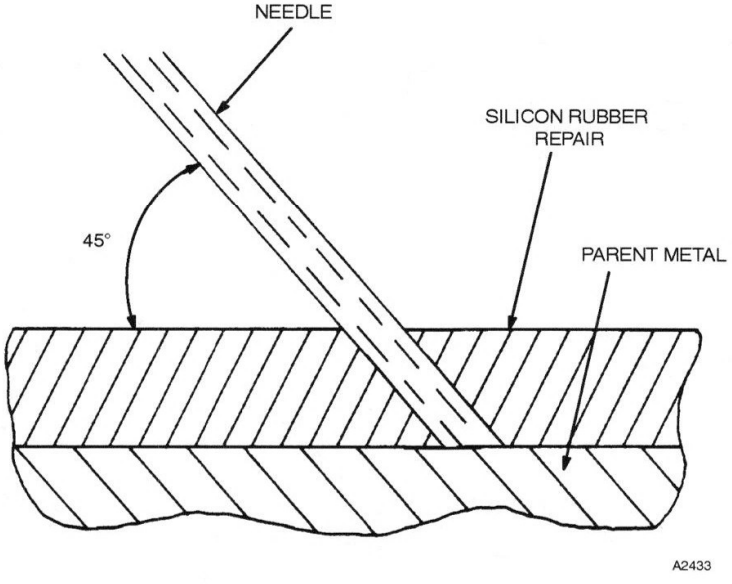

High Pressure Bond Testing of Silicone Abradable Material Repair
Figure 902

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FAN EXIT VANE ASSEMBLY – REPAIR-05

1. Repair Cracks in Inner Shroud Mounting Flange – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy	08-04
Welding Wire	03-19

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Blend affected mounting flange area(s) as required to form a smooth contour.

(2) Fabricate patch(es) from aluminum alloy sheet as required to fit flush with discrepant area(s).

NOTE: Thickness of inner shroud mounting flange may vary depending on inner shroud configuration. Select patch material thickness to correspond with flange thickness of mounting flange being repaired.

(3) Using welding wire and fusion welding method, weld patch(es) in place on inner shroud mounting flange. (Refer to 70-45-01, SPM.)

CAUTION: DO NOT UNDERCUT MOUNTING FLANGE. DAMAGE TO FLANGE WILL RESULT.

(4) Blend welded area flush with unaffected surrounding parent metal.

(5) Heat-treat inner shroud mounting flange in an oven at 350°F (177°C) for 5 hours.

(6) Fluorescent-penetrant inspect repaired area to class IV acceptance criteria. (Refer to 70-20-05 and 70-45-01, SPM.)

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1. B. (7) If part number of repaired inner shroud is 2-043-430-01, proceed as follows:

NOTE: Following Steps (a) and (b) do not apply to inner shroud 2-043-430-05.

(a) After rework of mounting flange has been accomplished, it will be necessary to assemble inner flange to main frame assembly with doubler ring 2-043-261-01 (Refer to 72-01-00, Assembly, 74, *Figure 1001)*, mounted on forward face of mounting flange. If doubler ring is not available, fabricate doubler ring as follows:

NOTE: If necessary, doubler ring may be obtained.

1 Fabricate doubler ring from aluminum alloy. *(See Figure 901.)*

2 Anodize doubler ring. (Refer to 70-30-10, SPM.)

3 Vibroetch BOTTOM where shown in *Figure 901*; letters shall be 0.12 inch (3.1 millimeter) high and 0.003 to 0.010 inch (0.08 to 0.25 millimeter) deep.

(b) Retain doubler ring with fan exit vane assembly for final assembly. (Refer to 72-01-00, Assembly.)

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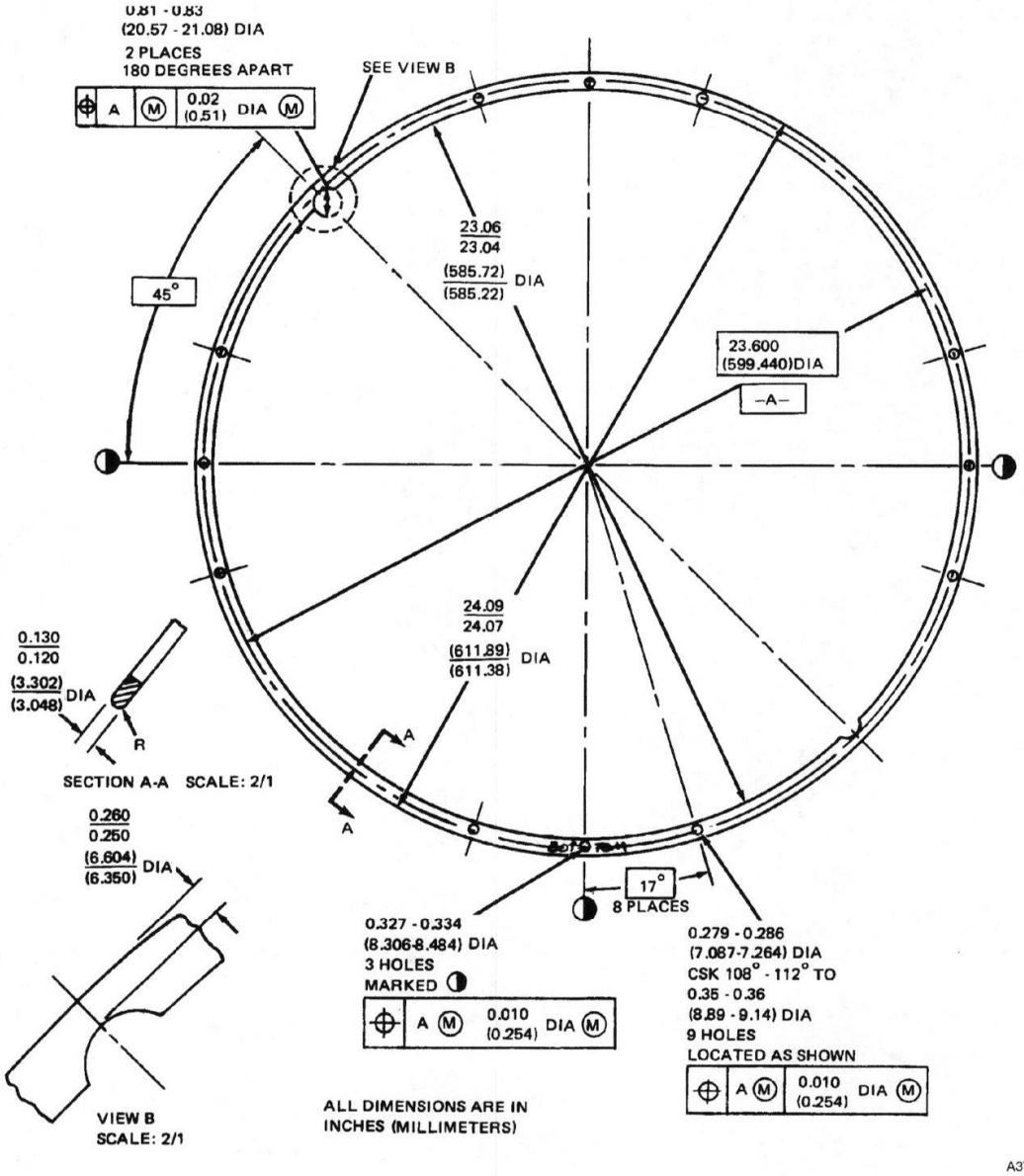

A3771

Inner Shroud Doubler Ring Fabrication
Figure 901

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FAN EXIT VANE ASSEMBLY – DISASSEMBLY

1. Fan Exit Vane Assembly – Disassembly

   A. Equipment and Materials

   Special Tools:

Part No.	Nomenclature
LTCT14769-01	Installation and Removal Tool

   B. Disassembly

   (1) Remove lockwire from nuts (8, *Figure 501*). Remove nuts, washers (9), and brackets (10).

   (2) Remove lockwire and back off screw (1) to shrink inner band (2) and outer band (3) to their smallest diameter. Remove bands (2 and 3) as a unit.

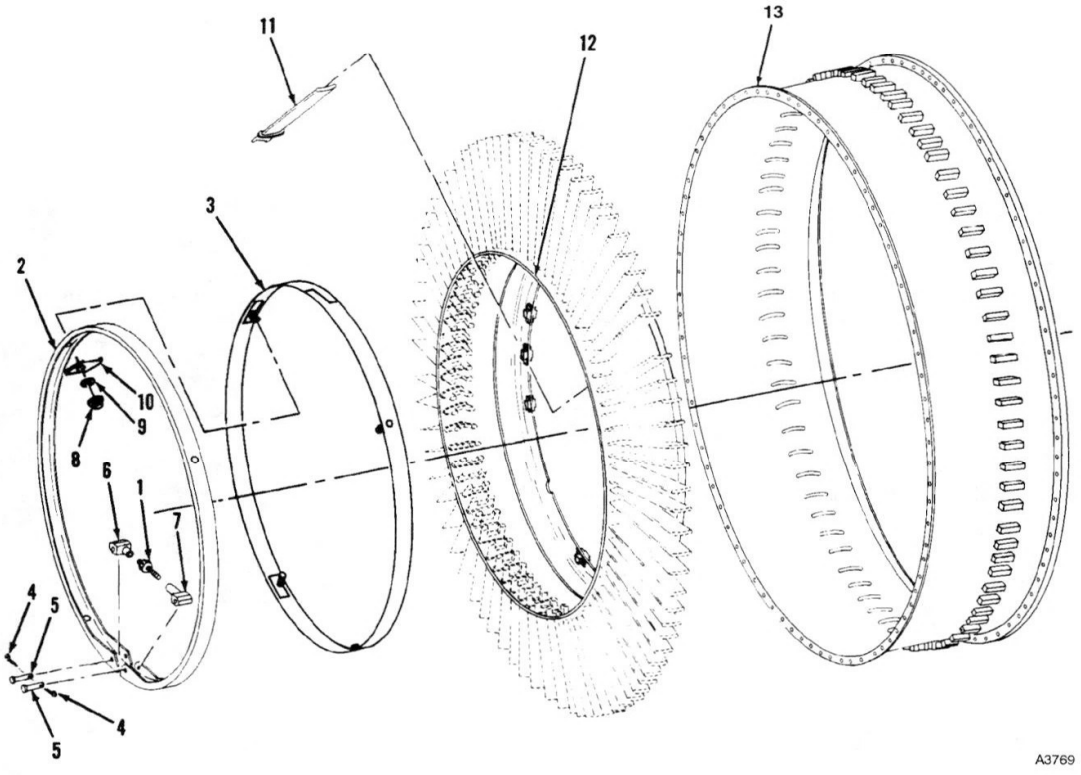
   NOTE: If additional clearance is required to remove bands (2 and 3), remove cotter pin (4) and pin (5) from link (7). Collapse and remove bands. Remove band (3) from band (2).

   (3) Remove cotter pins (4).

   (4) Remove two pins (5) and links (6 and 7). Remove screw (1).

   (5) Using removal tool LTCT14769-01, slide vane (11) out through inner shroud (12).

   (6) Remove inner shroud (12) from outer shroud (13).



1. SCREW
2. INNER BAND
3. OUTER BAND
4. COTTER PIN
5. PIN
6. LINK
7. LINK
8. NUT
9. WASHER
10. BRACKET
11. VANE
12. INNER SHROUD
13. OUTER SHROUD

Fan Exit Vane Assembly
Figure 501

FAN EXIT VANE ASSEMBLY – CLEANING

1. Fan Exit Vane Assembly (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

FAN EXIT VANE ASSEMBLY – INSPECTION/CHECK

1. Fan Exit Vane Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Nicks, burrs, scratches, and dents. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (b) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (c) Bent or distorted vanes. Repair bent or distorted vanes less than 0.500 inch (12.70 millimeter) by reforming vane between two wooden blocks formed to vane contour. If limit is exceeded, replace vane assembly.

         (d) Cracks in inner shroud that start from bolt holes on inner mounting flange. Repair. (Refer to Repair-03.)

         (e) Damage to rubber caps in outer shroud (i.e., unusual wear, cracks, or missing material that may allow movement of the vane). Not acceptable. Replace. (Refer to Repair-01.)

         (f) Fretting wear in inner shroud forward flange. Blend-repair worn areas. (Refer to 70-25-01, SPM.) A minimum of 0.010 inch (0.25 millimeter) parent metal thickness must be maintained after blending. If parent metal thickness cannot be maintained, replace.

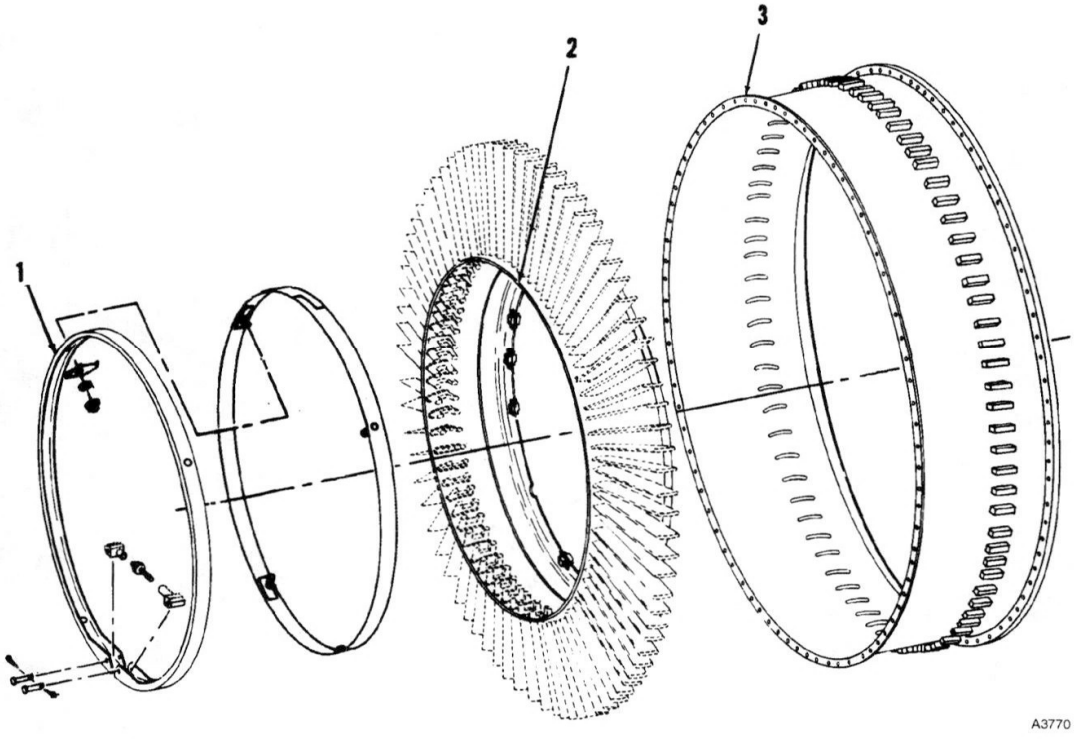
      (2) Fluorescent-penetrant inspect the following:

         (a) Band (1, *Figure 801*) for cracks. (Refer to 70-20-05, SPM.) Not acceptable. Replace.

         (b) Inner and outer shrouds (2 and 3) for cracks. (Refer to 70-20-05, SPM.) Repair. (Refer to Repair-02.)

      (3) Inspect mounting bosses on inner shroud (2) for cracks, loose or missing rivets, and broken spot-welds. Weld-repair cracks or replace bosses. (Refer to Repair-04.)

      (4) Inspect mounting flange of inner shroud (2) for cracks or cracks that have resulted in material fallout. Repair cracks or material fallout (Refer to Repair-05) or replace flange (Refer to Repair-06).



1. BAND
2. INNER SHROUD
3. OUTER SHROUD

Band and Fan Exit Vane Assembly Inner and Outer Shrouds
Figure 801

FAN EXIT VANE ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-043-390-02/-04	-01 thru -06	None

FAN EXIT VANE ASSEMBLY – REPAIR-01

1. Replacement of Damaged Rubber Caps on Outer Shroud – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Weld Wire	03-19

B. Procedure

(1) Remove damaged rubber caps by machining clips.

(2) Polish outer shroud area to be welded.

(3) Position rubber caps and weld new support retainers, Part No. 2-043-173-03, to outer shroud by one of the following methods: (See *Figure 901.)*

(a) (Option A) Resistance spot weld, Class III, vane support retainer to the outer shroud in 6 places in relation to the three center holes *(See Repair Option A, Figure 901).* (Refer to 70-45-01, SPM.)

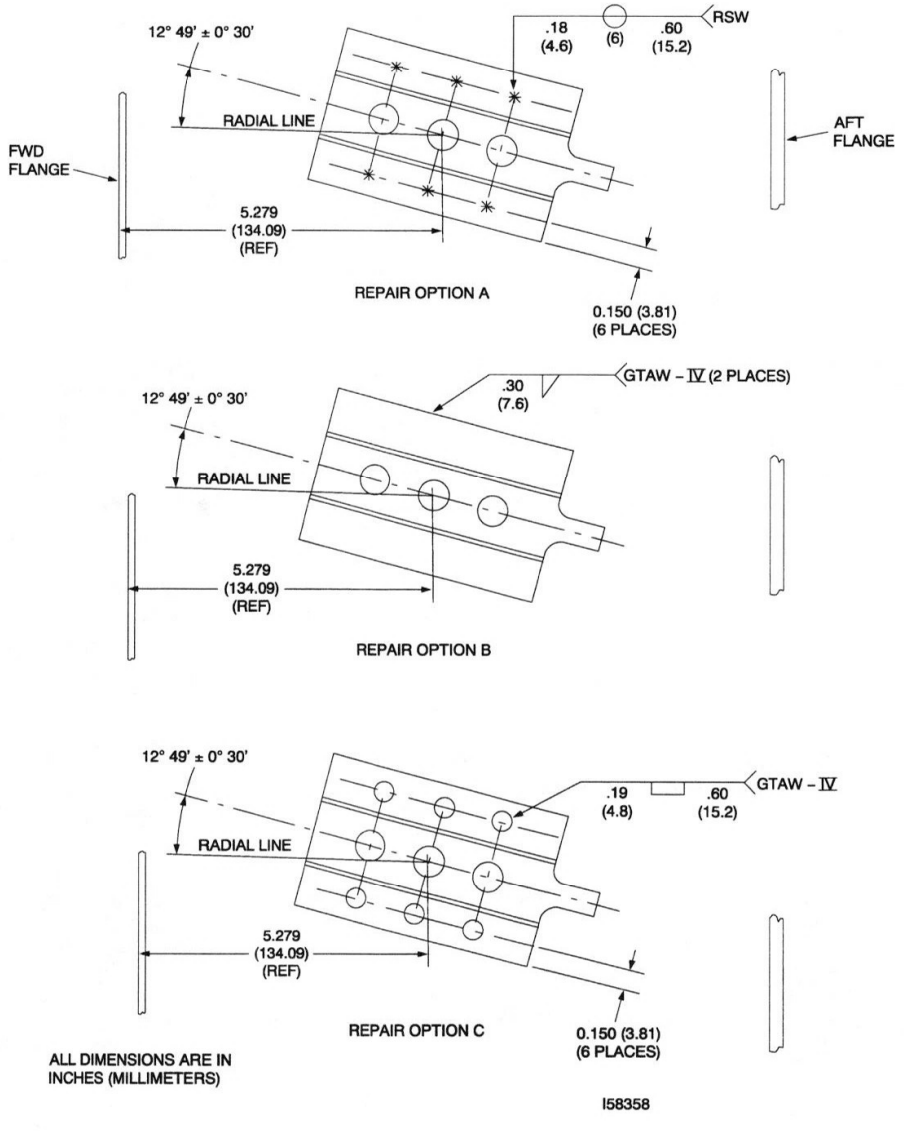
(b) (Option B) Fusion weld by GTAW, Class IV, using weld wire AMS4190, vane support retainer to the outer shroud by depositing a 0.030 inch (0.76 millimeter) fillet weld along both sides of the vane support retainer *(See Repair Option B, Figure 901).* (Refer to 70-45-01, SPM.)

(c) (Option C) Drill 6 holes in relation to the three center holes in vane support retainer, and plug weld by GTAW, Class IV, using weld wire AMS4190, vane support retainer to the outer shroud *(See Repair Option C, Figure 901).* (Refer to 70-45-01, SPM.)

(4) Visually and fluorescent-penetrant inspect fusion welds to Class IV fusion weld criteria. (Refer to 70-20-02, 70-20-05, and 70-45-01, SPM.)

(5) Clean per 70-15-03, SPM.

(6) Touch up machined surfaces. (Refer to 70-30-07, SPM.)



Replacement of Vane Support Retainer
Figure 901

FAN EXIT VANE ASSEMBLY – REPAIR-02

1. Repair of Cracks in Inner and Outer Shroud – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-19

B. Procedure

(1) Preheat shroud to 300°F (149°C).

(2) Using welding wire and fusion welding method, weld-repair cracks in inner and outer shrouds. (Refer to 70-45-01, SPM.)

(3) Machine weld to original contour.

(4) Visually and fluorescent-penetrant inspect repaired area to Class IV criteria. (Refer to 70-20-05 and 70-45-01, SPM.)

(5) Clean per 70-15-03, SPM.

(6) Touch up machined surfaces. (Refer to 70-30-07, SPM.)

FAN EXIT VANE ASSEMBLY – REPAIR-03

1. Repair Cracks in Fan Exit Vane Assembly Inner Shroud Mounting Flange – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy	08-04

B. Procedure

(1) Dye-penetrant inspect cracks to determine crack progression. (Refer to 70-20-04, SPM.)

(2) Using suitable drill, stop drill ends of crack(s).

(3) If part number of repaired inner shroud is 2-043-430-01, proceed as follows:

NOTE: Following Steps (a) and (b) do not apply to inner shroud 2-043-430-05.

(a) After rework of mounting flange has been accomplished, it will be necessary to assemble inner flange to main frame assembly with doubler ring 2-043-261-01 mounted on forward face of mounting flange. (Refer to 72-01-00, Assembly.) If doubler ring 2-043-261-01 is not available, fabricate doubler ring as follows:

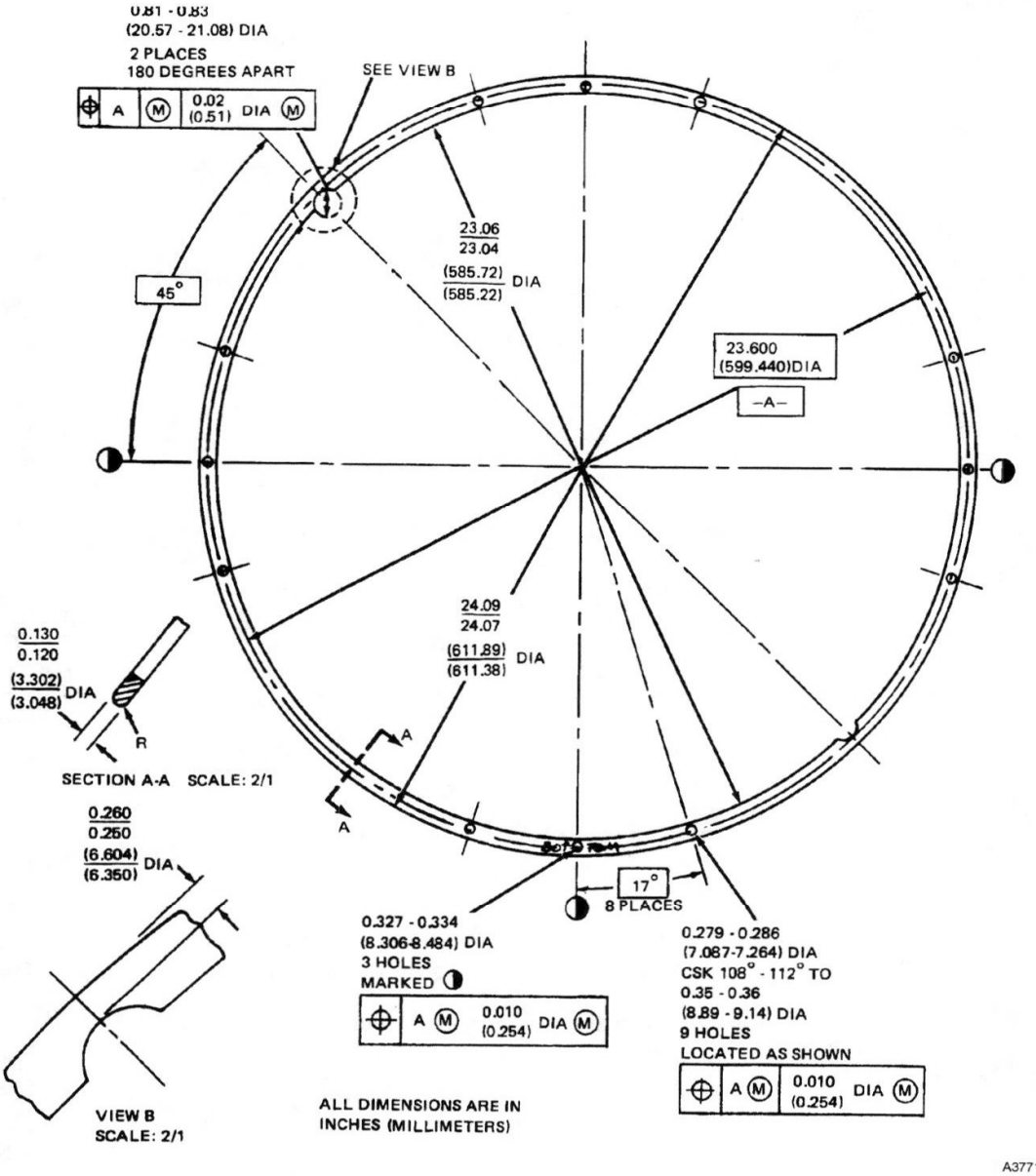
NOTE: If necessary, doubler ring 2-043-261-01 may be obtained.

1 Fabricate doubler ring from aluminum alloy. (*See Figure 901.*)

2 Anodize flange doubler ring. (Refer to 70-30-10, SPM.)

3 Vibroetch BOTTOM where shown in *Figure 901*; letters shall be 0.12 inch (3.1 millimeter) high and 0.003 to 0.010 inch (0.08 to 0.25 millimeter) deep.

(b) Retain doubler ring with fan exit vane assembly for final assembly. (Refer to 72-01-00, Assembly.)



Inner Shroud Doubler Ring Fabrication
Figure 901

FAN EXIT VANE ASSEMBLY – REPAIR-04

1. Repair Cracks or Replace Mounting Bosses on Fan Exit Vane – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Sheet	08-04
Aluminum Bar	08-09
Welding Wire	03-19

B. Procedure

CAUTION: TO PREVENT DAMAGE DO NOT REDUCE FLANGE WALL THICKNESS.

(1) Remove boss by grinding attaching rivets or spot-welds.

(2) Using welding wire and fusion welding method, fill rivet holes with weld.

(3) Without reducing wall thickness, blend weld flush on both sides. (Refer to 70-25-01, SPM.)

(4) Rout all cracks in inner shroud, and using welding wire and fusion welding method, repair cracks. (Refer to 70-45-01, SPM.)

(5) Blend weld flush with existing contour. Do not reduce base metal thickness.

(6) Heat-treat part at 350°F (177°C) for 5 hours.

(7) Fluorescent-penetrant inspect weld to Class I requirements. (Refer to 70-20-05, and 70-45-01, SPM.)

(8) Obtain boss 2-043-155-01. If boss is not available, fabricate new boss in accordance with *Figure 901.*

(9) Position replacement boss in place.

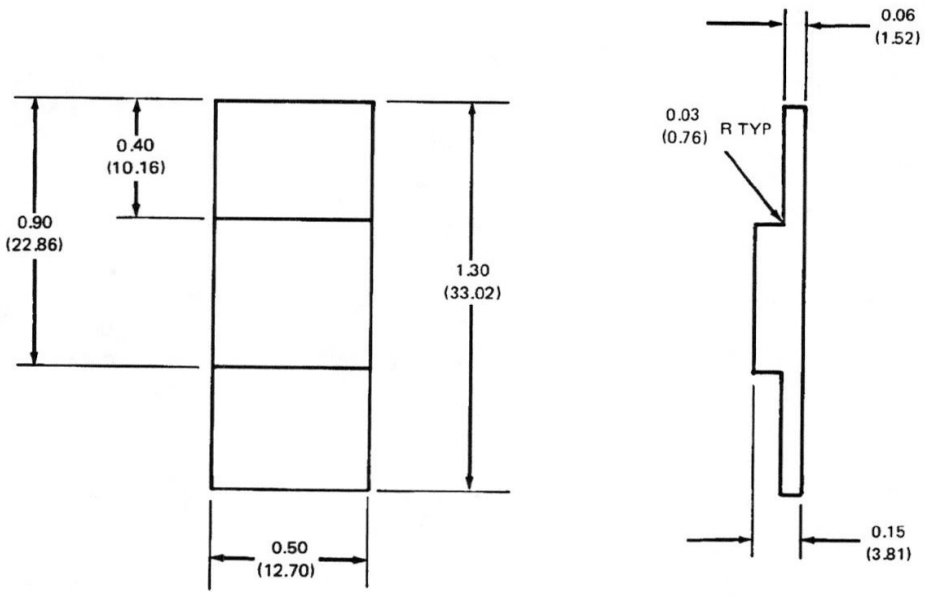
(10) Drill as required and install two rivets MS20426AD4-4. (*See Figure 902.*) Countersink heads of rivets to be installed flush on forward side.

(11) Drill center hole. (*See Figure 902.*)

1. B. (12) Machine replacement boss to proper height. (*See Figure 902.*)

(13) Clean per 70-15-03, SPM.

(14) Touch up machined surfaces. (Refer to 70-30-07, SPM.)

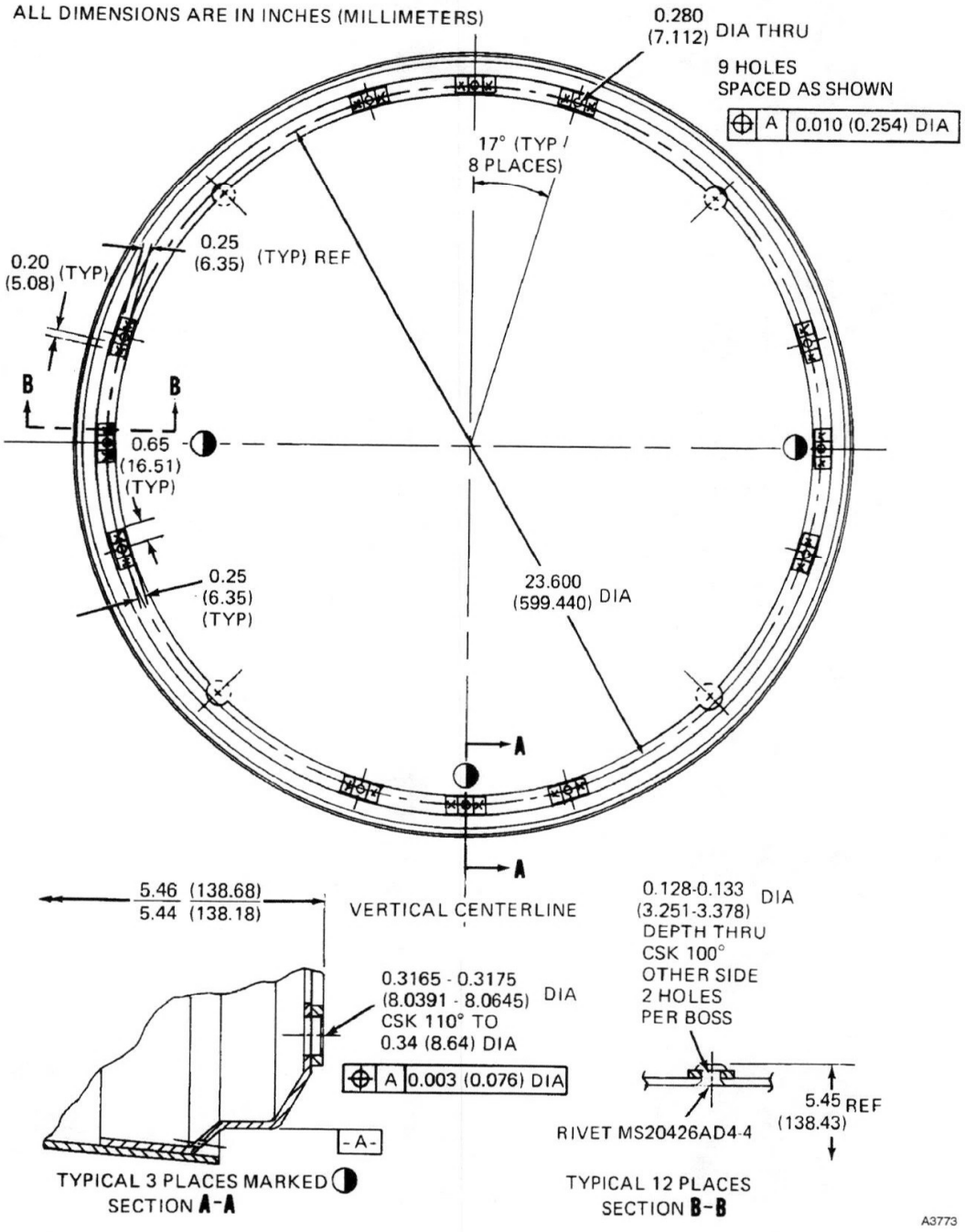


NOTES:
1. MAKE FROM ALUMINUM SHEET AMS4027 OR BAR AMS4117
2. HARDNESS TO BE R_B 50 MIN.
3. ALL DIMENSIONS ± 0.01 IN. (0.254 MM)

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

A3772

Mounting Boss Fabrication
Figure 901



Mounting Boss Installation
Figure 902

FAN EXIT VANE ASSEMBLY – REPAIR-05

1. Repair Cracks in Inner Shroud Mounting Flange – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy	08-04
Welding Wire	03-19

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Blend affected mounting flange area(s) as required to form a smooth contour.

(2) Fabricate patch(es) from aluminum alloy sheet as required to fit flush with discrepant area(s).

NOTE: Thickness of inner shroud mounting flange may vary depending on inner shroud configuration. Select patch material thickness to correspond with flange thickness of mounting flange being repaired.

(3) Using welding wire and fusion welding method, weld patch(es) in place on inner shroud mounting flange. (Refer to 70-45-01, SPM.)

CAUTION: DO NOT UNDERCUT MOUNTING FLANGE. DAMAGE TO FLANGE WILL RESULT.

(4) Blend welded area flush with unaffected surrounding parent metal.

(5) Heat-treat inner shroud mounting flange in an oven at 350°F (177°C) for 5 hours.

(6) Fluorescent-penetrant inspect repaired area to class IV acceptance criteria. (Refer to 70-20-05 and 70-45-01, SPM.)

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1. B. (7) If part number of repaired inner shroud is 2-043-430-01, proceed as follows:

NOTE: Following Steps (a) and (b) do not apply to inner shroud 2-043-430-05.

(a) After rework of mounting flange has been accomplished, it will be necessary to assemble inner flange to main frame assembly with doubler ring 2-043-261-01 (Refer to 72-01-00, Assembly, 74, *Figure 1001)*, mounted on forward face of mounting flange. If doubler ring is not available, fabricate doubler ring as follows:

NOTE: If necessary, doubler ring may be obtained.

1 Fabricate doubler ring from aluminum alloy. *(See Figure 901.)*

2 Anodize doubler ring. (Refer to 70-30-10, SPM.)

3 Vibroetch BOTTOM where shown in *Figure 901*; letters shall be 0.12 inch (3.1 millimeter) high and 0.003 to 0.010 inch (0.08 to 0.25 millimeter) deep.

(b) Retain doubler ring with fan exit vane assembly for final assembly. (Refer to 72-01-00, Assembly.)

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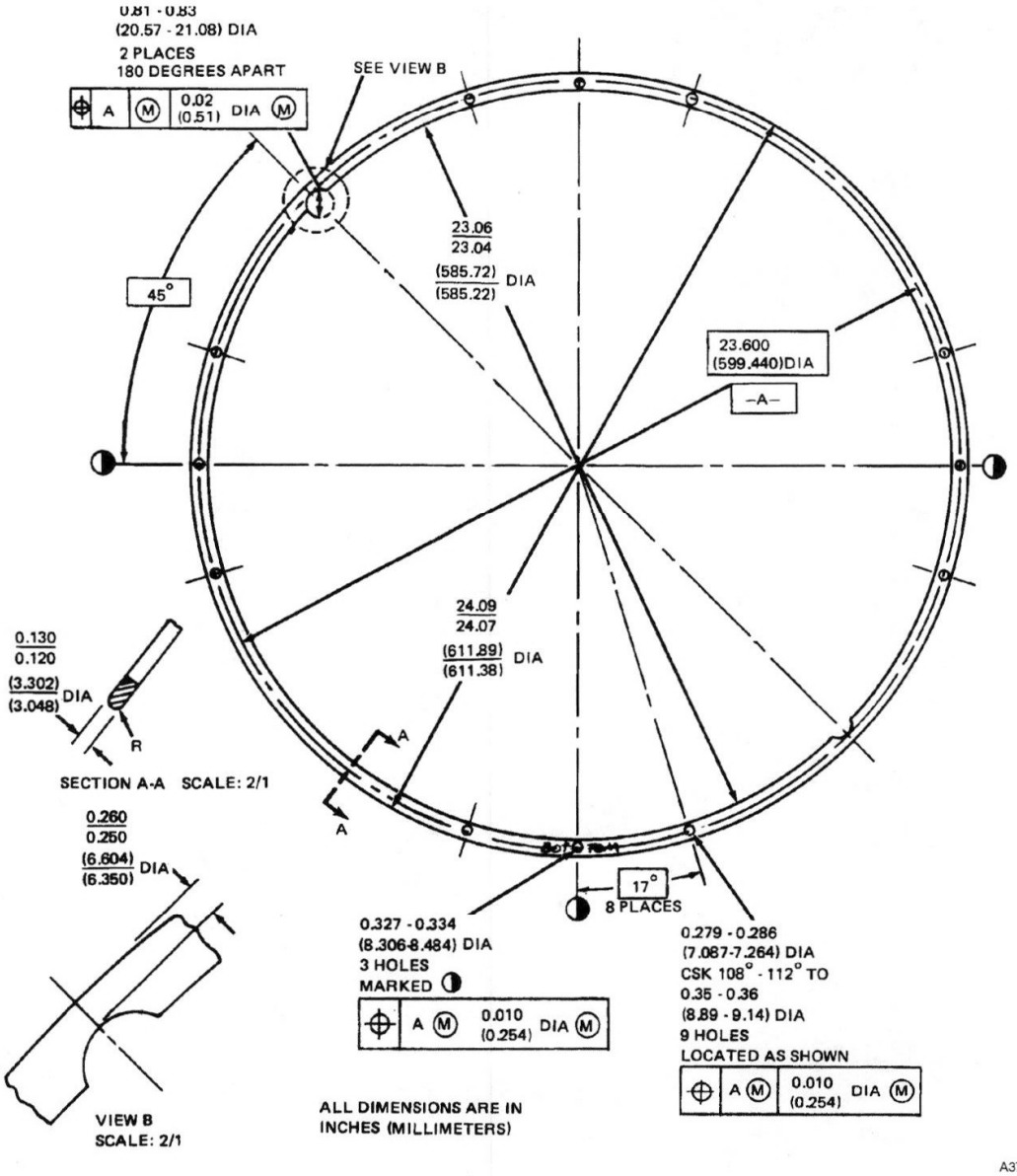

Inner Shroud Doubler Ring Fabrication
Figure 901

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FAN EXIT VANE ASSEMBLY – REPAIR-06

1. Replacement of Inner Shroud Mounting Flange – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

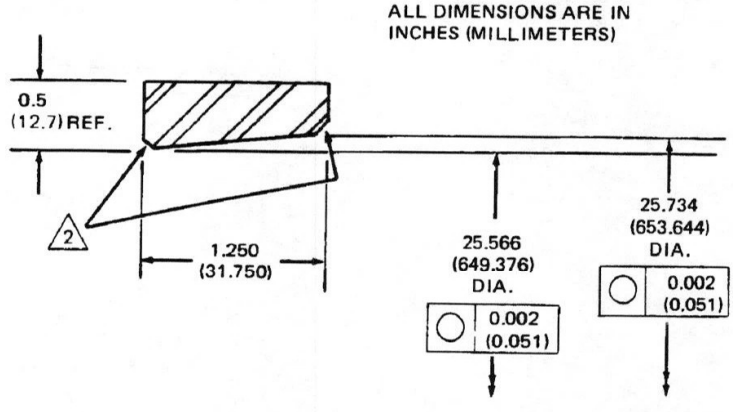
Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy	08-10, -12

B. Procedure

(1) Using aluminum alloy AMS7488, fabricate a tapered ring to be used to fit tightly on OD where shroud and flange are welded. (*See Figure 901.*)

NOTE: Ring or other suitable fixturing method may be used to maintain roundness and protect wall thickness when machining.

(2) Install ring or suitable fixture over shroud assembly and machine off flange. (*See Figure 902.*)



NOTE:

1. FABRICATE METAL RING SUITABLE TO HOLD TOLERANCES GIVEN WHEN IN TIGHT CONTACT WITH O.D. OF SHROUD.

2 CHAMFER CORNERS AND REMOVE ROUGH EDGES.

A3774

Fabrication of Ring
Figure 901

1. B. (3) Using aluminum alloy AMS4127, fabricate flange. (*See Figure 903.*)

NOTE: Flange 2-043-264-01 may be obtained.

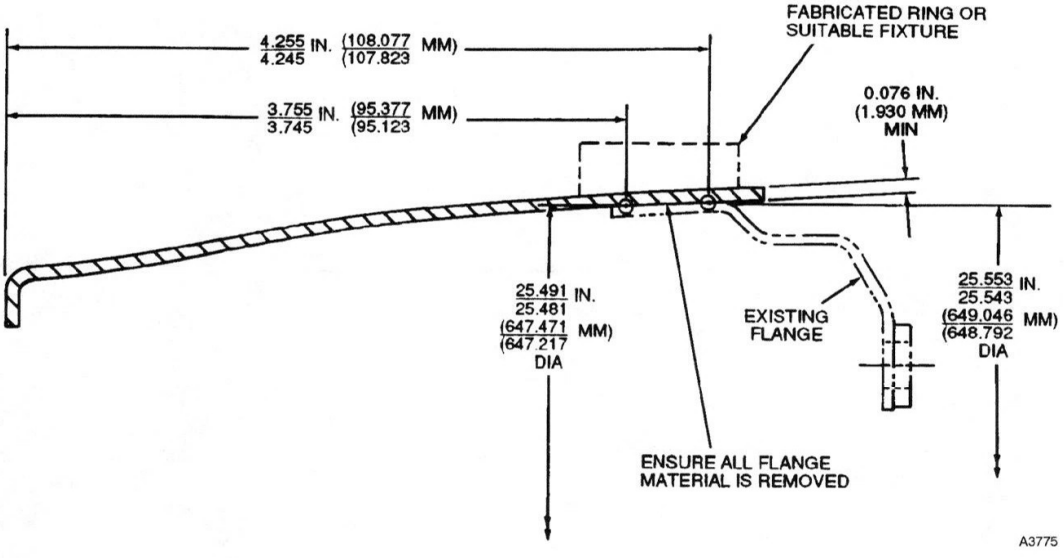
(4) Using resistance welding method, weld flange to shroud assembly. (Refer to 70-45-02, SPM, and *Figure 904.*)

(5) Visually, fluorescent-penetrant, and radiographically or ultrasonically inspect weld to Class III acceptance criteria. (Refer to 70-45-02, SPM.)

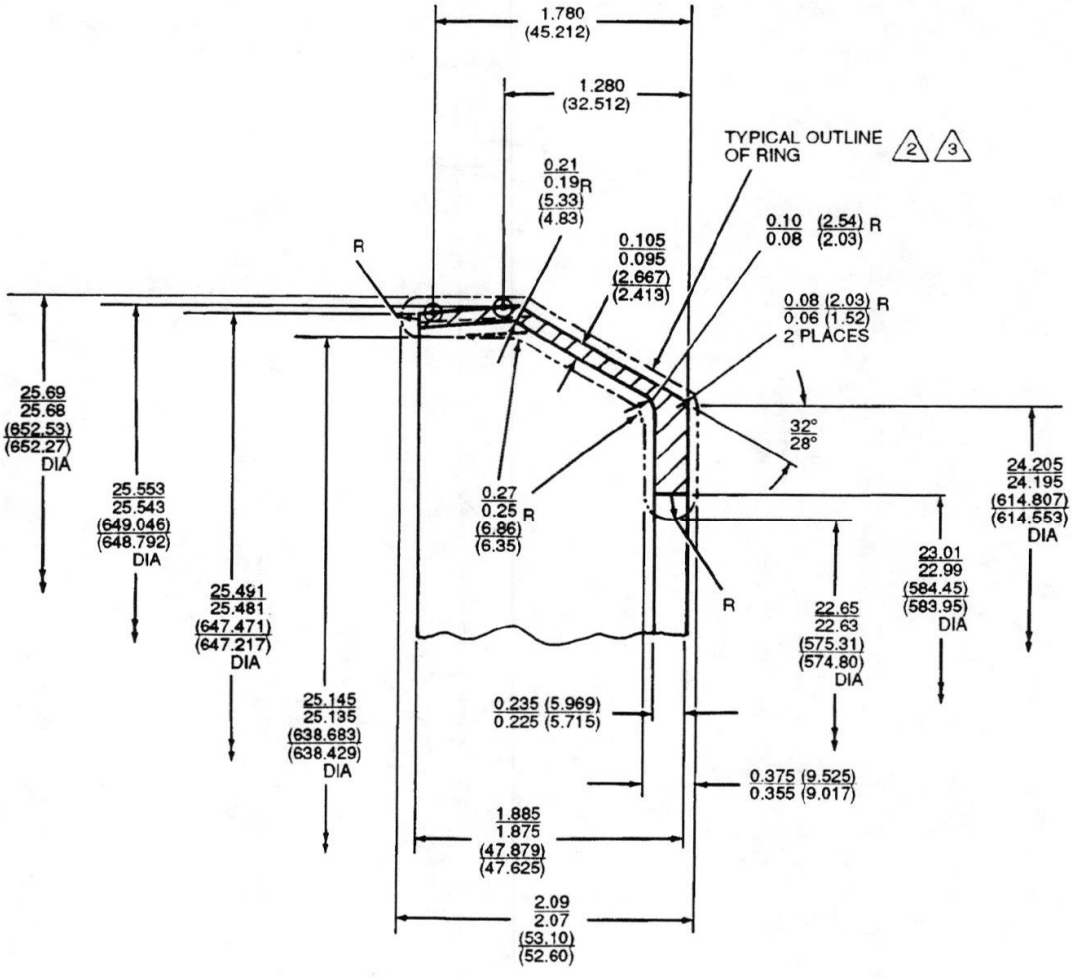
(6) Machine shroud assembly to finish dimensions. (*See Figure 904.*)

(7) Dimensionally inspect shroud assembly. (*See Figure 904.*)

(8) Touch up machined surfaces. (Refer to 70-30-07, SPM.)



Machining of Existing Mounting Flange
Figure 902



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

1. DIMENSIONS GOVERNING INTERSECTING SURFACES ARE SHOWN TO THE THEORETICAL INTERSECTION POINTS.

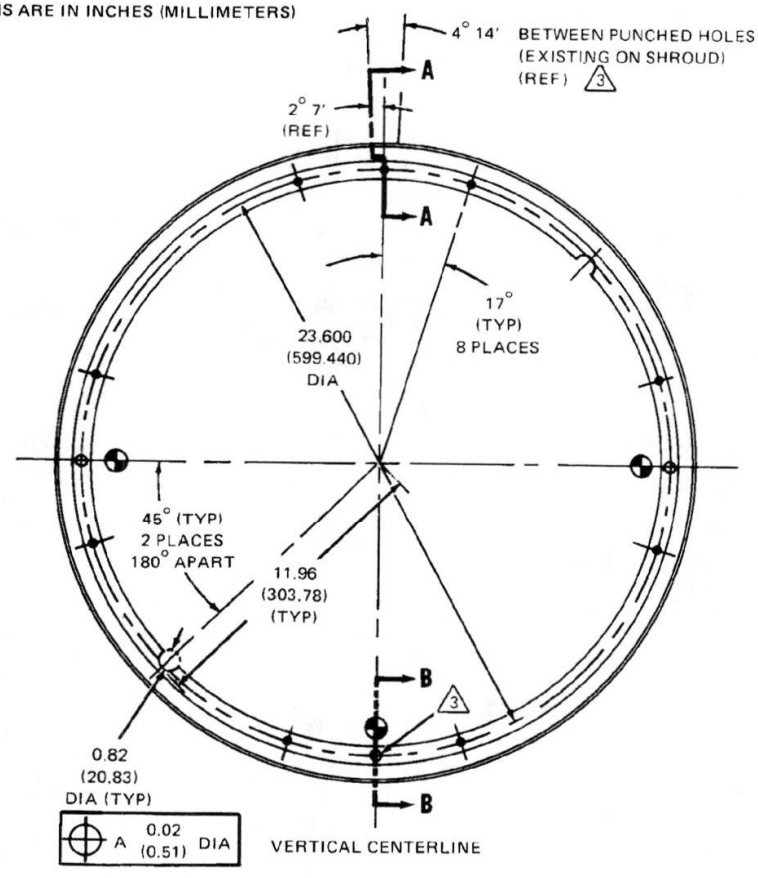
2 MAY BE MADE FROM BUTT WELDED RING AMS7488.

3 TYPICAL MACHINING ALLOWANCE 0.060 (1.524) MIN.

A3776

Fabrication of Replacement Flange
Figure 903

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)



NOTE:

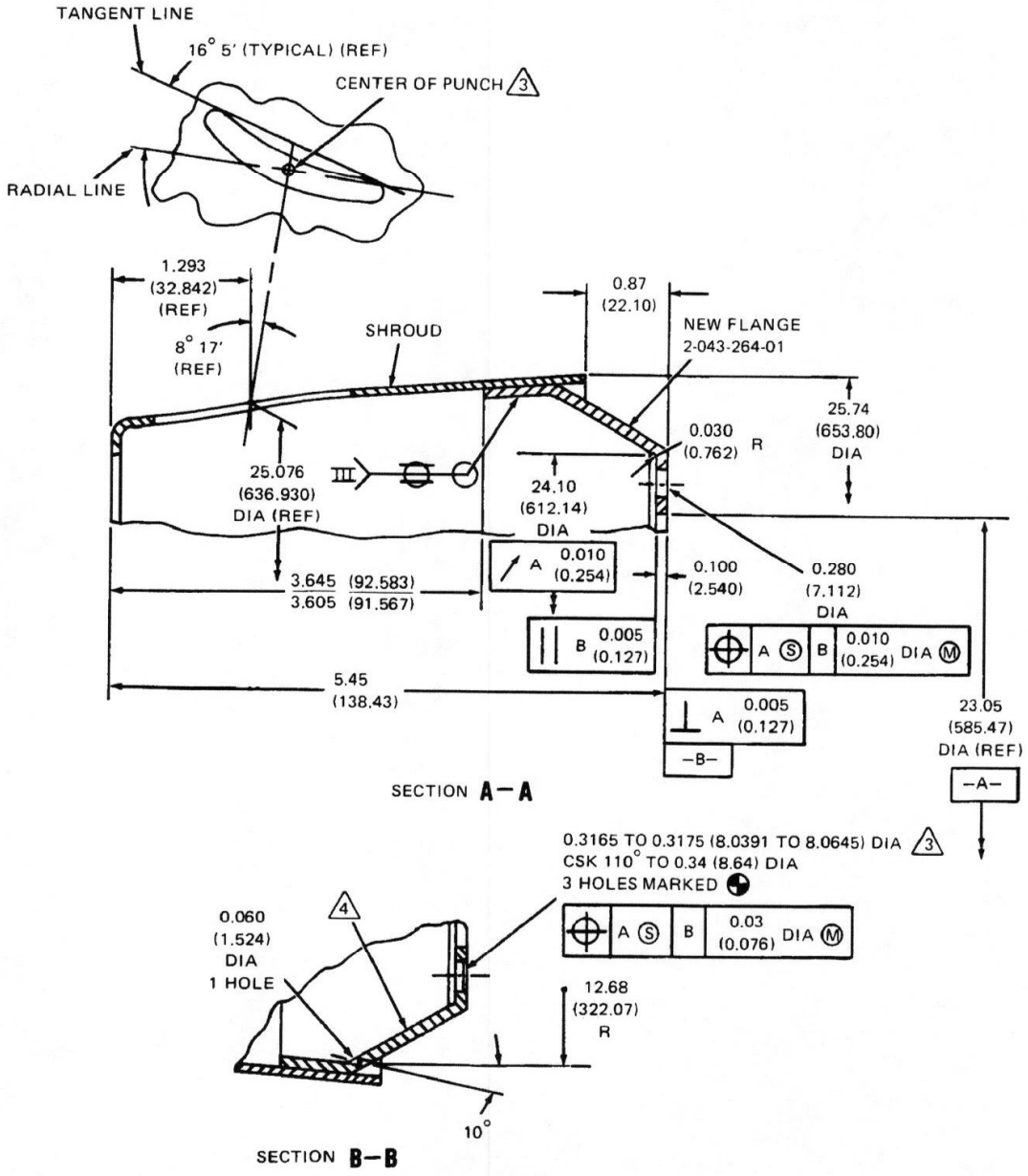
1. ALL DIAMETERS ⌀ A 0.020 (0.508) UNLESS OTHERWISE SPECIFIED.
2. ALL REQUIREMENTS APPLY IN MACHINED POSITION.

3 ALIGN A PUNCHED HOLE AND A 0.3165 TO 0.3175 (8.0391 TO 8.0645) DIA HOLE ON BOTTOM VERTICAL CENTERLINE WITHIN 0.005 (0.127) TOTAL.

4 MARK "BOTTOM" BY VIBRO-PEEN 0.001 TO 0.006 (0.025 TO 0.152) DEEP.

A3777

Shroud Assembly Finish Dimensions
Figure 904 (Sheet 1 of 2)



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

A3778

Shroud Assembly Finish Dimensions
Figure 904 (Sheet 2)

FAN EXIT VANE ASSEMBLY – ASSEMBLY

1. Fan Exit Vane Assembly – Assembly

   A. Equipment and Materials

   Special Tools:

Part No.	Nomenclature
LTCT14769-01	Installation and Removal Tool

   Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Lubricant	02-22C

   B. Assembly

   (1) Install outer band (3, *Figure 1001*) onto inner band (2) and loosely install four brackets (10), washers (9), and nuts (8).

   (2) Install screw (1) into links (6 and 7). Secure links to band (2) with pins (5). Install cotter pins (4).

   (3) Place inner shroud (12) inside of outer shroud (13).

   NOTE: The 0.2533 to 0.2543 inch (6.434 to 6.459 millimeter) hole in outer shroud (13) and the hole marked bottom in inner shroud (12) shall be aligned when assembled.

   (4) Using installation tool LTCT14769-01, slide vane (11) in through inner shroud (12) and into rubber cap on outer shroud (13).

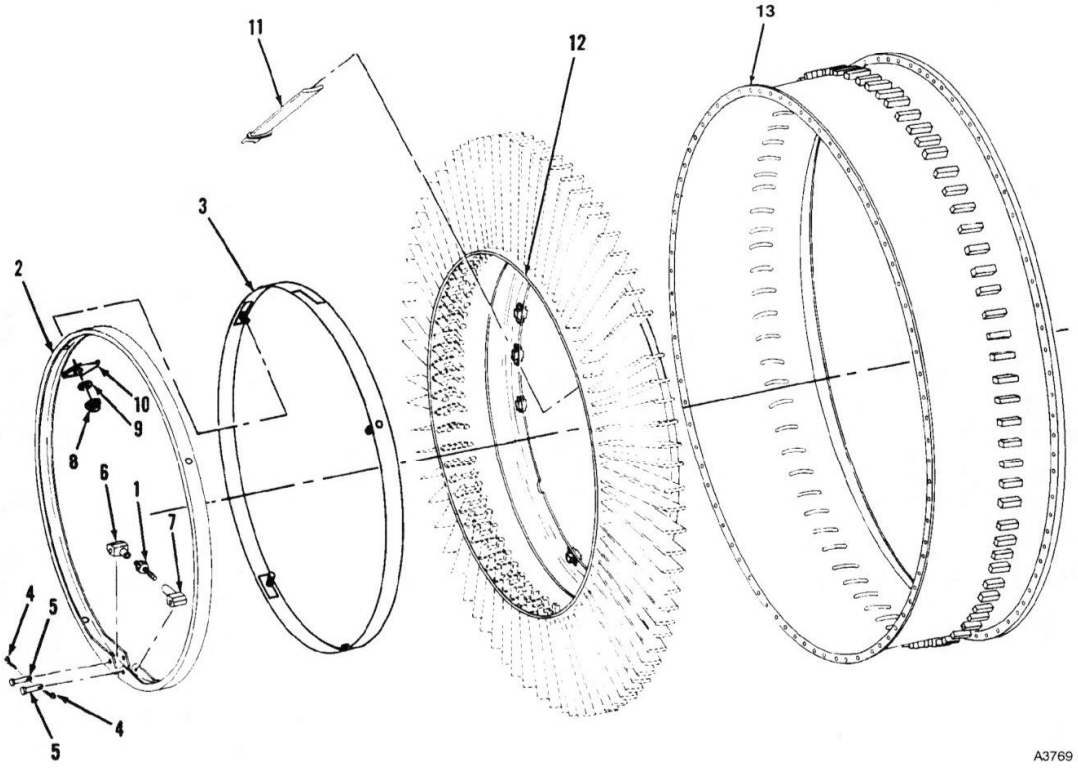
   NOTE: For ease of installation, vane tip may be moistened with lubricant. Tap base of vane with soft mallet to seat vane in rubber cap.

   (5) Repeat Step (4) until all vanes have been installed.

   (6) Back off screw (1) to shrink inner band (2) and outer band (3) to their smallest diameter and install into position at base of vanes.

   NOTE: Band assembly should be positioned with locking device on bottom vertical centerline.

   (7) Adjust screw (1) as required, and lockwire. Tighten nuts (8) and lockwire.



1. SCREW
2. INNER BAND
3. OUTER BAND
4. COTTER PIN
5. PIN
6. LINK
7. LINK
8. NUT
9. WASHER
10. BRACKET
11. VANE
12. INNER SHROUD
13. OUTER SHROUD

Fan Exit Vane Assembly
Figure 1001

SUPPORT FRAME ASSEMBLY – DISASSEMBLY

1. Support Frame Assembly – Disassembly

   A. Equipment and Materials

      None.

   B. Disassembly

      (1) Remove flange assembly (1, *Figure 501*), tube assembly (2), and two packings (3).

      (2) Remove two bolts (4) and two washers (5). Remove oil transfer adapter (6). Remove packing (7).

      (3) Remove two bolts (8), and two washers (9). Remove frame plug (10). Remove packing (11).

      (4) Remove four bolts (12) and frame plate (13). Remove gasket (23).

      (5) Remove four bolts (14) and frame plate (15). Remove gasket (32).

      (6) Remove four bolts (16) and two ignition lead plates (17).

      (7) Remove plug (18) and packing (19).

      (8) Remove four bolts (20) and four washers (21). Remove oil pressure/temperature bulb cover assembly (22) and oil inlet tube assembly (28 and 29). Remove two packings each (24, 25, 26, and 27). Remove gasket (23).

          NOTE: Most configurations have a union on oil inlet tube (29) that precludes withdrawing the tube from outside the engine. In this case, remove gas producer module (Refer to 72-02-00, Removal) and withdraw tube (29) and union from the inside of the engine.

      (9) Remove eight bolts (30) and two strut cover assemblies (31). Remove gaskets (32).

      (10) Remove nut (36) and three bolts (37). Remove No. 7 strut cover assembly (38). Remove gasket (39).

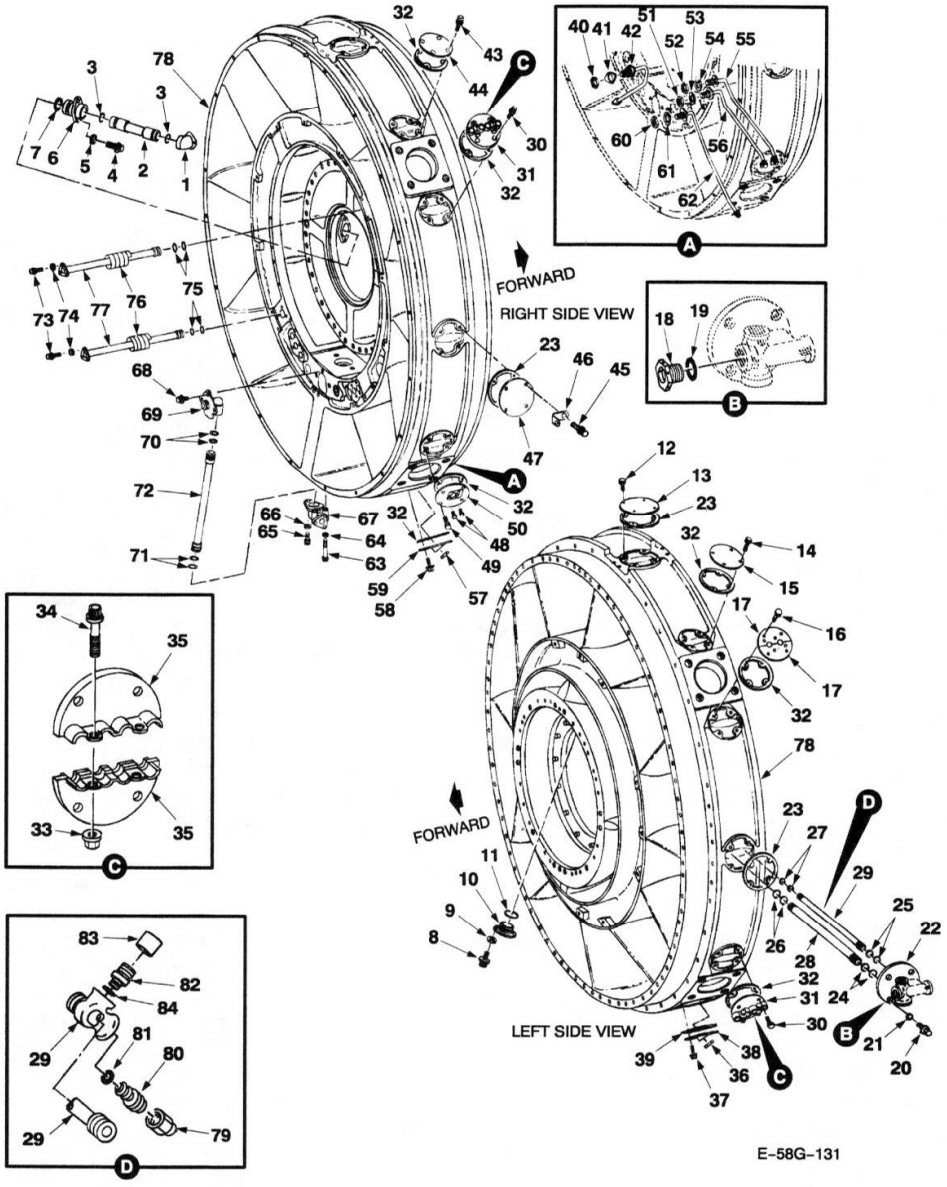
      (11) Remove nuts (40) and retaining plate (41). Remove No. 7 strut tube assembly (42).

      (12) Remove four bolts (43) and frame plate (44). Remove gasket (32).

      (13) Remove four bolts (45), bracket (46), and frame plate (47). Remove gasket (23).

      (14) Remove two bolts (48), four bolts (49), and No. 4 strut cover (50). Remove gasket (32).

      (15) Remove nuts (51 and 52) and retaining plates (53 and 54). Remove No. 4 strut tube assemblies (55 and 56).



Support Frame Assembly
Figure 501

KEY TO FIGURE 501

1. FLANGE ASSEMBLY
2. TUBE ASSEMBLY
3. PACKING
4. BOLT
5. WASHER
6. OIL TRANSFER ADAPTER
7. PACKING
8. BOLT
9. WASHER
10. FRAME PLUG
11. PACKING
12. BOLT
13. FRAME PLATE
14. BOLT
15. FRAME PLATE
16. BOLT
17. IGNITION LEAD PLATE
18. PLUG
19. PACKING
20. BOLT
21. WASHER
22. OIL PRESSURE/TEMPERATURE BULB COVER ASSEMBLY
23. GASKETS
24. PACKING
25. PACKING
26. PACKING
27. PACKING
28. OIL INLET TUBE ASSEMBLY
29. OIL INLET TUBE ASSEMBLY
30. BOLT
31. STRUT COVER ASSEMBLY
32. GASKETS
33. NUT
34. BOLT
35. STRUT COVER ASSEMBLY HALF
36. NUT
37. BOLT
38. NO. 7 STRUT COVER ASSEMBLY
39. GASKETS
40. NUT
41. RETAINING PLATE
42. NO. 7 STRUT TUBE ASSEMBLY
43. BOLT
44. FRAME PLATE
45. BOLT
46. BRACKET
47. FRAME PLATE
48. BOLT
49. BOLT
50. NO. 4 STRUT COVER
51. NUT
52. NUT
53. RETAINING PLATE
54. RETAINING PLATE
55. NO. 4 STRUT TUBE ASSEMBLY
56. NO. 4 STRUT TUBE ASSEMBLY
57. NUT
58. BOLT
59. NO. 5 STRUT COVER ASSEMBLY
60. NUT
61. RETAINING PLATE
62. NO. 5 STRUT TUBE ASSEMBLY
63. BOLT
64. WASHER
65. BOLT
66. WASHER
67. NO. 6 STRUT FUEL-IN FITTING
68. BOLT
69. NO. 6 STRUT FUEL-OUT FITTING
70. PACKING
71. PACKING
72. NO. 6 STRUT FUEL-IN TUBE ASSEMBLY
73. BOLT
74. WASHER
75. PACKING
76. SLEEVE
77. ANTI-ICING TUBE ASSEMBLY
78. SUPPORT FRAME ASSEMBLY
79. CAP
80. ADAPTER
81. PACKING
82. ADAPTER
83. CAP
84. PACKING

1. B. (16) Remove nut (57). Remove three bolts (58) and No. 5 strut cover assembly (59). Remove gasket (39).

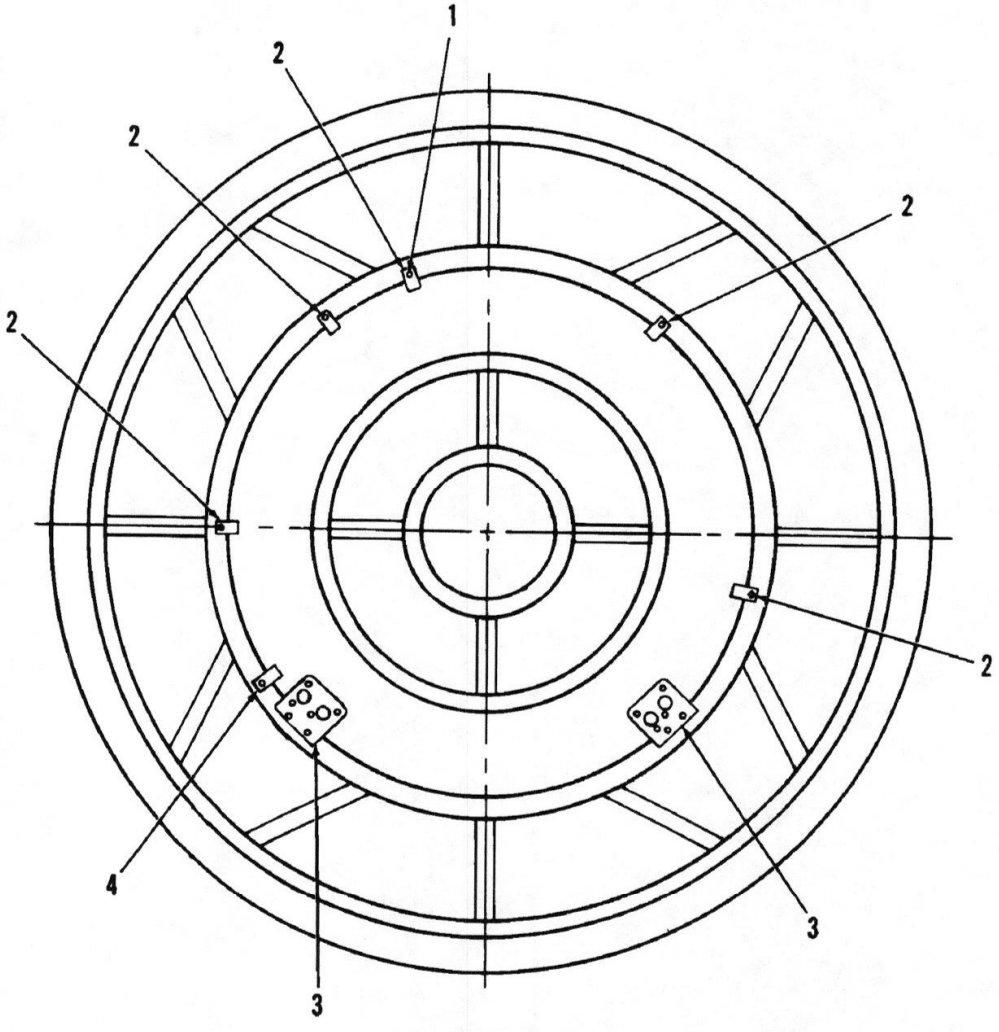
(17) Remove nut (60) and retaining plate (61). Remove No. 5 strut tube assembly (62).

(18) Remove two bolts (63), two washers (64), bolt (65), washer (66), and No. 6 strut fuel-in fitting (67).

(19) Remove three bolts (68) and fuel-out fitting (69). Remove fuel in tube assembly (72), two packings (70), and two packings (71).

(20) Remove six bolts (73) and six washers (74). Remove two anti-icing tube assemblies (77). Remove four packings (75) and two sleeves (76).

(21) Remove 10 bolts (1, *Figure 502*), 5 brackets (2), 2 brackets (3), and bracket (4).



VIEW FROM REAR

A3780

1. BOLT
2. BRACKET 2-182-030-01
3. BRACKET 2-163-452-01
4. BRACKET MS9592-008

Support Frame Assembly Bracket Locations
Figure 502

SUPPORT FRAME ASSEMBLY – CLEANING

1. Support Frame Assembly – Cleaning

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

SUPPORT FRAME ASSEMBLY – INSPECTION/CHECK

1. Support Frame Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

            WARNING: THE SUPPORT FRAME ASSEMBLY IS COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

         (b) Nicks, burrs, scratches, and dents. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks and distortion. Not acceptable. Replace.

         (e) Nicks, burrs, and scratches. Blend-repair defects. (Refer to Repair-01.)

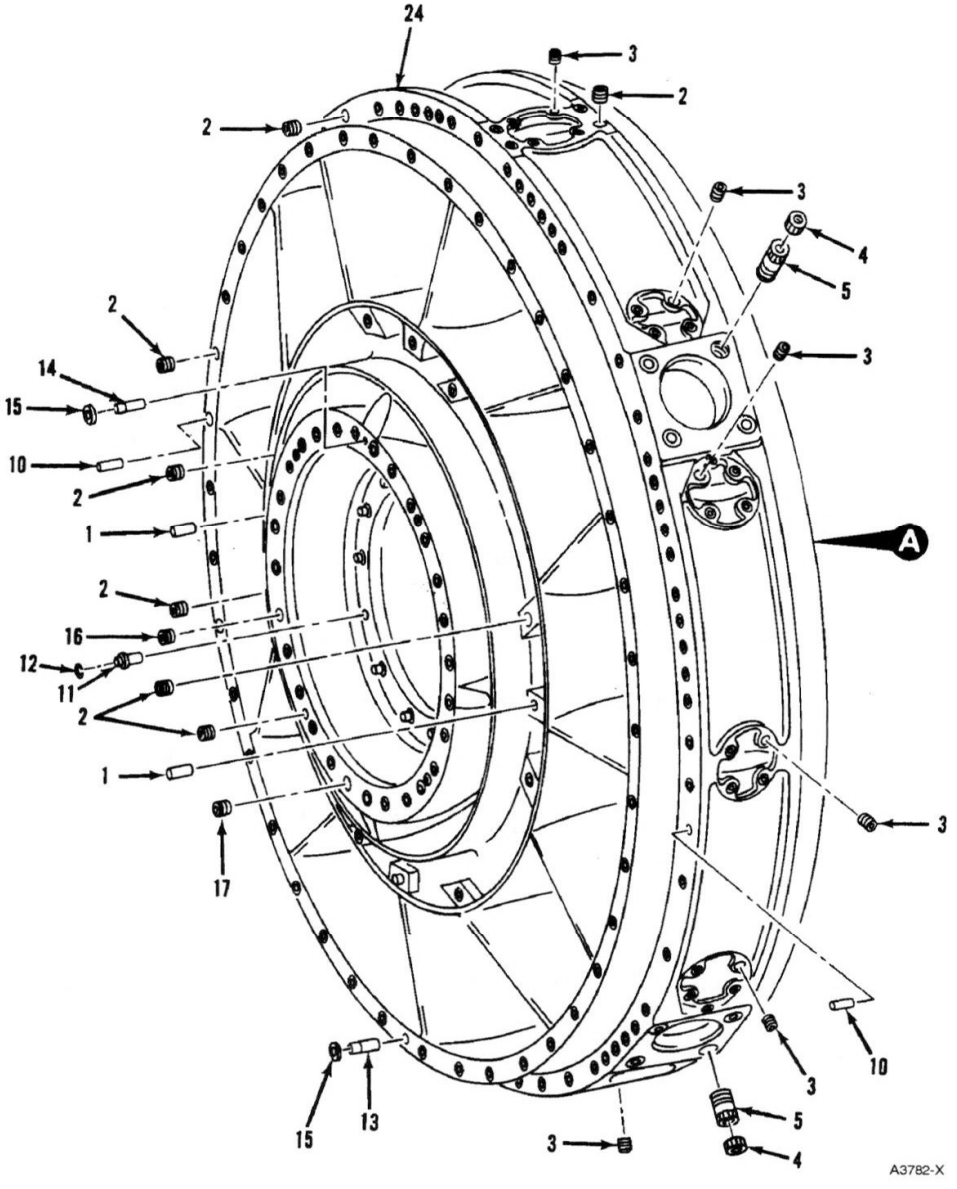
         (f) Damaged or missing studs and inserts. (*See Figure 801.*) Not acceptable. Replace. (Refer to 70-25-03 and 70-25-04, SPM.)

         (g) Corroded or loose Rosan inserts and lock rings (four) in engine mount pads. If corrosion has progressed from Rosan inserts to magnesium interface, Rosan insert must be removed and parent metal inspected and treated. (Refer to Repair-03 and -28.) If Rosan insert is loose, replace with oversize Rosan insert. (Refer to Repair-03.)

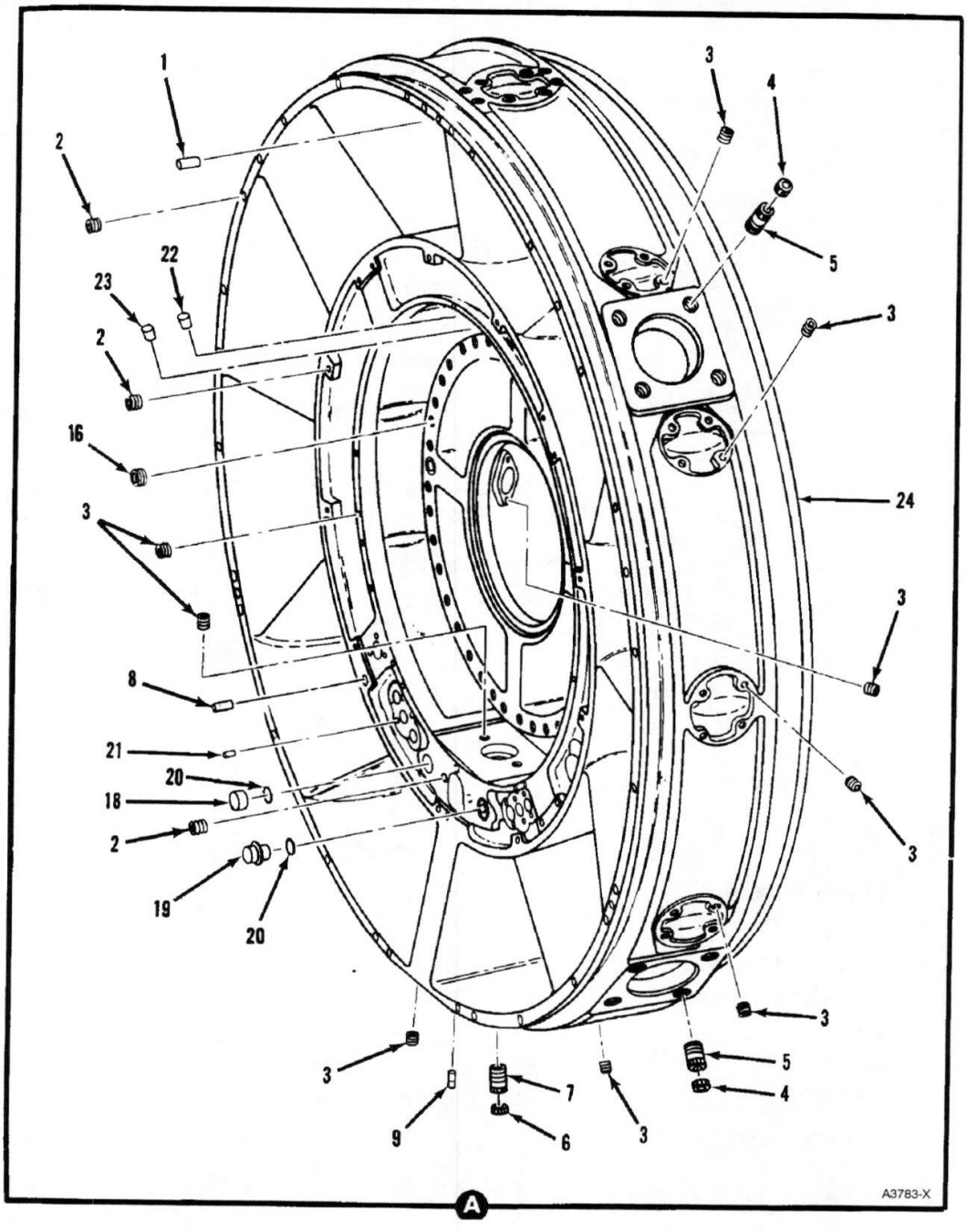
         (h) Corroded engine mount pad pilots and engine to airframe mating surface. Remove corrosion. (Refer to Repair-04.)

         (i) Stripped or loose Rosan inserts that secure No. 12 bearing assembly to support frame assembly. Replace if damaged. (Refer to Repair-05.)

         (j) Stripped No. 12 bearing assembly Rosan insert holes. Repair. (Refer to Repair-06 or -12.)



Support Frame Assembly Stud and Insert Locations
Figure 801 (Sheet 1 of 2)



Support Frame Assembly Stud and Insert Locations
Figure 801 (Sheet 2)

1. B. (1) (k) Excessive fretting on 1.430 to 1.434 inch (36.32 to 36.42 millimeter) diameter No. 12 bearing support hole. (*See Figure 802.*) Repair. (Refer to Repair-13.)

(l) Stripped or loose Rosan inserts that secure accessory drive gearbox module to support frame assembly. Repair. (Refer to Repair-07.)

(m) Dirt, grease, and debris on inside and bottom of Rosan inserts that secure No. 12 bearing to support frame assembly. Thoroughly clean to remove foreign material.

(n) Loose locating pins (11, *Figure 801*) on frame assembly 2-063-010-18. Not acceptable. Repair. (Refer to Repair-10.)

NOTE: All 14 pins should be fully seated in frame assembly with no indication of movement.

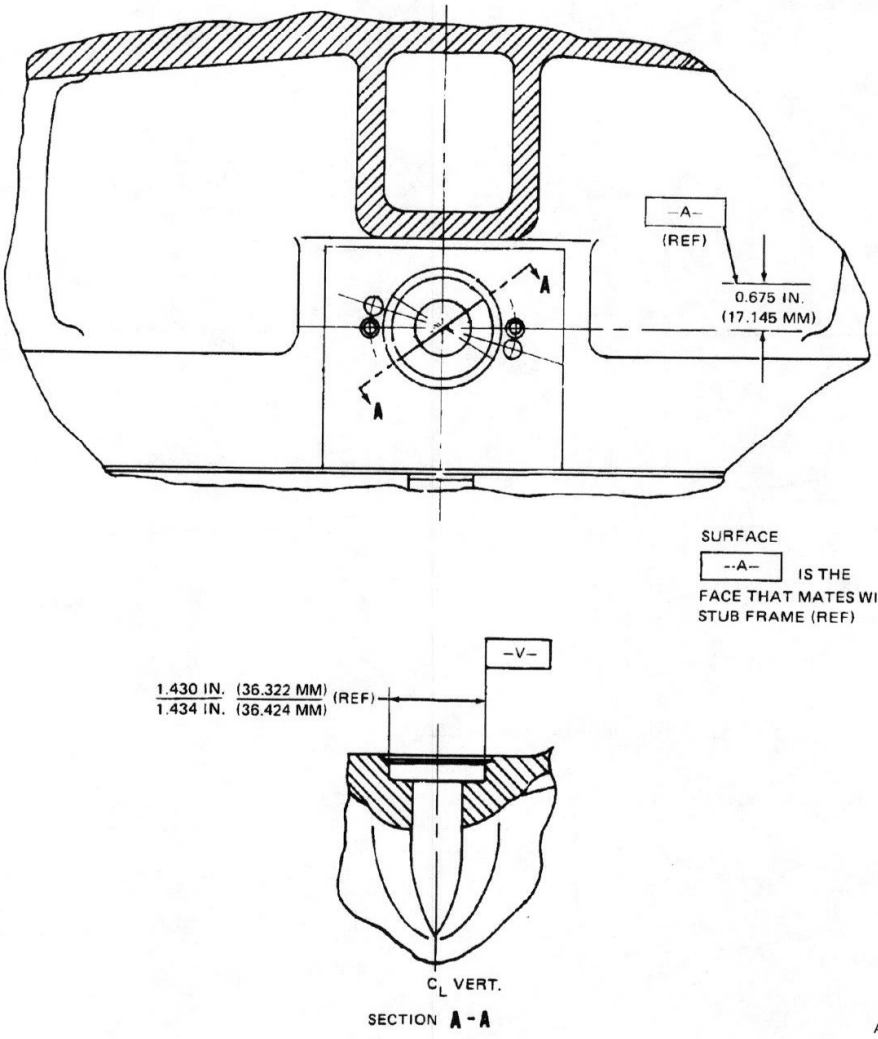
(o) Corrosion and fretting on accessory drive gearbox mounting pad contact surface at 21.297 to 21.303 inch (540.09 to 541.10 millimeter) dimension.

1 If corrosion or fretting less than 0.010 inch (0.25 millimeter) deep is noted on 50 percent or less of pad contact area, repair as specified in Repair-01.

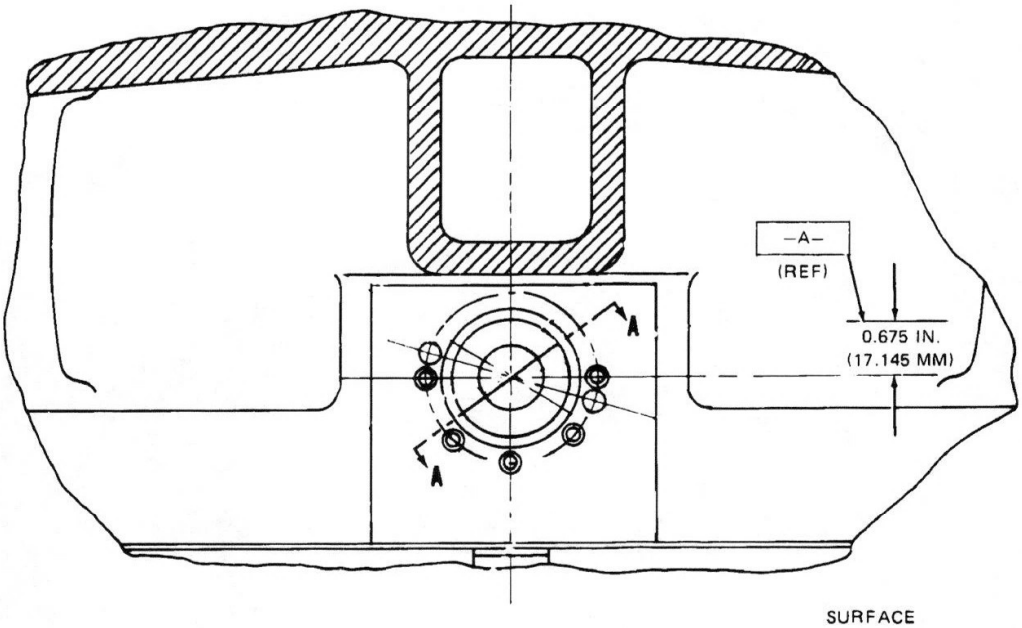
2 If corrosion or fretting exceeding 0.010 inch (0.25 millimeter) deep is noted over more than 50 percent of pad contact area, repair as specified in Repair-11 or -21.

KEY TO FIGURE 801

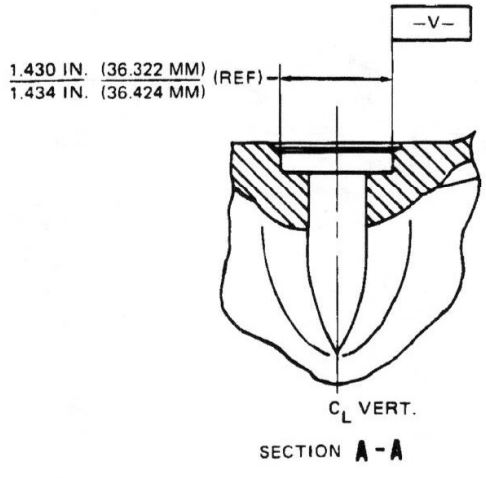
1. PIN
2. INSERT
3. INSERT
4. LOCK RING
5. INSERT
6. LOCK RING
7. INSERT
8. PIN
9. PIN
10. PIN
11. PIN
12. LOCK RING
13. PIN
14. PIN
15. RETAINING RING
16. INSERT
17. INSERT
18. PLUG
19. ADAPTER
20. PACKING
21. PIN
22. PLUG
23. PLUG
24. FRAME



Inspection of Fan Frame Assembly
Figure 802 (Sheet 1 of 2)



SURFACE -A- IS THE FACE THAT MATES WITH STUB FRAME (REF)



SECTION A-A

A3785

Inspection of Fan Frame Assembly
Figure 802 (Sheet 2)

1. B. (1) (p) Nicks on all inner struts.

1 A total of two nicks are allowed on all inner struts, provided each individual nick is less than 0.050 square-inches (32.3 square-millimeters) in area and 0.050 inch (1.27 millimeter) in depth. Two additional nicks per strut are allowed on 3 and 9 o'clock inner struts. In addition, a total of 12 nicks are allowed on each inner strut, provided each individual nick is less than 0.050 square-inches (32.3 square-millimeters) in area and 0.030 inch (0.76 millimeter) in depth. All nicks must be separated from each other by at least 3 times the diameter of the largest nick. Blend-repair nicks. (Refer to 70-25-01, SPM.)

2 Nicks larger than those specified in preceding Step 1 should be repaired as a hole. (Refer to Repair-14.) A total of two holes are allowed for weld repair on all inner struts, provided each hole does not exceed 0.200 square-inches (129.04 square-millimeters) in area and no side exceeds 0.500 inch (12.70 millimeter) in length.

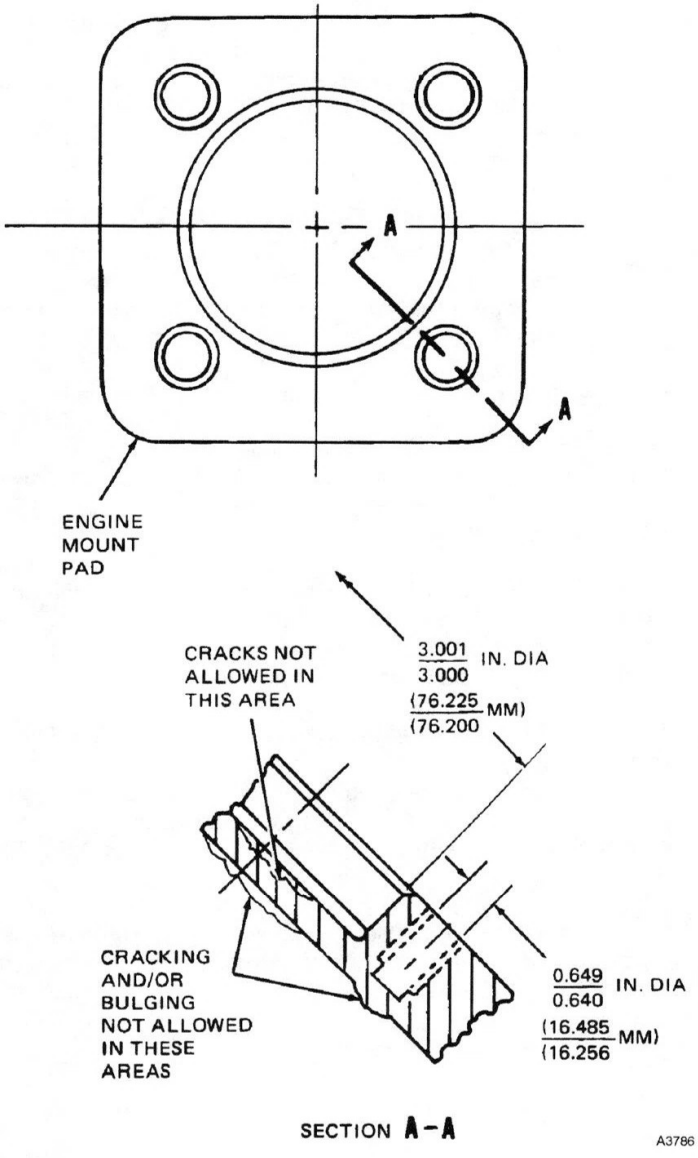
3 Hole area to be measured along plane of flow path.

(q) Cracking and bulging indications in flow path area directly opposite 0.640 to 0.649 inch (16.26 to 16.49 millimeter) diameter hole in mounting pad. (*See Figure 803.*) Not acceptable. Repair discrepant 0.90 to 0.98 inch (22.86 to 24.89 millimeter) depth. (Refer to Repair-17.)

(r) Bulging and/or cracked material on the flow path surface directly below the 3.000 to 3.001 inch (76.20 to 76.23 millimeter) diameter mounting pad pilot hole or cracking in the bottom of the mounting pad pilot hole. (*See Figure 803.*) If bulging or cracking exists, repair. (Refer to Repair-18.)

(s) Wear in frame coupling anti-rotation pin slot area in the Nos. 4, 5, and 7 strut tube assemblies. Acceptable, provided wear does not exceed 0.030 inch (0.76 millimeter) in depth and 0.100 inch (2.54 millimeter) in length. (*See Figure 804.*) If limits are exceeded, repair. (Refer to Repair-22 for No. 4 strut tube assembly, Repair-23 for No. 5 strut tube assembly, and Repair-23 for No. 7 strut tube assembly.)

(t) Magnesium corrosion caused by collection of moisture and salt at thru holes adjacent to No. 6 strut. If signs of corrosion are present, repair. (Refer to Repair-24.)



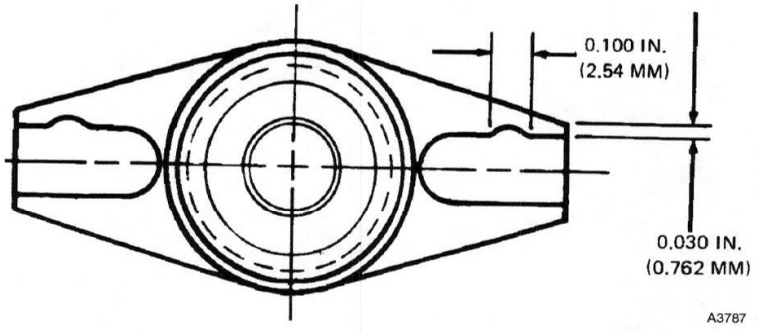
Inspection of Flow Path Area Directly Below Mounting Pad Pilot Hold
Figure 803

1. B. (2) Dimensionally inspect the accessory drive gearbox mounting pilot diameter. (*Refer to Table 801 and Figure 805.*) Repair (Refer to Repair-08), or replace if limits cannot be met.

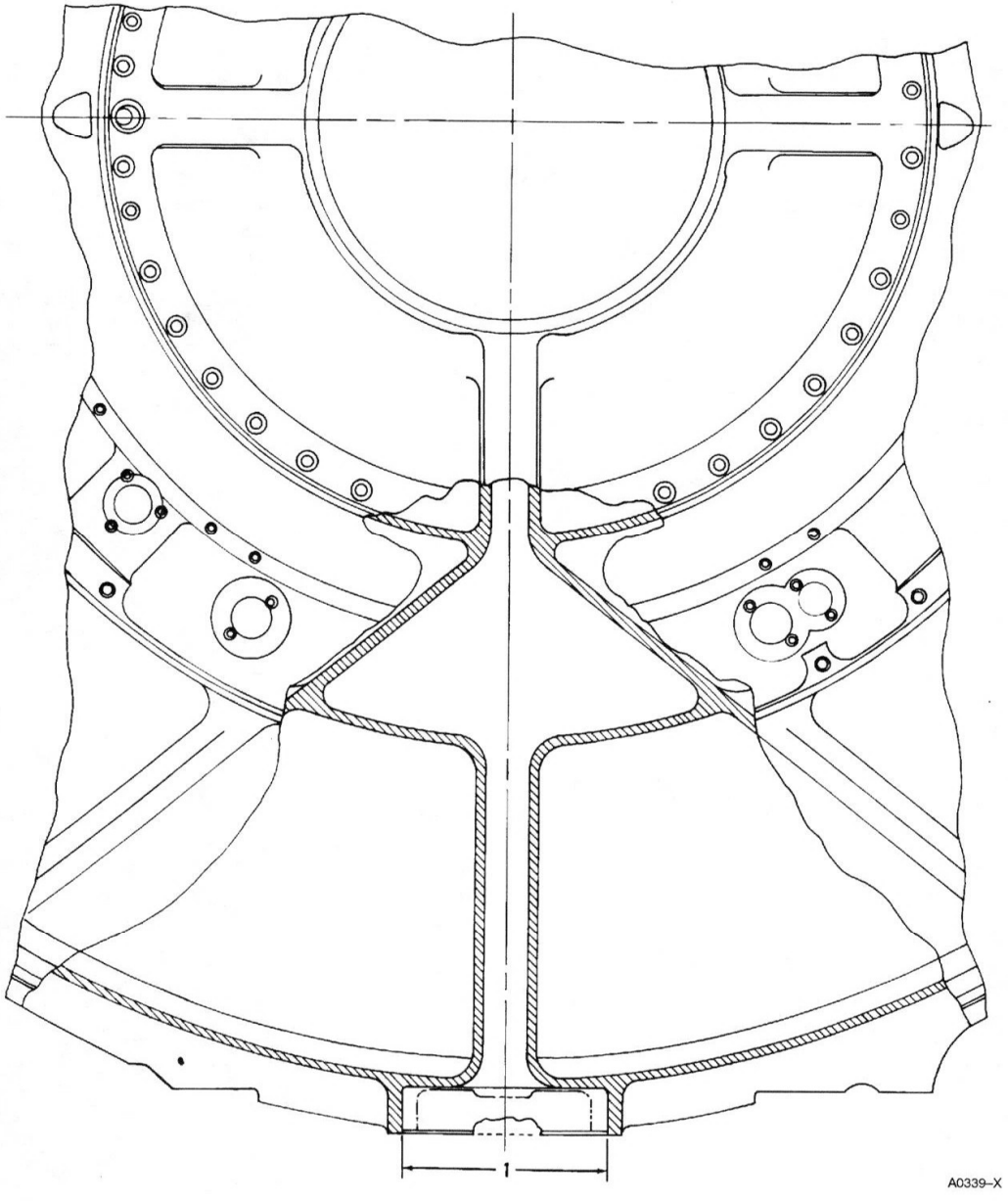
(3) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Repair cracks that can be removed by blend-repair. (Refer to Repair-01.) If cracks cannot be removed by blend-repair, replace support frame assembly.

Table 801. Support Frame Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID	4.400 (111.76)	4.401 (111.79)	4.400 (111.76)	4.401 (111.79)	**805** 1



Inspection Wear Limits for Frame Coupling Anti-Rotation Pin Slot Area
Figure 804



Support Frame Assembly Dimensional Inspection Locations
Figure 805

1. B. (4) Inspect engine mounting boss pilots for corrosion. Corrosion limits are as follows:

(a) Corrosion on base of engine mounting pad pilot that does not exceed a depth of 0.190 inch (4.83 millimeter) is repairable. (Refer to Repair-02.)

(b) Corrosion located on side wall of engine mounting pad pilot is repairable provided: (Refer to Repair-04.)

1 Corrosion depth does not exceed 0.190 inch (4.83 millimeter).

2 No more than 20 percent of pilot circumference is affected.

NOTE: The chamfer of the engine mount pilot is not considered part of the pilot when addressing corrosion limitations.

3 No more than 65 percent of pilot wall depth is affected.

(c) Corrosion located on the side wall of engine mounting pad pilot is repairable by epoxy filling (Refer to Repair-02) provided:

1 The maximum corrosion depth is 0.190 inch (4.83 millimeter). If Repair-03 has been done, the maximum corrosion depth is 0.100 inch (0.25 millimeter) in areas within 0.75 inch (19.1 millimeter) of the Rosan inserts.

2 The maximum area of any corrosion spot is 0.40 by 0.40 inch (10.2 by 10.2 millimeter). The corrosion spot must be separated from the next nearest corrosion spot by at least 3 times the diameter off the larger spot.

3 No more than 15 percent of the total surface area of the mounting pad side wall may be affected by corrosion.

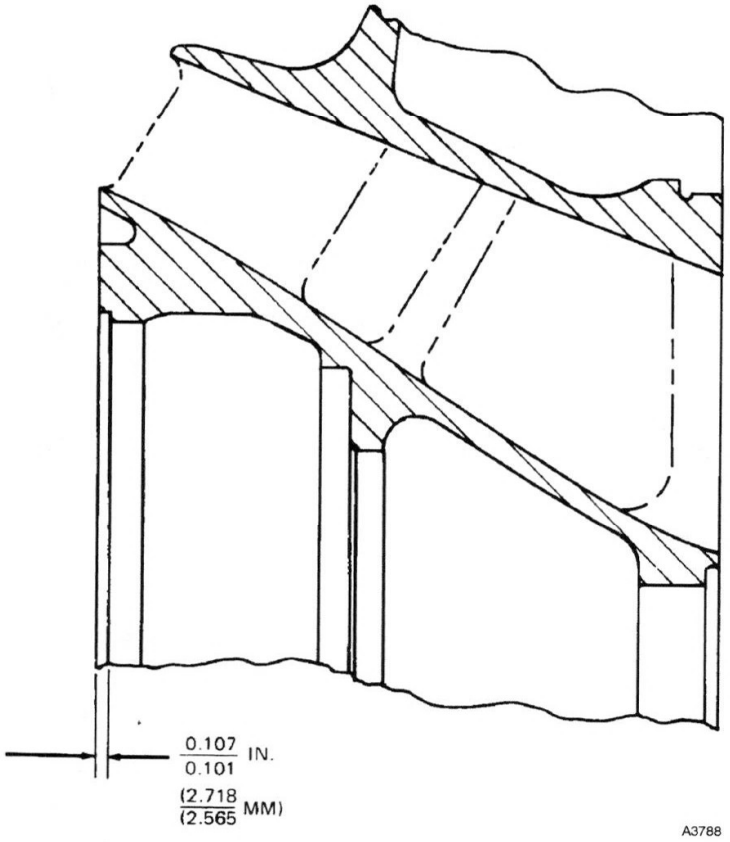
(5) Inspect 0.101 to 0.107 inch (2.57 to 2.72 millimeter) deep shoulder in the front bearing support mounting face of frame assembly for damage. (*See Figure 806.*) Not acceptable. Repair. (Refer to Repair-09.)

1. B. (6) Check self-locking feature of Rosan inserts that secure No. 12 bearing assembly to support frame assembly as follows: (Refer to 70-55-06, SPM.)

CAUTION: DO NOT ALLOW BOLT TO BOTTOM IN HOLE OR BOLT HEAD TO MAKE CONTACT WITH SUPPORT FRAME SURFACE; THIS WILL CAUSE INACCURATE RESULTS. ENSURE BOLT AND INSERT THREADS ARE CLEAN.

Install bolt MS9565-05 into hole. At the point where thread locking feature of the Rosan has engaged the bolt, measure running torque. Torque must be 2.0 pound-inches (0.23 newton-meters) minimum. If Rosan insert(s) do not meet torque requirements, replace insert(s).

(7) Inspect carrier contact surface for minor wear. Not acceptable. Repair. (Refer to Repair-15.)



Inspection of 0.101 to 0.107 Inch (2.57 to 2.72 Millimeter) Deep Shoulder
Figure 806

1. B. (8) Visually inspect ID of the reduction gear carrier assembly mounting surface for cracked or chipped paint in the area radially adjacent to the carrier assembly locating pins (11, *Figure 801*). If cracked or chipped paint exists, locally remove damaged paint to expose bare metal and proceed as follows.

(a) Using brush-on method, locally fluorescent-penetrant inspect area for cracks. (Refer to 70-20-05, SPM and *Figure 807.*) Up to four axial cracks of 0.600 inch (15.24 millimeter) and two cracks of 0.205 inch (5.21 millimeter) maximum length are allowed provided no adjacent pin holes are cracked and there are no more than one axial crack per carrier pin location. If limits are exceeded, repair.

NOTE: Carrier pin holes that have been blend repaired in accordance with Repair-26, and have not cracked further, do not count as cracked pin holes when applying these inspection criteria.

1 Any number of carrier pin hole cracks not exceeding 0.205 inch (5.21 millimeter) in length may be repaired. (Refer to Repair-26.)

2 Up to seven carrier pin hole cracks greater than 0.205 inch (5.21 millimeter) in length may be repaired by welding. (Refer to Repair-26.) No more than three adjacent pin holes may be welded. If limits are exceeded, replace fan frame.

(9) Inspect the 26.989 to 26.999 inch (685.52 to 685.78 millimeter) diameter flange for corrosion and fretting. (*See Figure 808.*) If corrosion or fretting is evident, blend repair flush to fan frame surface. (Refer to Repair-27.)

(10) Inspect 13.338 to 13.340 inch (338.79 to 338.84 millimeter) reduction gear carrier and carrier retaining spring pilot diameter for fretting. (*See Figure 809.*) Fretting up to 0.005 inch (0.13 millimeter) is allowed for a cumulative distance of 90 degrees of the pilot circumference. If fretting limits are not met, repair. (Refer to Repair-16.)

(11) Dimensionally inspect 1.430 to 1.434 inch (36.32 to 36.42 millimeter) diameter No. 12 bearing support hole. (*See Figure 802.*) If limits are exceeded, repair. (Refer to Repair-12 or -13.)

(12) Inspect oil transfer holes for gouging and/or wear. (*See Figure 810.*) Wear is acceptable provided it is not through the protective coating. If wear is through the coating, holes may be repairable provided:

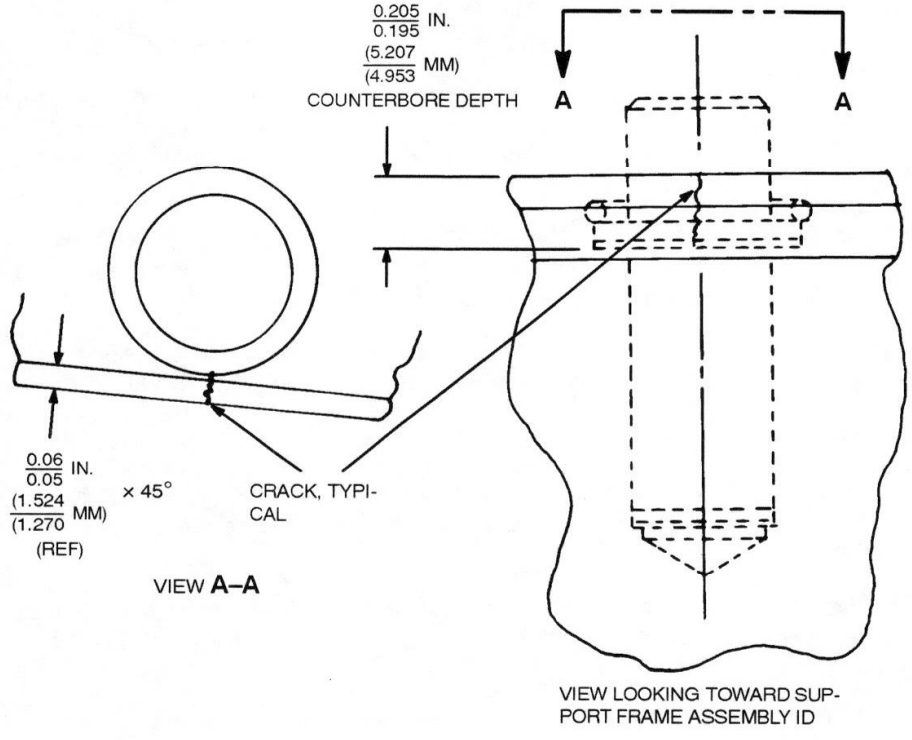
NOTE: Repair of oil transfer hole with sleeve insert is optional. (Refer to Repair-25.)

(a) Depth of wear is between 0.035 to 0.258 inch (0.89 to 6.55 millimeter). Repair. (Refer to Repair-19.)

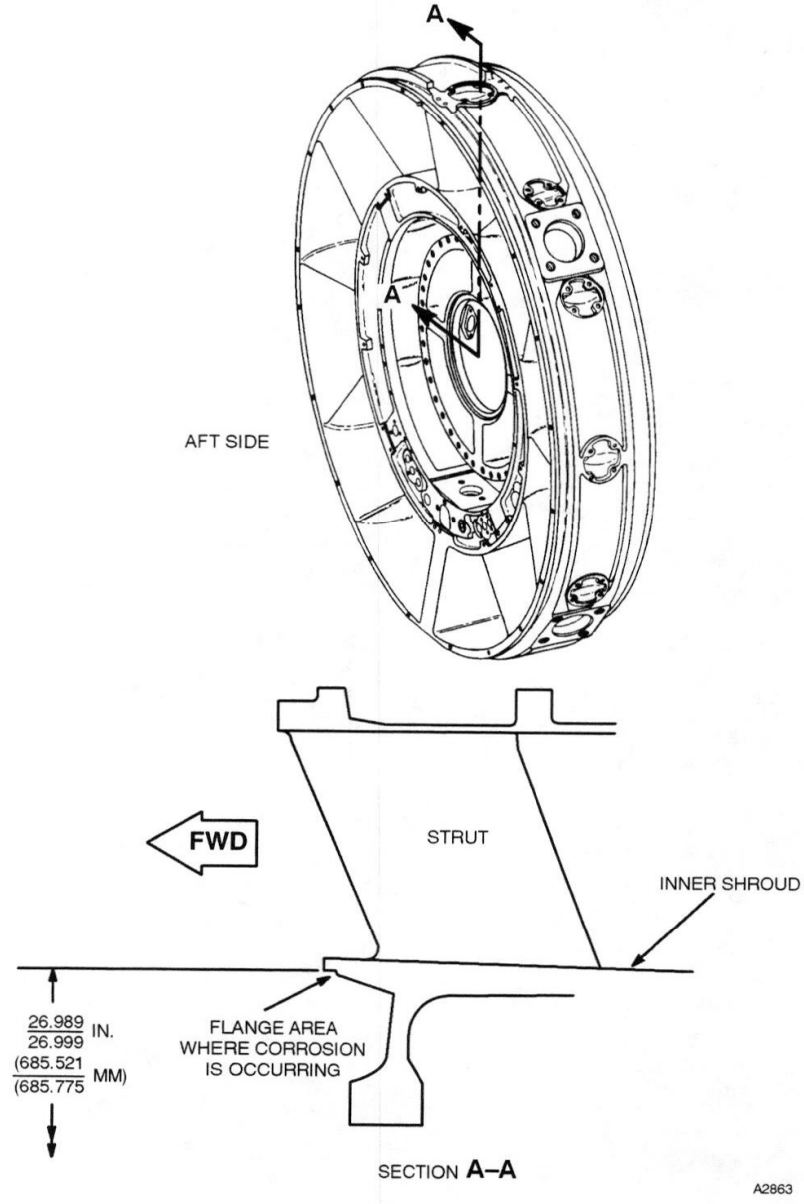
(b) Depth of wear is less than 0.035 inch (0.89 millimeter). Repair. (Refer to Repair-20.)

1. B. (13) Visually inspect that insert and/or lockring in engine mounting pad is recessed 0.05 inch (1.27 millimeter) below pad surface. If limit is exceeded, replace insert and/or lock ring. (Refer to 70-25-03 SPM.)

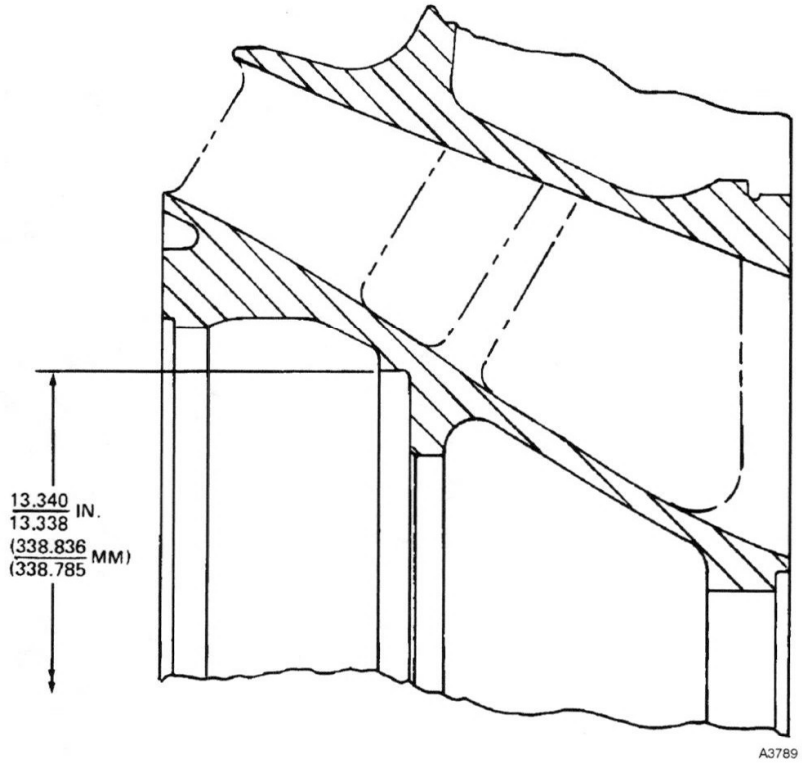
(14) Cracks, corrosion, fretting, or other damage that is unacceptable in accordance with the Inspection/Check requirements herein may be eligible for weld repair. Refer to Repair-29.



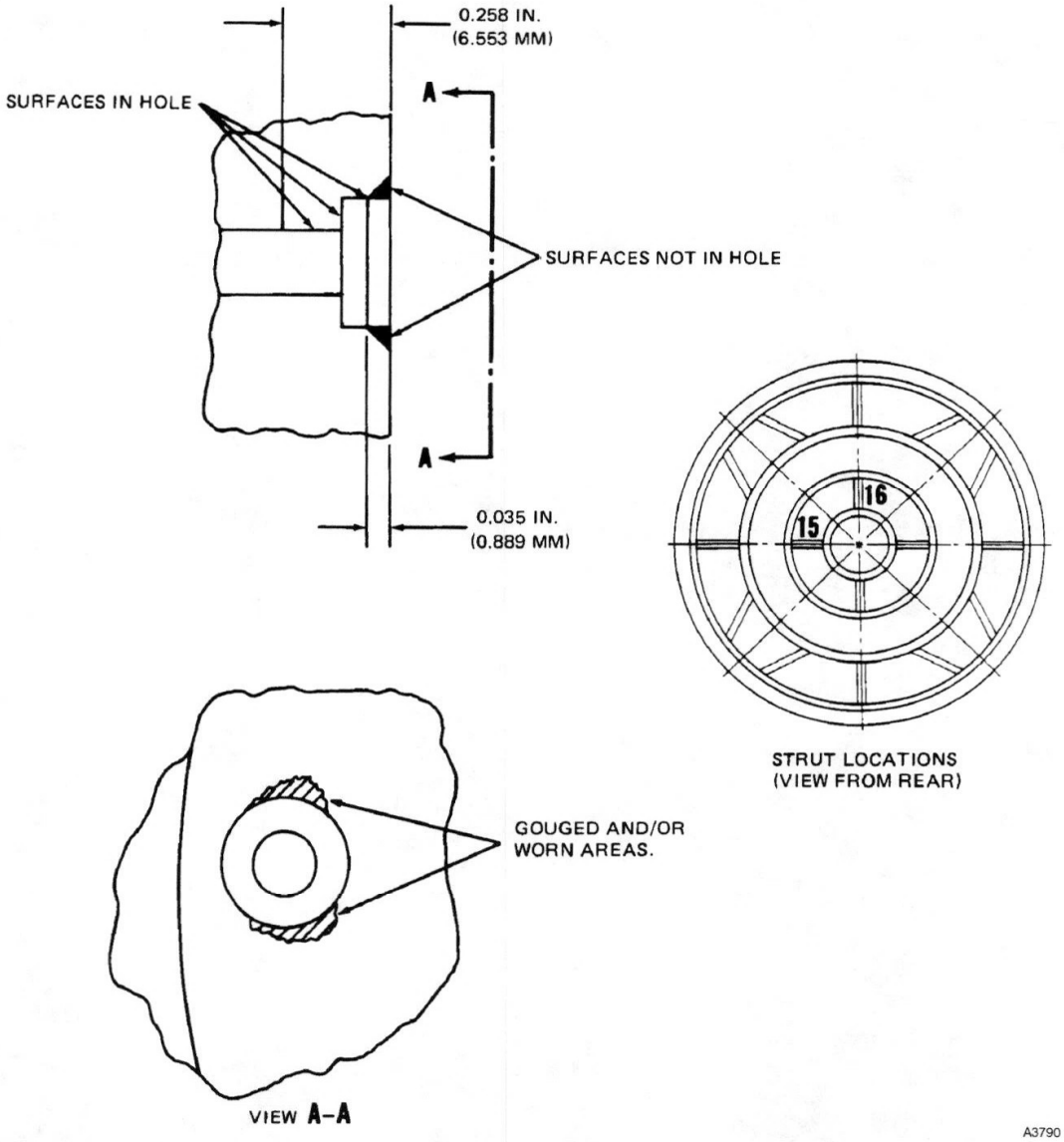
Inspection of Carrier Assembly Mounting Surface for Cracks
Figure 807



Inspection of the 26.989 to 26.999 Inch (685.52 to 685.78 Millimeter) Diameter Flange Area
Figure 808



Inspection of 13.338 to 13.340 Inch (338.79 to 338.84 Millimeter) Reduction Gear Carrier and Carrier Spring Pilot Diameter
Figure 809



Inspection of Oil Transfer Holes for Wear
Figure 810

SUPPORT FRAME ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-063-010-08/-11	-01 thru -09 and -11 thru -30	None
2-063-010-R16/18/-26	-01 thru -30	None
2-063-010-27	-01 thru -30	ALF502R 72-313

SUPPORT FRAME ASSEMBLY – REPAIR-01

1. Repair Nicks, Burrs, Scratches, Minor Cracks, or Other Surface Defects – Repair-01

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

      (1) Remove nicks, burrs, scratches, minor cracks, and other surface defects by blend-repair. (Refer to 70-25-01, SPM.)

      (2) Using blue or gray epoxy resin method, as applicable, touch-up repaired area. (Refer to 70-30-20, SPM.)

SUPPORT FRAME ASSEMBLY – REPAIR-02

1. Repair Engine Mounting Pad Pilot Corrosion by Epoxy Filling – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Epoxy Adhesive	01-04

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Mechanically remove corrosion from base and side walls of affected engine mounting pad pilot. Clean-up shall not exceed a depth of 0.190 inch (4.83 millimeter) unless Repair-03 has been done and oversized Rosan inserts have been installed in any of the engine mount pad bolt holes. If Repair-03 has been done, the maximum side wall clean-up depth is 0.0100 inch (0.254 millimeter) in areas within 0.75 inch (19.1 millimeter) of the Rosan inserts.

(2) Inspect per Inspection/Check to verify that corrosion removal limits have not been exceeded.

(3) Using acetone or equivalent, clean the entire area.

(4) Chrome pickle bare metal surfaces per 70-30-18, SPM, except do not apply primer or grey enamel.

(5) Using epoxy (70-30-22, SPM) fill to restore material removed from mount pad pilot diameter during corrosion removal.

(6) Machine excess epoxy flush to existing surfaces. If necessary, reapply chrome pickle solution.

(7) Apply sealant, strontium chromate primer, and machinable friction reducing coating in accordance with 70-30-14, SPM.

(8) Finish machine mounting pad pilot as shown in *Figure 901*.

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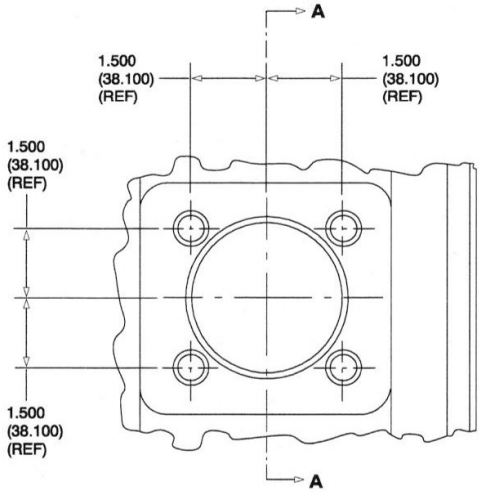
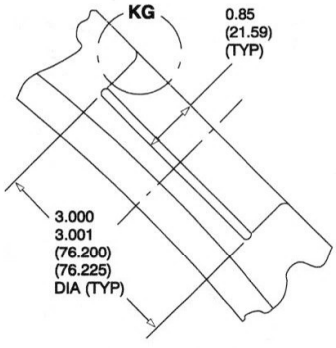
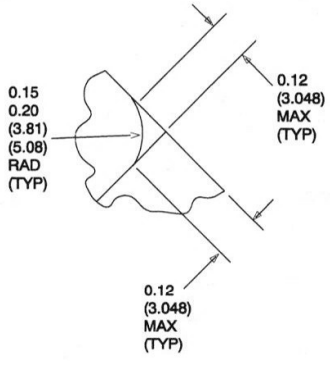


LOCATING DIAMETER CENTER



SECTION **A – A**



DETAIL **KG**

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS) I58202

Final Machining of Engine Mount Pad Pilot
Figure 901

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SUPPORT FRAME ASSEMBLY – REPAIR-03

1. Replacement of Corroded or Loose Rosan Inserts and Lock Rings in Engine Mount Pads – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
R210-D	Drive Tool (Rosan Inc, Newport Beach, CA)
R1111-W	Wrench (Rosan Inc, Newport Beach, CA)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Nitric Acid	04-06
Sodium Dichromate	04-23
Zinc Chromate Primer	01-31

B. Procedure

(1) Remove inserts and lock rings. (Refer to 70-25-03, SPM.)

(2) Using acetone or equivalent, clean entire area.

CAUTION: DO NOT USE OVERSIZED INSERTS TO REPAIR 0.7500-10 UNC THREADED HOLES IN CONJUNCTION WITH 72-32-04, REPAIR-04, OR ANY OTHER REPAIR THAT WOULD REDUCE PARENT METAL EDGE DISTANCE. ALSO, DO NOT USE OVERSIZED INSERTS TO REPAIR MORE THAN ONE HOLE PER ENGINE MOUNT PAD.

DURING DRILLING, DO NOT INCREASE EXISTING HOLE DEPTH.

(3) Inspect hole for corrosion or damaged threads. If threads are damaged, drill hole oversize to existing hole depth; then, using 0.875-14 UNC-3B bottom tap, thread oversized hole.

NOTE: For exact hole configuration, use requirements specified by Rosan Inc., Newport Beach, CA for replacement insert MS51993S-508 or MS51993S-648L.

1. B. (4) Remove corrosion from lock ring counterbore.

(5) Prepare solution of chrome pickle consisting of: sodium dichromate (1.5 pounds; 0.681 kilograms) and nitric acid (1.5 pints; 0.709 liter), with specific gravity of 1.42, to 1 gallon (3.8 liters) of water. Maintain solution at room temperature.

(6) Using cotton swab, apply chrome pickle solution to all bare magnesium surfaces. Treat hole and counterbore of removed insert with chrome pickle solution.

(7) Allow chrome pickle solution to remain on surfaces for 2 to 5 minutes. Rinse in clean, cold water and allow to air-dry.

(8) Coat threads of both hole and insert with zinc chromate primer.

NOTE: If insert was loose and hole has been drilled oversize, disregard following Step (9) and proceed to following Step (10). If hole has not been drilled oversize, proceed to following Step (9) and disregard following Step (10).

(9) Install new Rosan inserts MS51991E210 and lock rings MS51990E110 into wet zinc chromate primer. (Refer to 70-25-03, SPM.)

CAUTION: IF REQUIRED, WHEN INSTALLING OVERSIZED ROSAN INSERT, REMOVE MATERIAL FROM BOTTOM OF ROSAN INSERT SO THAT IS DOES NOT COME IN CONTACT WITH BOTTOM OF HOLE DURING INSTALLATION.

(10) Install new oversize Rosan insert MS51993S-508 and lock ring MS51997-108P into wet zinc chromate primer in place of original Rosan insert and lock ring, ensuring lock ring is installed with serrations away from pilot hole. (Refer to 70-25-03, SPM.)

NOTE: Rosan insert MS51993S-648L may be used as an alternate for Rosan insert MS51993S-508; however, self-locking feature of insert must be removed with an 0.5000-20 UNJF tap.

SUPPORT FRAME ASSEMBLY – REPAIR-04

1. Repair of Corrosion Damage to Engine Mount Pad, Pilots, and Engine to Airframe Mating Surfaces – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
3950	Dremel Moto Tool

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Epoxy Adhesive	01-11
Epoxy Paint	07-09 or -12
Epoxy Paint Catalyst	07-08 or -61
Ethyl Alcohol	07-19
Nitric Acid	04-06
Silicon Carbide Sandpaper	05-23
Sodium Dichromate	04-23
Steel	08-47, -49

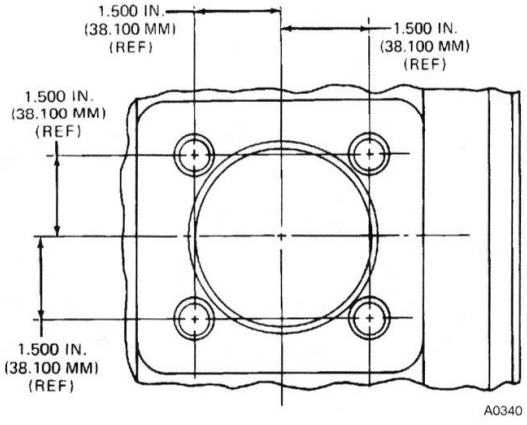
B. Procedure

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

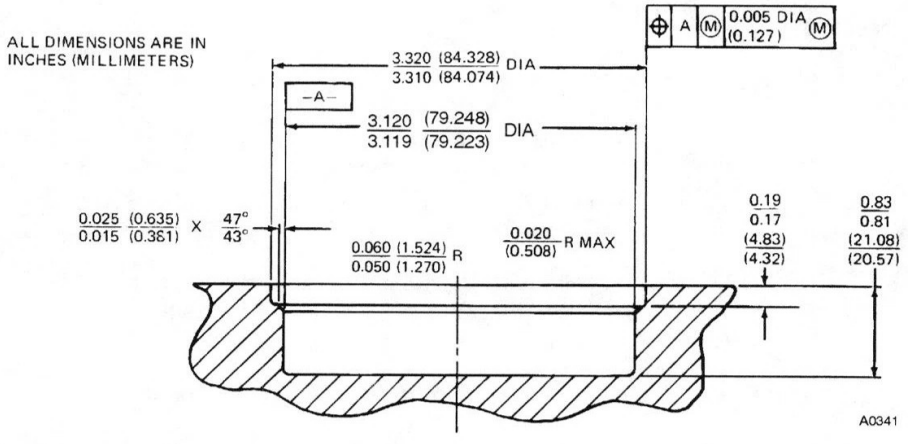
CAUTION: DO NOT USE THIS REPAIR IF REPAIR-03 HAS BEEN ACCOMPLISHED AND OVERSIZED INSERTS HAVE BEEN INSTALLED IN ANY OF THE ENGINE MOUNT PAD BOLT HOLES.

(1) Using a Dremel Moto Tool and a small stone, remove corrosion.

(2) Locating from an unaffected wall of mount pad pilot, drill existing 3.000 to 3.001 inch (76.2 to 76.23 millimeter) diameter oversize to 3.119 to 3.120 inches (79.22 to 79.25 millimeters). (See *Figure 901* for locating diameter center.)



Locating Diameter Center
Figure 901



Counterboring Oversize Diameter
Figure 902

1. B. (3) Counterbore to 3.310 to 3.320 inch (84.07 to 84.33 millimeter) diameter and to a depth of 0.17 to 0.19 inch (4.3 to 4.8 millimeter). (*See Figure 902.*)

(4) Using acetone or equivalent, clean entire area.

(5) Prepare solution of chrome pickle consisting of: sodium dichromate (1.5 pounds; 0.68 kilogram) and nitric acid (1.5 pints; 0.08 liter), with specific gravity of 1.42, to 1 gallon (3.8 liters) of water. Maintain solution at room temperature.

(6) Using a cotton swab, apply chrome pickle solution to all bare magnesium surfaces.

(7) Allow chrome pickle solution to remain on surfaces for 2 to 5 minutes. Rinse in clear, cold water and allow to air-dry.

(8) Using epoxy (Refer to 70-30-22, SPM), fill to restore material removed from mount pad pilot diameter during corrosion removal. (Refer to Step (1).)

(9) Mask all surfaces adjacent to areas that require dimensional buildup.

(10) Cure epoxy. (Refer to 70-30-22, SPM.)

(11) Requalify mount pad pilot diameter. (*See Figure 902.*) If required, reapply chrome pickle solution.

(12) Fabricate a fan mount sleeve from AMS5636 or AMS5645 material. (*See Figure 903.*)

(13) Heat fan frame to 190 to 210°F (88 to 99°C).

(14) Apply epoxy (Refer to 70-30-22, SPM) to outer diameter and to shoulder of sleeve. Press sleeve into heated fan frame until it bottoms.

(15) Use epoxy (Refer to 70-30-22, SPM) to backfill against fan frame sleeve outer diameter.

(16) Apply epoxy (Refer to 70-30-22, SPM) to restore material to engine to airframe mating surface removed during corrosion clean up. (Refer to Step (1).)

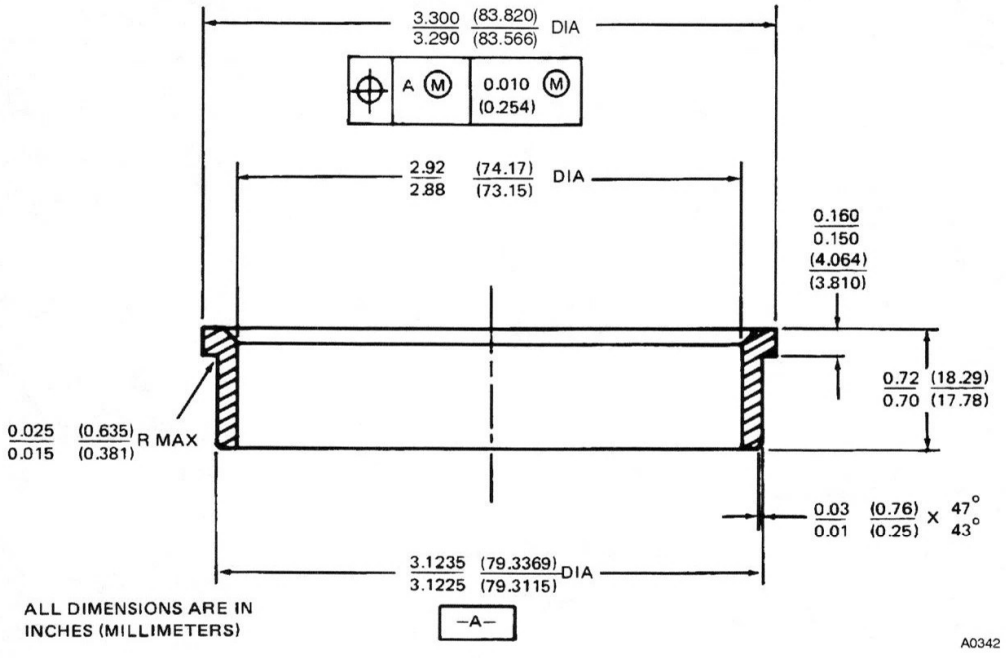
(17) Allow epoxy to cure. (Refer to 70-30-22, SPM.)

1. B. (18) Sand epoxy to meet existing contour. If required, re-apply chrome pickle.

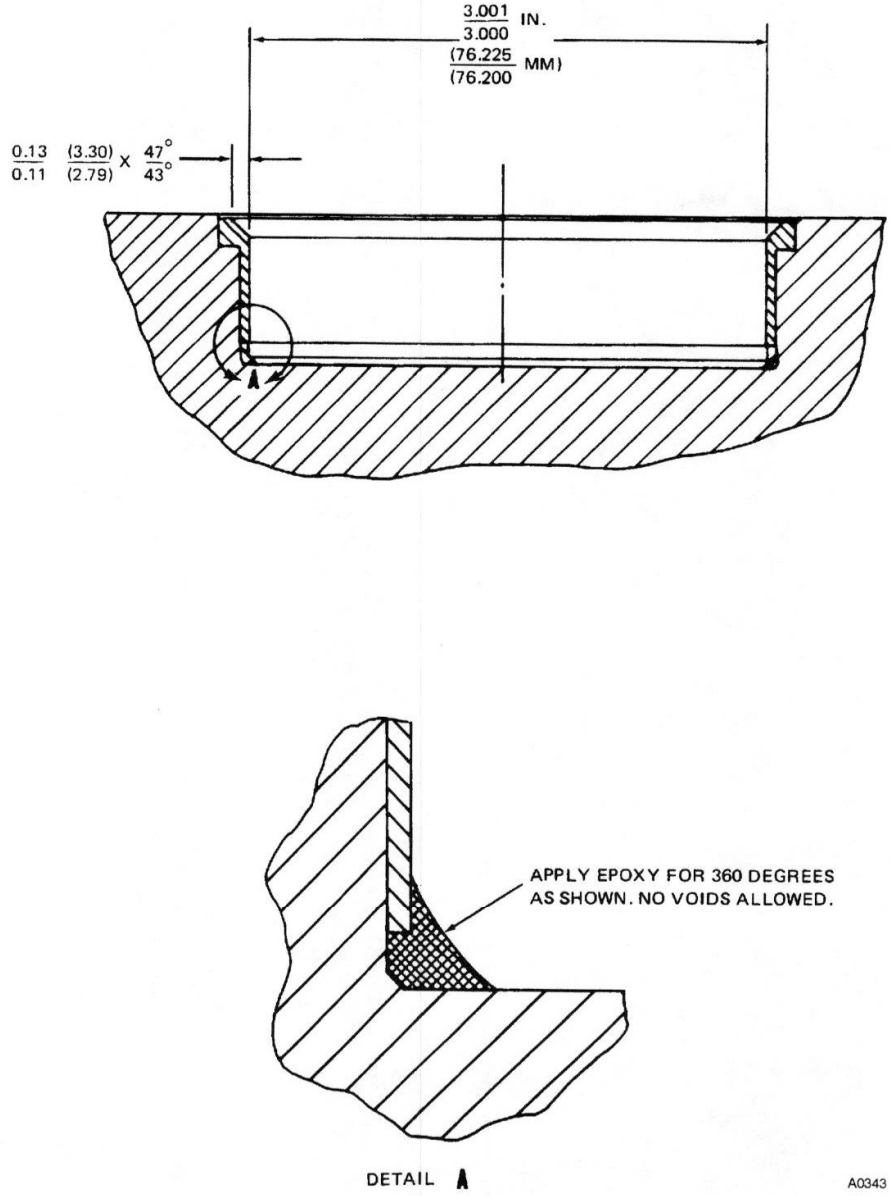
(19) Machine sleeve inside diameter. (*See Figure 904.*)

(20) Apply epoxy (Refer to 70-30-22, SPM) to base of sleeve. (Refer to View A, *Figure 904.*) Allow assembly to cure. (Refer to 70-30-22, SPM.)

(21) Using blue or gray epoxy paint method as applicable, touch-up entire area. (Refer to 70-30-14, SPM.)



Fan Mount Sleeve Fabrication
Figure 903



Machining Sleeve Inside Diameter
Figure 904

SUPPORT FRAME ASSEMBLY – REPAIR-05

1. Replacement of Stripped or Loose Rosan Inserts That Secure No. 12 Bearing Assembly to Support Frame Assembly – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
SR19R	Removal, Tool (Rosan Inc, Newport Beach, CA)
SR19W-A	Drive Tool (Rosan Inc, Newport Beach, CA)
248-3	Installation Tool (Emhart Fastening System Group, Danbury, CT)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22

Repair Parts:

		IPC Reference		
Name	Part Number	Chap-Sect-Subj	Figure	Item
Insert	976C-3SE-0312			
Key Ring	704-5			

B. Procedure

(1) Remove damaged Rosan insert. (Refer to 70-25-03, SPM.)

(2) Using acetone or equivalent, clean entire area.

(3) Drill existing hole. (*See Figure 901.*)

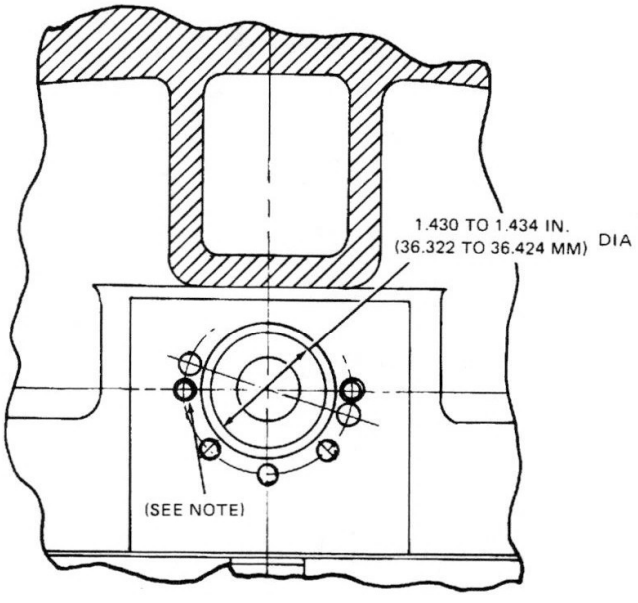
(4) Visually inspect 1.430 to 1.434 inch (36.32 to 36.42 millimeter) diameter bearing bore for wear or chatter marks. (*See Figure 901.*)

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

(5) If wear or chatter marks exist, blend-repair bearing bore to 1.4350 inches (36.449 millimeters) maximum. (Refer to 70-25-01, SPM.)

1. B. (6) Touch-up repaired area. (Refer to 70-30-18, SPM.)

(7) Using installation tool, install keylox insert 976C-3SE-0312 and key ring 704-5 into support frame assembly. (Refer to 70-25-03, SPM.)



NOTE:

1. DRILL HOLE TO A DIAMETER OF 0.2719 TO 0.2799 INCH (6.9063 TO 7.1095 MILLIMETERS) TO A DEPTH OF 0.430 INCH (10.922 MILLIMETERS) MAXIMUM.
2. COUNTERBORE HOLE TO A DIAMETER OF 0.317 TO 0.322 INCH (8.052 TO 8.179 MILLIMETERS) TO A DEPTH OF 0.05 TO 0.06 INCH (1.27 TO 1.52 MILLIMETERS)
3. TAP HOLE 5/16-24 UNJF-3B TO 0.347 INCH (8.814 MILLIMETERS) MINIMUM FULL THREAD DEPTH.

A0344

Insert Hole Drilling Requirements
Table 901

SUPPORT FRAME ASSEMBLY – REPAIR-06

1. Repair of Stripped No. 12 Bearing Assembly Support Holes – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
Model D314L	Angle Drill (Desautter Co, Livonia, MI)
SR19D	Step Drill (Rosan Inc, Newport Beach, CA)
SR19R	Removal Tool (Rosan Inc, Newport Beach, CA)
SR19S-A	Swage Tool (Rosan Inc, Newport Beach, CA)
SR19W-A	Drive Tool (Rosan Inc, Newport Beach CA)
77413	Spindle Drive (Desautter Co, Livonia, MI)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Epoxy	01-11
Slimsert (SR192L)	

B. Procedure

(1) If necessary, remove damaged Rosan insert. (Refer to 70-25-03, SPM.)

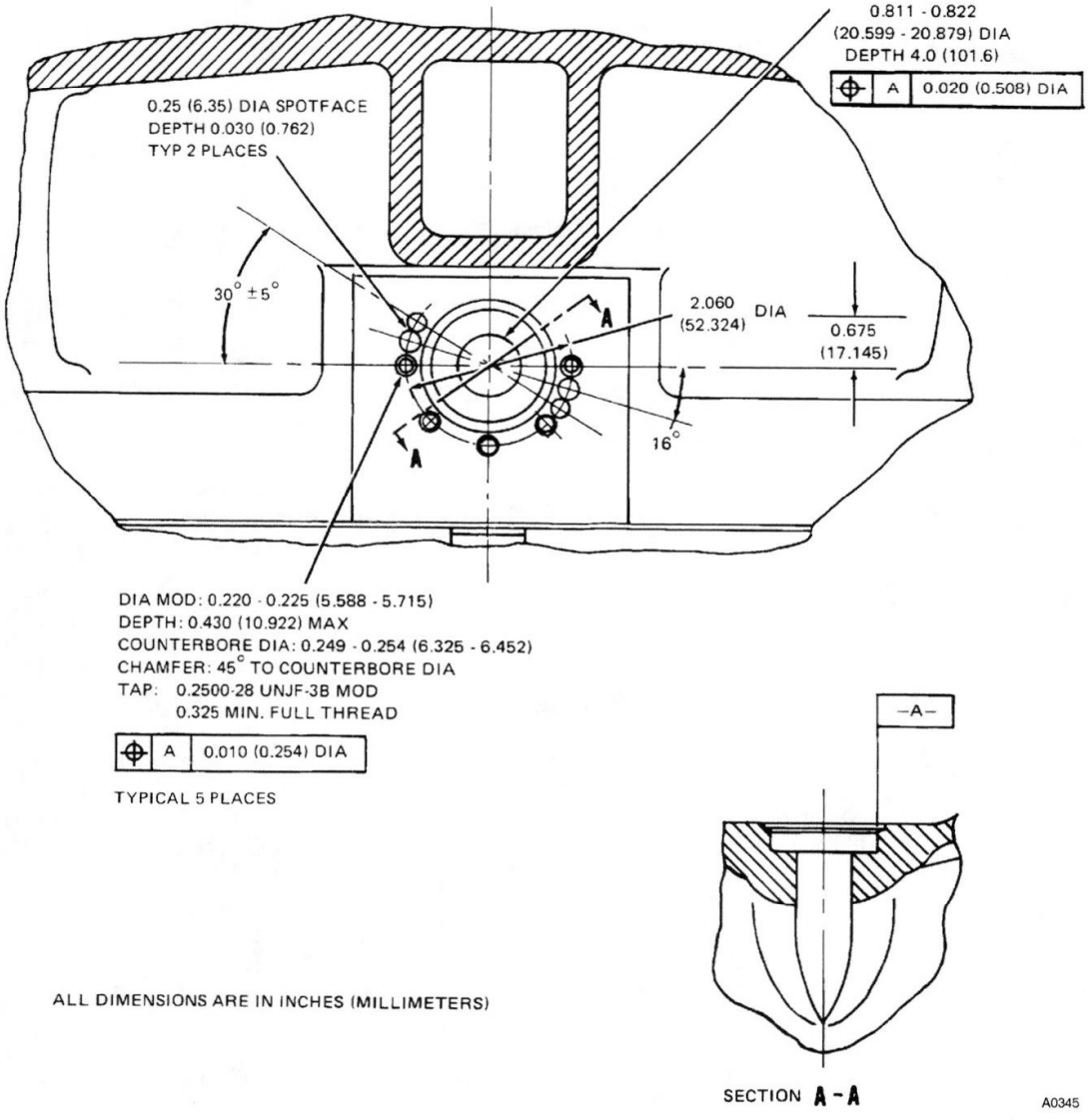
(2) Visually inspect 1.430 to 1.434 inch (36.32 to 36.42 millimeter) diameter bearing bore for wear or chatter marks. (*See Figure 901.*)

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

(3) If wear or chatter marks exist, blend-repair bearing bore to 1.4350 inches (36.449 millimeters) maximum. (Refer to 70-25-01, SPM.)

(4) Fill two existing holes with epoxy. (Refer to 70-30-22, SPM.)

(5) Remove excess epoxy from surface face.



No. 12 Bearing Support Hole Drilling Requirements
Figure 901

1. B. (6) Install No. 12 bearing support. Rotate bearing support 30 degrees clockwise and scribe location for two new holes. (*See Figure 901.*)

(7) Remove No. 12 bearing support.

(8) Using angle drill, spindle, and step drill SR19D, drill and tap relocated holes for 1/4-28 Rosan inserts. (*See Figure 901.*)

(9) Touch-up repaired area. (Refer to 70-30-18, SPM.)

(10) Install Rosan slimserts SR192L. (Refer to 70-25-03, SPM.)

SUPPORT FRAME ASSEMBLY – REPAIR-07

1. Repair of Stripped or Loose Rosan Inserts That are Used to Secure Accessory Drive Gearbox Module to Support Frame Assembly – Repair-07

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
6FPB	Helicoil Tap (Helicoil Products, Danbury, CT)
25/64	Drill
29/64	Drill
3692-6	Tang Breakoff Tool (Helicoil Products, Danbury, CT)
7552-6	Insertion Tool (Helicoil Products, Danbury, CT)
No. 7	Screw Extractor

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Steel Bar	08-48
Zinc Chromate Sealant	01-30

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Lock Pin	MS9105-28			
Insert, Helicoil	3591-6CN0562			

1. B. Procedure

NOTE: This repair is to be used whenever replacement insert cannot eliminate the defect.

(1) Using 29/64 inch (11.5 millimeter) drill and standard screw extractor, remove damaged Rosan insert. (Refer to 70-25-03, SPM.)

(2) Measure the diameter of the insert hole.

NOTE: If the diameter measures 0.6273 inch (15.933 millimeter) or less, do rework specified in following Step (a) and disregard following Step (b). If the hole diameter measures more than 0.6273 inch (15.933 millimeter) and is next to the 0.250 inch (6.35 millimeter) diameter dowel location, disregard following Step (a) and proceed to following Step (b). If the hole diameter measures more than 0.6273 inch (15.933 millimeter) and is not next to a dowel pin location, disregard following Steps (a) and (b) and proceed to following Step (c).

(a) If the insert hole diameter is less than or equal to 0.6273 inch (15.933 millimeter), do the following:

1 Using a 0.6200 to 0.6283 inch (15.748 to 15.959 millimeter) diameter flat-bottom drill, drill insert hole to a depth of 0.83 inch (21.1 millimeter). (*See Figure 901.*)

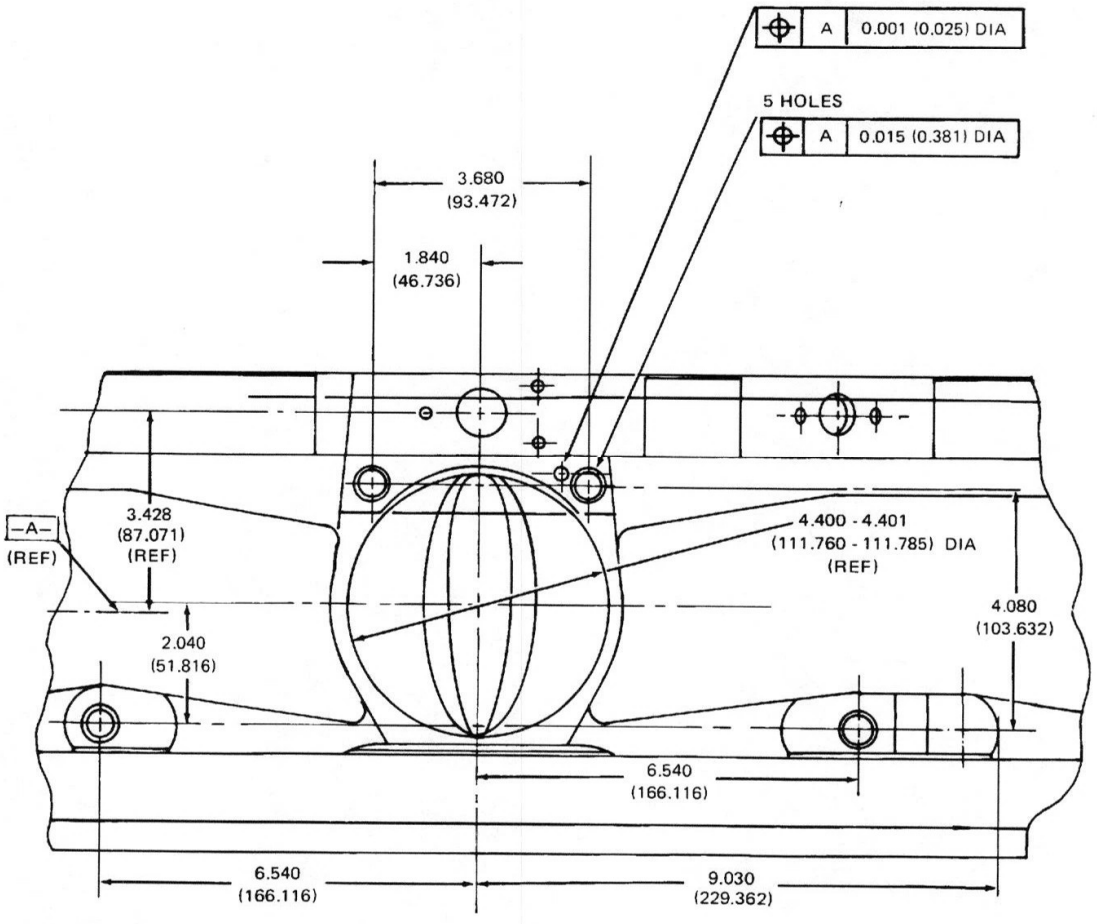
2 Counterbore insert hole to a diameter of 0.6875 to 0.7031 inch (17.462 to 17.859 millimeter) and to a depth of 0.040 to 0.045 inch (1.02 to 1.14 millimeter).

3 Using a 0.6875-16UN-3B bottom tap, thread insert hole to a minimum depth of 0.83 inch (21.1 millimeter).

4 Touch-up all bare surfaces as required. (Refer to 70-30-18, SPM.)

5 Using steel, fabricate a plug. (*See Figure 902.*) All criteria must be met.

6 Using zinc chromate primer, coat threads of both the insert hole and the plug; then while the primer is still wet, install the plug into the insert hole flush to the existing contour.



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

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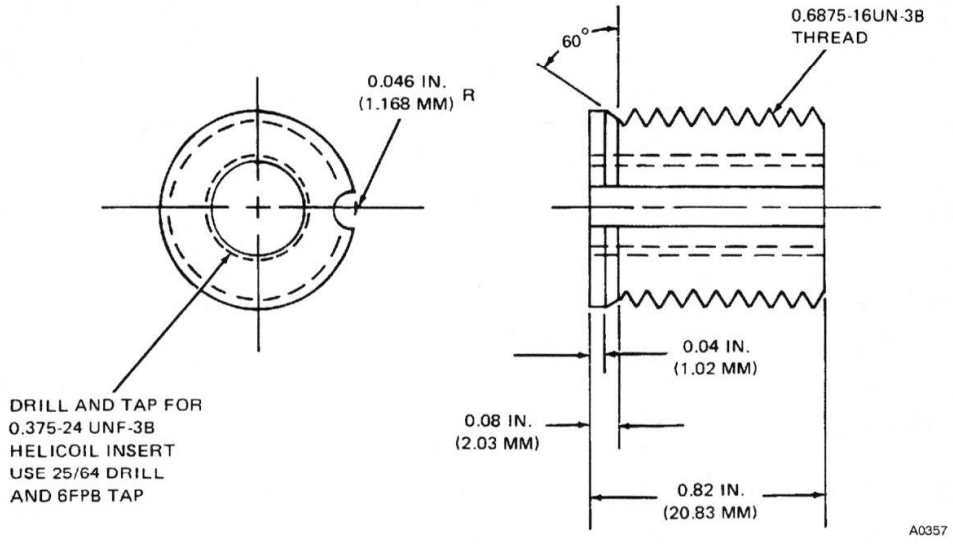
Dimensional Locations for Small Plug Hole
Figure 901

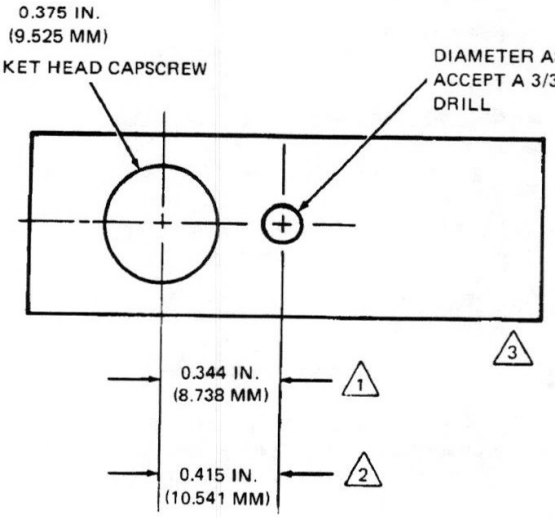
1. B. (2) (a) 7 Using 0.500 inch (12.70 millimeter) thick tool steel, fabricate a drill fixture. (*See Figure 903.*)

8 Using a suitable cap screw, clamp the fabricated drill fixture to the installed plug and align fixture with the groove in the plug.

9 Drill a 0.0938 inch (2.383 millimeter) diameter hole for a lock pin using the groove in the plug as a guide, in the magnesium main frame to a depth of 0.250 inch (6.35 millimeter). (*See Figure 902.*)



Fabrication of Small Plug
Figure 902



1 FOR CLAMPING TO SMALL PLUG WITH 0.6875-16UN-3B THREAD, FABRICATE DRILL FIXTURE WITH THIS DISTANCE BETWEEN HOLES, CENTER-TO-CENTER.

2 FOR CLAMPING TO LARGE PLUG WITH 0.750-16UN-3B THREAD, FABRICATE DRILL FIXTURE WITH THIS DISTANCE BETWEEN HOLES, CENTER-TO-CENTER.

3 ALL OTHER FEATURES OF FIXTURE ARE OPTIONAL

A0358

Fabrication of Drill Fixture
Figure 903

1. B. (2) (b) If the insert hole diameter is greater than 0.6273 inch (15.933 millimeter) but less than 0.6900 inch (17.526 millimeter), do the following:

NOTE: This procedure is only used to repair the insert hole next to the 0.250 inch (6.35 millimeter) dowel pin location.

1 Using a 0.6833 to 0.6908 inch (17.356 to 17.546 millimeter) diameter flat-bottom drill, drill the insert hole to a depth of 0.83 inch (21.1 millimeter). (*See Figure 904.*)

2 Perform the epoxy build-up repair to surfaces within the insert hole that deviate from the bore contour. (See *Figure 905* and 70-30-22, SPM.)

3 Machine epoxy compound to existing bore contour. (*See Figure 905.*)

4 Using a 0.750-16UN-3B bottom tap, thread insert hole to a minimum depth of 0.83 inch (21.1 millimeter).

5 Touch up all bore surfaces as required. (Refer to 70-30-18, SPM.)

6 Using steel, fabricate plug. (*See Figure 906.*) All criteria must be met.

7 Using zinc chromate primer, coat threads of both the insert hole and plug (threads and bottom); then, while primer is still wet, install plug into the insert hole. Plug must be completely bottomed in hole.

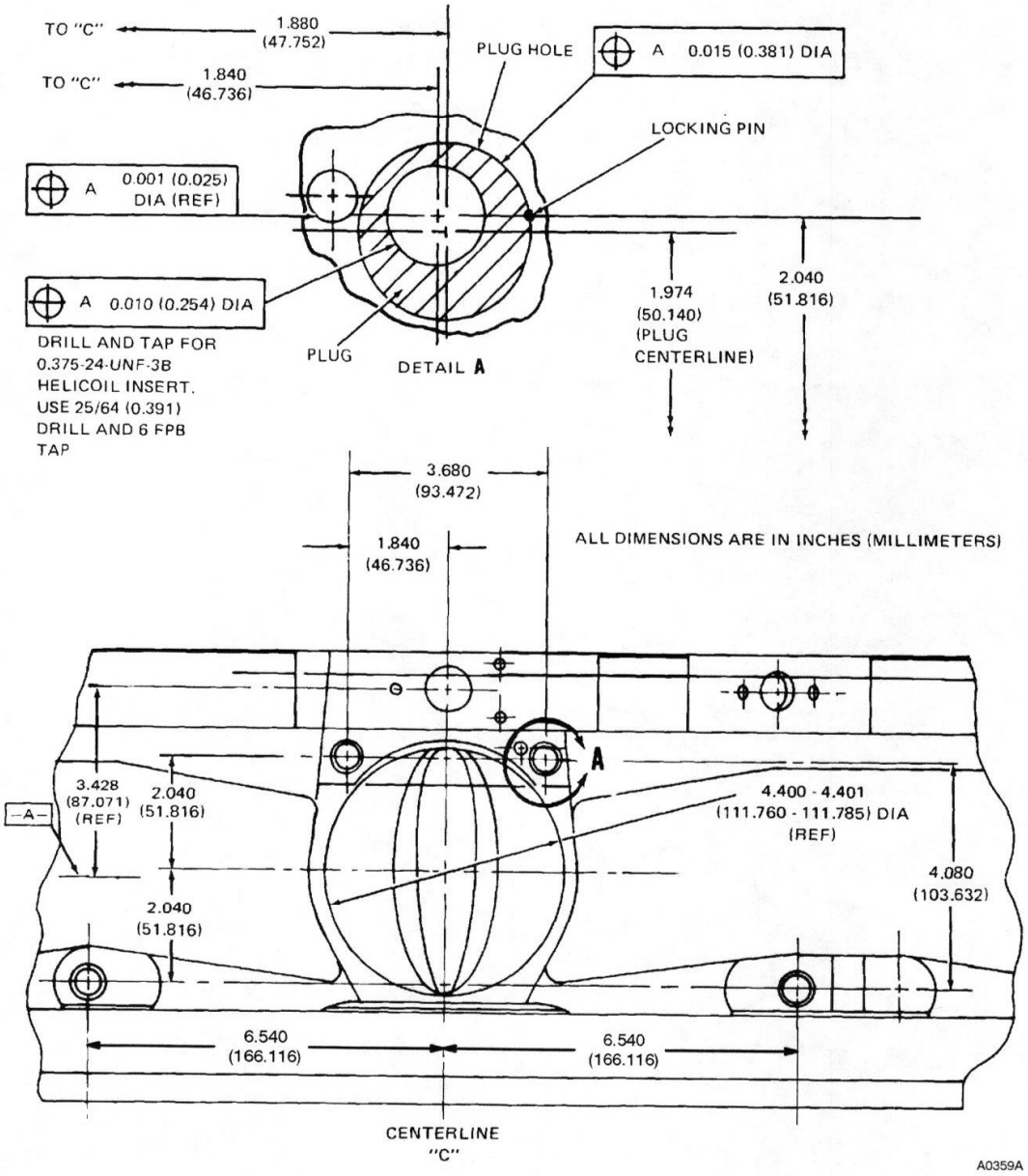
8 Cut off plug head and machine plug to surrounding contour.

9 Drill and tap the plug as required. (*See Figure 904.*)

10 Using 0.500 inch (12.70 millimeter) thick tool steel, fabricate a drill fixture as specified. (*See Figure 903.*)

11 Using a suitable cap screw, clamp the fabricated drill fixture to the installed plug.

12 Drill a 0.0938 inch (2.383 millimeter) diameter hole in the magnesium main frame to a depth of 0.250 inch (6.35 millimeter) for a lock pin. (*See Figure 904.*)



Dimensional Locations for Large Plug Hole
Figure 904

1. B. (2) (c) If the insert hole diameter measure more than 0.6273 inch (15.933 millimeter), but less than 0.6900 inch (17.626 millimeter) and is not next to a dowel pin location, do the following:

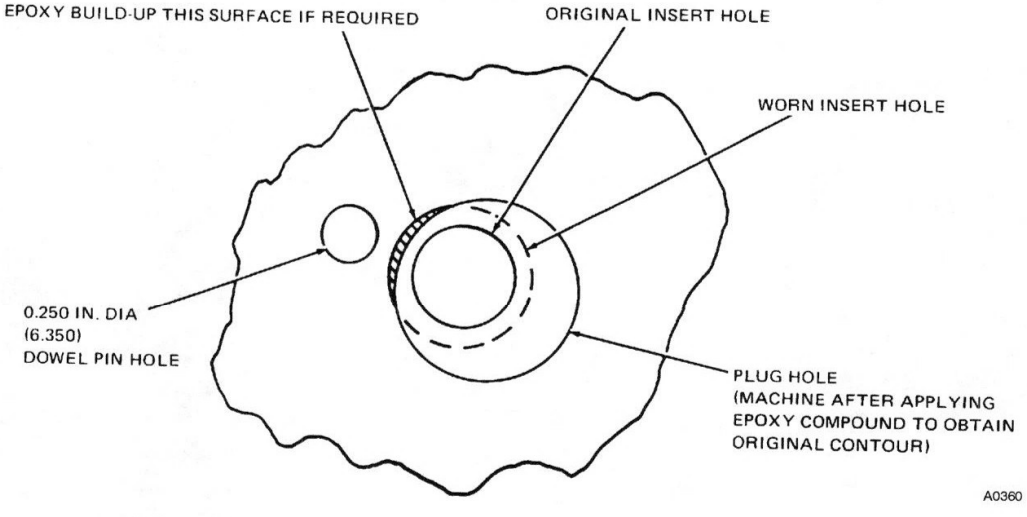
NOTE: This procedure is used to repair the mount holes with a large plug at locations where a dowel pin is not installed.

1 Using a 0.6833 to 0.6908 inch (17.356 to 17.546 millimeter) diameter flat bottom drill, drill the insert hole to a depth of 0.83 inch (21.1 millimeter) at original location. (*See Figure 904.*)

2 Using a 0.750-16UN-3B bottom tap, thread insert hole to a minimum depth of 0.83 inch (21.1 millimeter).

3 Counterbore insert hole to accept the plugs 60° 0.040 to 0.045 inch (1.02 to 1.14 millimeter) chamfer depth.

4 Touch-up all bore surfaces as required. (Refer to 70-30-18, SPM.)



Epoxy Build-Up of Worn Insert Hole
Figure 905

1. B. (2) (c) 5 Using steel, fabricate plug. (*See Figure 906.*) All criteria must be met.

6 Using zinc chromate primer, coat threads of both the insert hole and plug (threads and bottom); then, while primer is still wet, install plug into the insert hole. Plug must be completely bottomed in hole.

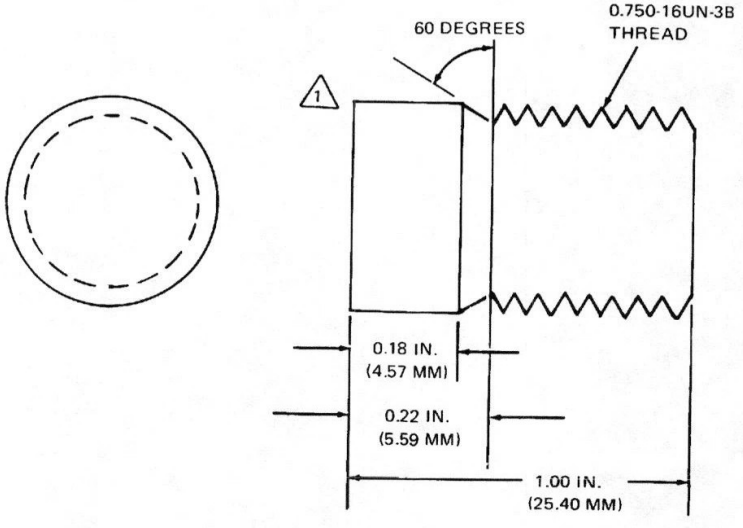
7 Cut off plug head and machine plug to surrounding contour.

8 Drill and tap the plug for Helicoil insert as required. (*See Figure 904.*)

9 Using 0.500 inch (12.70 millimeter) thick tool steel, fabricate a drill fixture as specified. (*See Figure 903.*)

10 Using a suitable cap screw, clamp the fabricated drill fixture to the installed plug.

11 Drill a 0.0938 inch (2.383 millimeter) diameter hole in the magnesium main frame to a depth of 0.250 inch (6.35 millimeter) for a lock pin. (*See Figure 904.*)



Fabrication of Large Plug
Figure 906

1. B. (3) Treat exposed magnesium with chrome pickle solution. (Refer to 72-30-18, SPM.)

(4) Coat lock pin MS9105-28 with zinc chromate primer.

(5) Install lock pin wet in hole flush or below existing surface.

(6) Stake lock pin securely.

(7) Drill for insert at location specified in *Figure 904.*

(8) Using tang breakoff tool and insertion tool, install screwlock helicoil insert 3591-6CN0562. (Refer to 70-25-03, SPM.)

(9) Touch up entire area. (Refer to 70-30-14, SPM.)

SUPPORT FRAME ASSEMBLY – REPAIR-08

1. Repair Discrepant 4.400 to 4.401 Inch (11.76 to 11.79 Millimeter) Diameter – Repair-08

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Magnesium (AMS4350, AMS4352) or	08-19, -20
Magnesium (AZ61A-F, ZK60A-T5)	08-19A, -20A
Zinc Chromate Primer	01-31A

B. Procedure

(1) Bore diameter oversize to 4.515 inches (114.68 millimeters) to a depth of 1.0 inch (25 millimeter). (*See Figure 901.*)

(2) Using magnesium AMS4352 or equivalent, fabricate sleeve. (*See Figure 902.*)

(3) Coat bore ID and sleeve OD with zinc chromate primer; then install sleeve while primer is still wet. Ensure that sleeve bottoms.

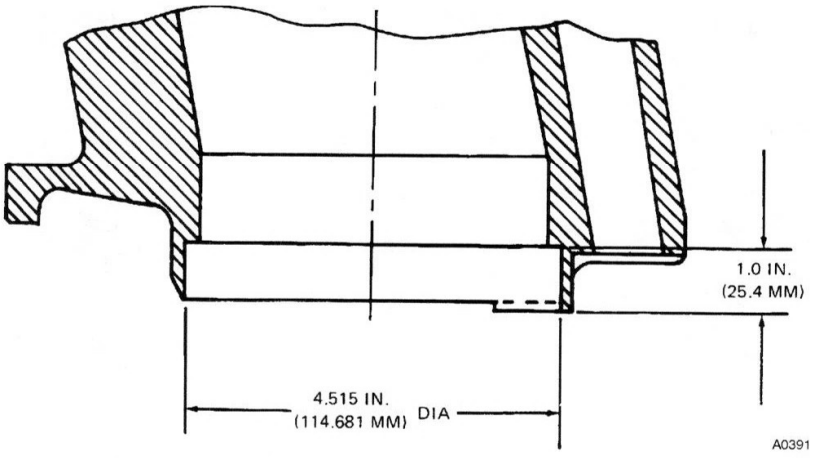
(4) Using magnesium AMS4350 or equivalent, fabricate two lock pins. (*See Figure 903.*)

(5) Drill and ream lock pin holes. (*See Figure 904.*)

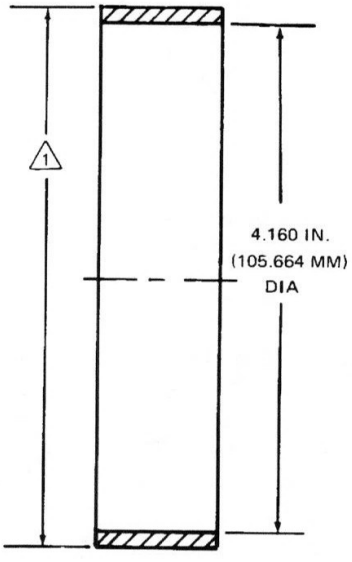
(6) Coat lock pins and holes with zinc chromate primer; then install lock pins while primer is still wet.

(7) Machine to specified dimensions. (*See Figure 905.*)

(8) Touch up exposed surfaces. (Refer to 70-30-19, SPM.)



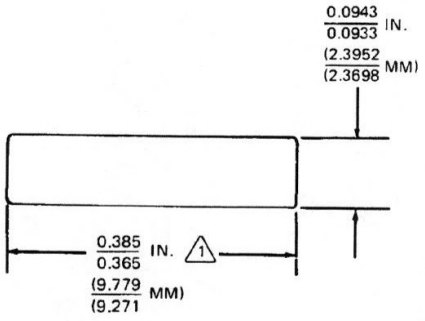
Oversized Bore Dimensions
Figure 901



1 DIAMETER TO BE 0.001 TO 0.002 INCH (0.025 TO 0.051 MM) TIGHT FIT WITH OVERSIZED BORE.

A0392

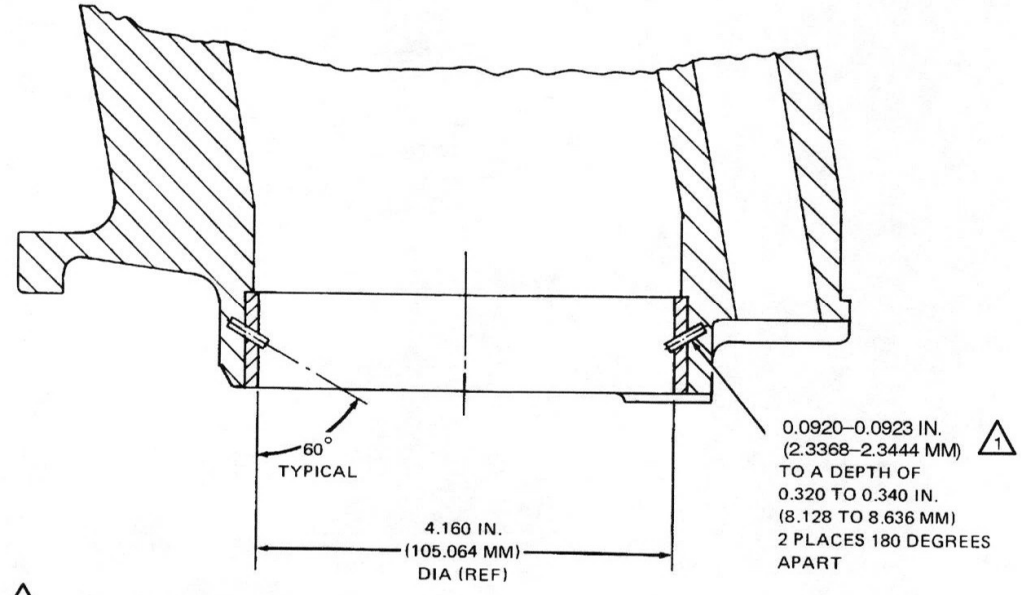
Fabrication of Sleeve
Figure 902



1 BREAK SHARP EDGES 0.003 TO 0.015 INCH (0.076 TO 0.381 MM). LOCKPIN TO BE STRAIGHT WITHIN 0.001 IN. (0.025 MM).

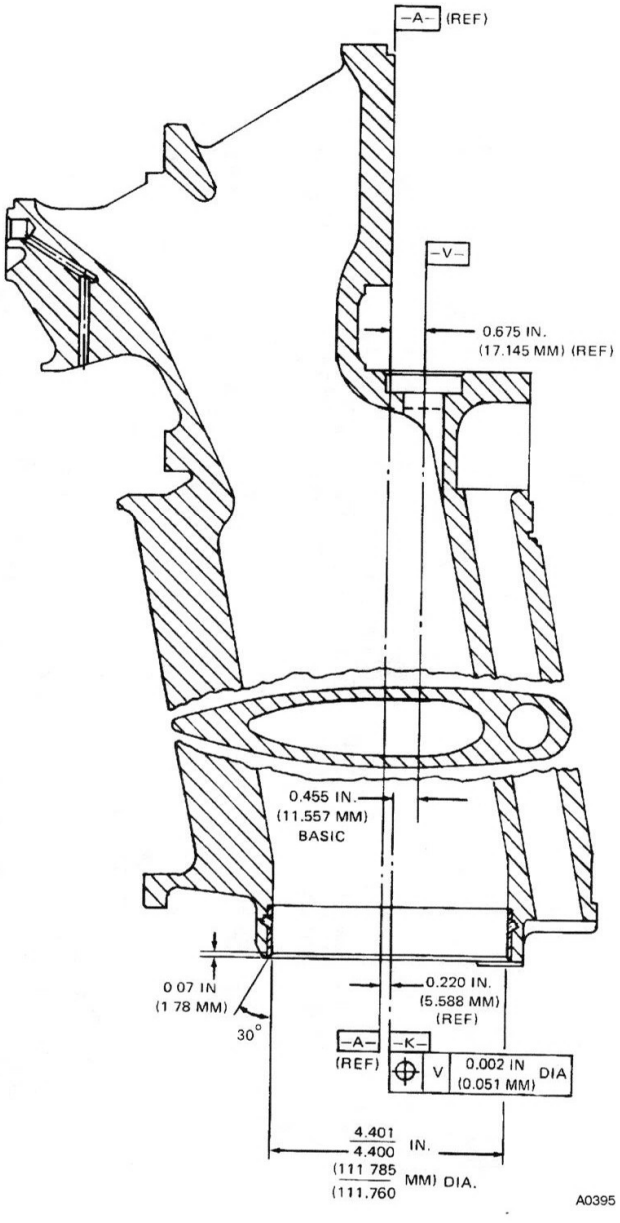
A3795

Fabrication of Lock Pins
Figure 903



A0394

Lock Pin Locations
Figure 904



Final Machining Dimensions
Figure 905

SUPPORT FRAME ASSEMBLY – REPAIR-09

1. Repair of 0.101 to 0.107 Inch (2.57 to 2.72 Millimeter) Deep Shoulder – Repair-09

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Aluminum Oxide Abrasive (70 Grit)	05-11
Magnesium (AMS4350, AMS4377) or Magnesium (AZ61A-F, AZ31B-H24)	08-19, -21 or 08-19A, -21A
Primer	01-09
Retaining Compound	01-07

B. Procedure

(1) Mask adjacent holes and passages to prevent introduction of machining chips.

(2) Machine shoulder as required to accept a shim having a 0.100 to 0.110 inch (2.54 to 2.79 millimeter) final machined thickness. (*See Figure 901.*)

(3) Fabricate a shim from magnesium alloy having a 0.001 to 0.005 inch (0.03 to 0.13 millimeter) tight fit with the 14.665 to 14.675 inch (372.49 to 372.75 millimeter) inside diameter. Break sharp edges to a 0.030 inch (0.76 millimeter) radius (approximately).

NOTE: Shim ID and thickness may be varied to facilitate installation but must meet requirements of the finished product.

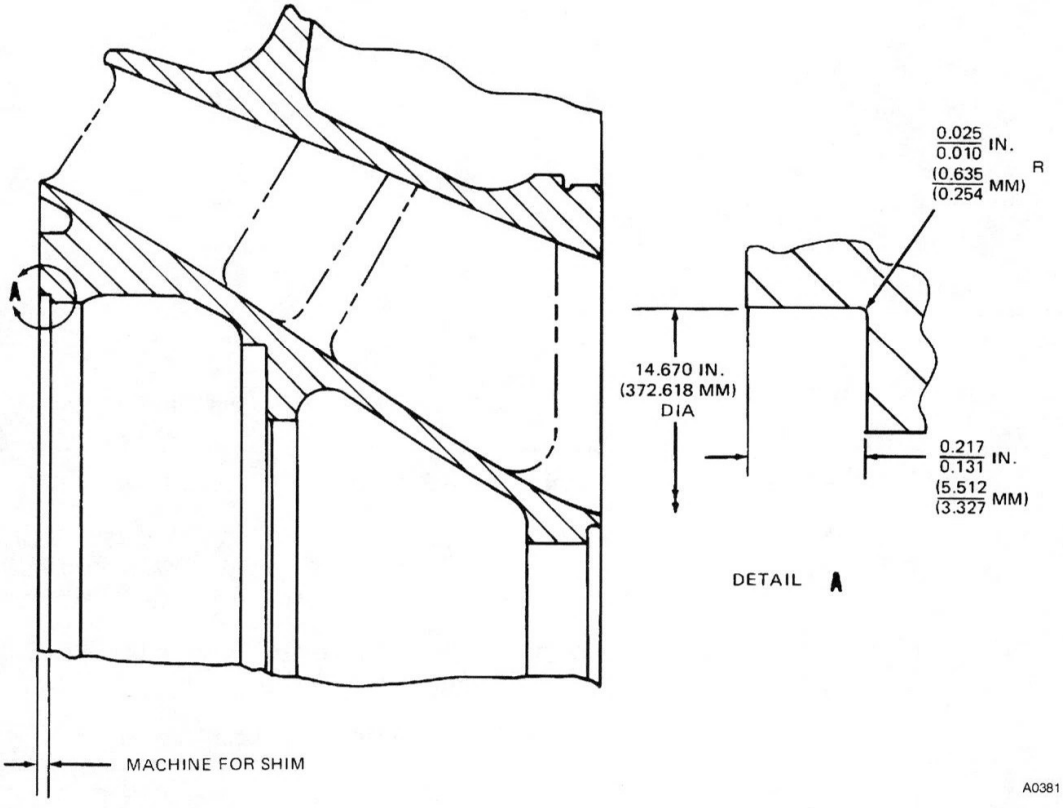
(4) Prepare surfaces for application of primer and retaining compound as follows:

(a) Using acetone or equivalent, thoroughly clean surfaces to be bonded.

(b) Using aluminum oxide grit delivered at 65 psi (448.18 kN/m^2) suction pressure, grit-blast affected surfaces.

(c) Using a clean, dry air blast, remove all residual grit.

NOTE: Primer and retaining compound shall be applied within 2 hours of surface preparation.



Machining of 0.101 to 0.107 Inch (2.57 to 2.72 Millimeter) Deep Shoulder to Accept Shim
Figure 901

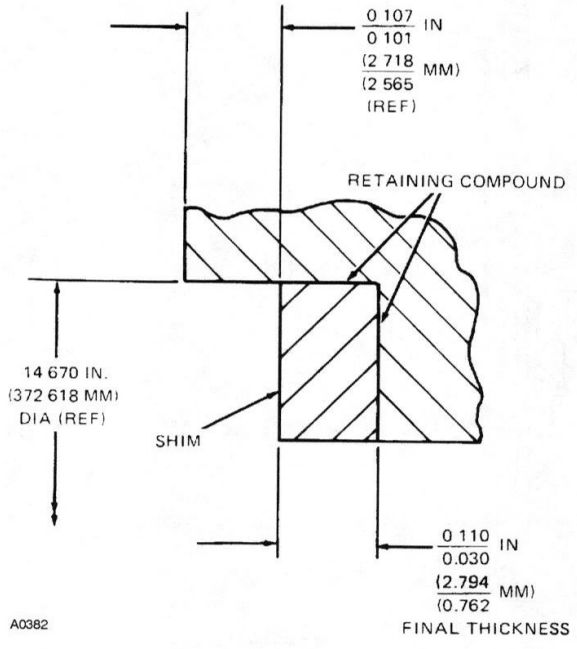
1. B. (5) Apply Loctite primer and retaining compound to surfaces to be bonded in accordance with manufacturer's instructions; then install fabricated shim. (*See Figure 902.*)

NOTE: Retaining compound shall be cured in accordance with manufacturer's instructions.

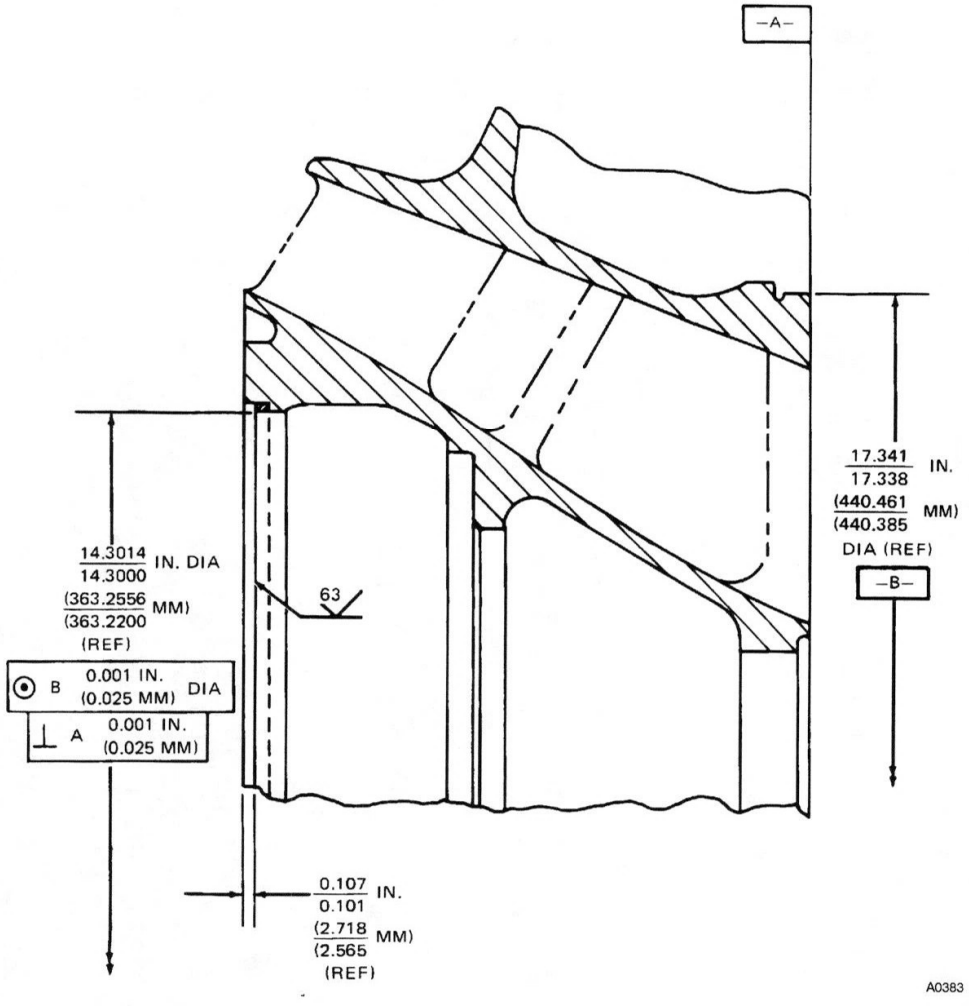
(6) Machine shim to specified dimensions. (*See Figure 903.*)

(7) Remove excess retaining compound.

(8) Touch up surfaces as required. (Refer to 70-30-20, SPM.)



Installation of Fabricated Shim
Figure 902



Final Machining of 0.101 to 0.107 Inch (2.57 to 2.72 Millimeter) Dimension
Figure 903

SUPPORT FRAME ASSEMBLY – REPAIR-10

1. Repair or Replacement of Loose Locating Pins – Repair-10

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT1218	Mechanical Puller
LTCT7675	Gage and Reaming Kit
LTCT7676	Pin Removal Fixture
LTCT7685	Adapter
Model A-1	Automatic Recessing Tool

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Alcohol	07-20
Aluminum Oxide Abrasive (80 Grit)	05-11
Dry Ice	10-12
Liquid Argon	10-04
Liquid Nitrogen	10-15
Nitric Acid	04-06
Primer	01-09
Retaining Compound	01-08
Sodium Dichromate	04-23
Steel	08-59
Thread Locking Compound	01-05

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Pin	2-063-017-04/ -05/-06			
Retaining Ring	2-073-005-01			

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1. B. Procedure

NOTE: Accomplish repair and replacement of one loose pin at a time; do not remove reaming fixture assembly between each pin replacement effort.

(1) Remove loose pin from frame assembly.

NOTE: New pins may be manufactured. (Refer to following Step (2).) Existing pins may be chrome plated or nickel plated (Refer to following Step (3) or (4)), as required, to achieve a larger OD on the pin shank.

(2) Manufacture a new pin with an oversize shank as follows:

(a) Using steel bar, rough machine a new pin to specified dimensions. *(See Figure 901.)*

(b) Heat-treat manufactured pin as follows:

1 Heat part in an oven to 1525 to 1575°F (829.4 to 857.2°C) and hold at heat for 30 minutes.

2 After 30 minutes have elapsed, quench part in oil.

3 Immediately reheat part to 880 to 920°F (471 to 493°C) and hold at heat for 2 hours.

4 After 2 hours have elapsed, allow part to cool in air.

5 Check that hardness of pin is HRc 37 to 42 or equivalent.

(c) Final machine pin to specified dimensions. *(See Figure 901.)*

(d) Surface treat pin. (Refer to 70-30-03, SPM.)

(e) Magnetic-particle inspect pin. (Refer to 70-20-03, SPM.)

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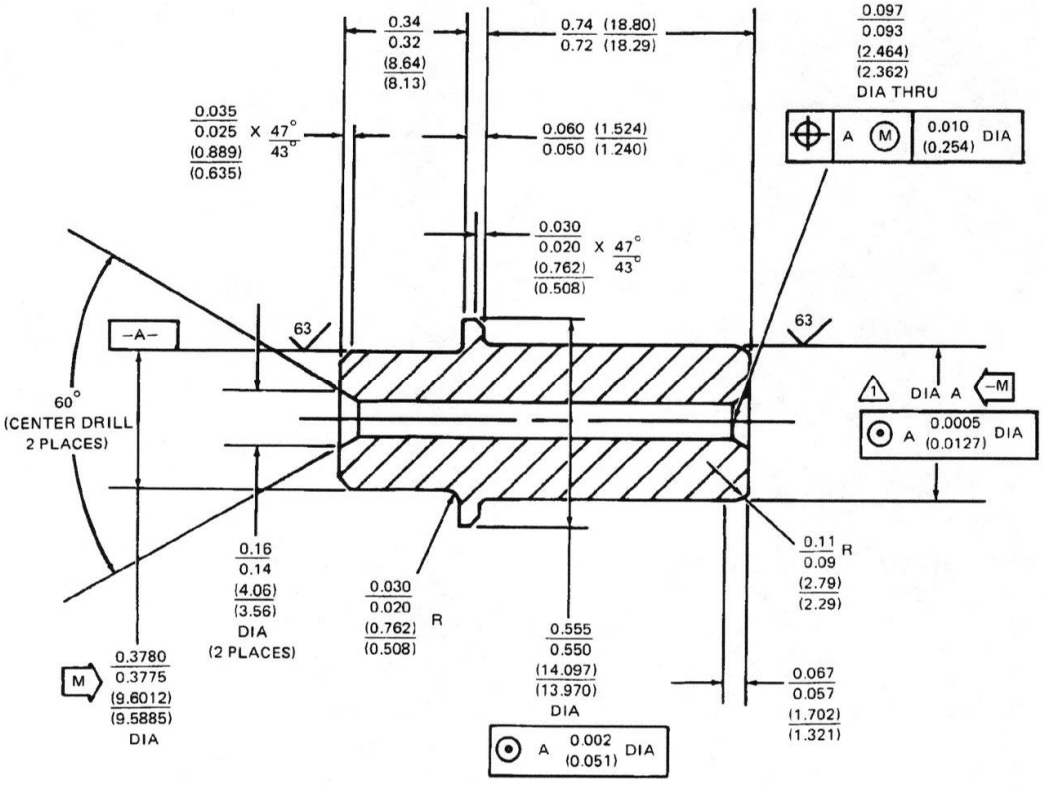
ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)



1 DIAMETER A MAY VARY IN AMOUNT OF DISCREPANCY UP TO 0.440 INCH (11.176 MILLIMETERS) MAXIMUM. DIAMETER TO BE 0.0012 TO 0.0025 INCH (0.0305 TO 0.0635 MILLIMETER) TIGHT FIT WITH PIN HOLE.

A3796

Fabrication of Pin
Figure 901

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1. B. (3) Chrome-plate the existing pin to achieve a larger OD on the shank as follows:

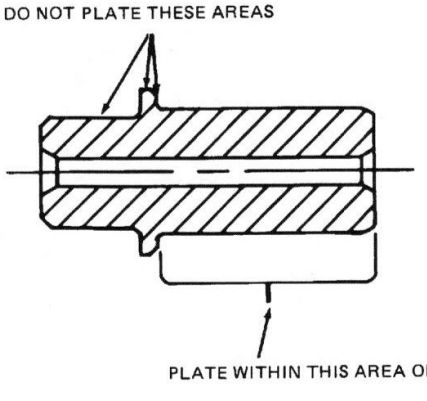
NOTE: If pin has previously been plated, original plating must be removed before plating again.

(a) Using aluminum oxide grit at 60 psi (413.7 kN/m^2), remove surface finish from pin.

(b) Chrome-plate pin as required to obtain a plate thickness of 0.002 to 0.015 inch (0.05 to 0.38 millimeter) after final machining. (Refer to 70-35-01, SPM and *Figure 902.)*

(c) Heat-treat part in air at 365 to 385°F (185 to 196°C) for 3 hours.

(d) Finish machine pin to specified dimensions. *(See Figure 901.)*



1 PLATING CANNOT EXCEED 0.015 INCH (0.381 MILLIMETER) RADIAL THICKNESS

A1787

Plating of Pin
Figure 902

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1. B. (4) Nickel-plate the existing pin to achieve a larger OD on the shank as follows:

NOTE: If pin has previously been plated, original plating must be removed before plating again.

(a) Nickel-plate pin as required to obtain a plate thickness of 0.002 to 0.015 inch (0.05 to 0.38 millimeter) after final machining. (Refer to 70-35-03, SPM and *Figure 902.)*

(b) Finish machine pin to specific dimensions. *(See Figure 901.)*

(5) Replace pin found to be loose with pin having an oversize shank OD, (Refer to preceding Step (2), (3), or (4)) as follows:

(a) Mask all openings to prevent entry of foreign material.

(b) Install gage and reaming assembly LTCT7675-08, detail of LTCT7675, with 0.3815 inch (9.690 millimeter) ID bushings installed to engage properly positioned pins. Secure reaming assembly to the frame assembly with the four locators and integral jack screws.

(c) Select an appropriate size reamer to ensure a 0.0012 to 0.0025 inch (0.031 to 0.064 millimeter) tight fit between pin and hole is maintained.

(d) Remove the 0.3815 inch (9.690 millimeter) bushing over the loose pin and install an ANSI STD bushing having an 0.750 inch (19.05 millimeter) OD and an appropriate ID as determined by the selected reamer size.

(e) Install stop LTCT7675-29, detail of LTCT7675, on reamer.

(f) Fully install reamer cutting end into set block LTCT7675-28, detail of LTCT7675. Adjust stop against set block to obtain a 2.950 inch (74.93 millimeter) distance between the bushing contact face of the stops and the cutting end face of the reamer. Tighten set screw 70 to 75 pound-inches (7.9 to 8.5 newton-meters) torque.

(g) Inspect cutting flutes of reamer to ensure they are dry and clear of chips.

(h) Using a tap handle or low speed (approximately 200 RPM) drill motor to turn the reamer, ream pin hole.

NOTE: Remove the reamer periodically to clear chips.

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1. B. (5) (i) Using a clean cloth moistened with acetone or equivalent, remove all chips from the reworked area.

(j) Using chrome pickle solution, surface treat reamed holes.

NOTE: Chrome pickle solution shall be composed of 24 ounces (680.4 grams) sodium dichromate and 1.5 pints (0.709 liter) nitric acid (specific gravity 1.42) per gallon (3.785 liters) water.

(k) Coat shank of pin with retaining compound primer and retaining compound 272. (Refer to manufacturer's instructions.)

(l) Using installer LTCT7675-30, detail of LTCT7675, and a ball peen hammer, install pin.

(m) Repeat preceding Steps (a) thru (l) for each remaining loose pin.

(n) Remove reaming fixture from frame assembly; then remove any excess compound from around pins.

(o) Remove all masking material.

(p) Touch up surrounding exposed areas on frame assembly where surface coating has been damaged. (Refer to 70-30-19, SPM.)

CAUTION: DO NOT USE FORCE TO INSTALL GAGE ASSEMBLY ON FRAME ASSEMBLY.

(6) Install gage assembly LTCT7675-03, detail of LTCT7675, on frame assembly reduction gear carrier assembly mounting surface; then inspect pins for alignment.

(7) Gage assembly hole marked "OFFSET HOLE" must be installed over offset pin.

(a) If gage assembly seats fully without using force, pin locations are acceptable.

(b) If gage assembly does not seat fully, it may be due to either interference with the inside diameter of the frame assembly or a mislocated pin in the frame assembly. In some instances, both conditions may exist. Correct pin misalignment in accordance with following Steps (7) and/or (8).

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1. B. (8) If gage assembly LTCT7675-03, detail of LTCT7675, does not seat fully, visually inspect inside diameter of frame assembly for interference indications. If interference is evident, proceed as follows:

(a) Remove gage assembly LTCT7675-03 from frame assembly.

(b) Using a clean cloth moistened with acetone or equivalent, clean inside of frame assembly.

(c) Mask all openings to prevent entry of foreign material.

WARNING: PRIOR TO SCRAPING FRAME THAT MAY CONTAIN RADIOACTIVE THORIUM, PROTECTIVE MASK AND PROPER EYE PROTECTION IS REQUIRED. THORIUM IS NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION IMMEDIATELY.

(d) Using a sharp, straight-edged steel scraper, locally remove material as necessary to eliminate interference. Maintain all original contours and remove any burrs.

NOTE: Scrap materials containing radioactive thorium must be segregated and stored in proper containers and be properly disposed of.

(e) Repeat preceding Step (6). If gage seats fully, surface treat repair areas using chrome pickle solution. (Refer to 70-30-18, SPM.)

(9) If gage assembly LTCT7675-03 still does not seat fully without force, and mislocation of pins is not obvious, proceed as follows:

(a) Install gage and reaming fixture LTCT7675-08, detail of LTCT7675, and attempt to install all 0.3815 inch (9.690 millimeter) ID bushings. Bushings that cannot be fully installed will indicate mislocated pins; identify these mislocated pins.

NOTE: A maximum of ten mislocated pins may be repaired. If more than ten pins are mislocated, contact the following for disposition:

Honeywell Engines, Systems & Services
Customer Support Center
P.O. Box 29003
M/S 26-06/2102-323
Phoenix, AZ 85038-9003
Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
FAX: 1-602-365-3343

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1. B. (9) (b) Replace mislocated pins as follows: *(See Figure 903.)*

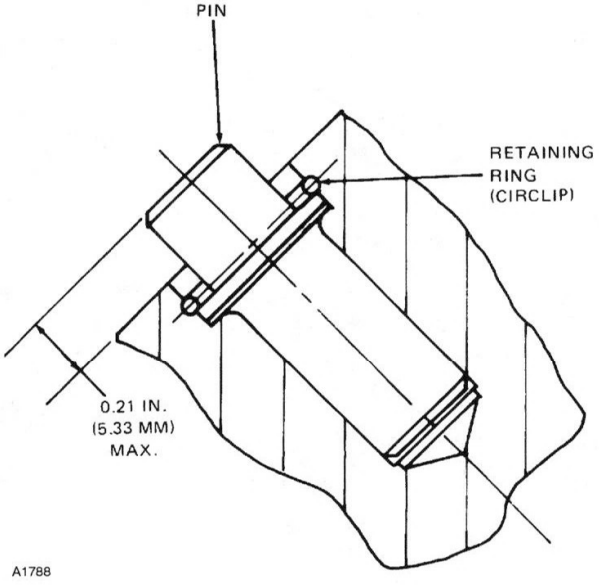
1 Mask all openings to prevent entry of foreign material.

2 Using pin removal fixture LTCT7676 or mechanical puller LTCT1218 and adapter LTCT7685, remove loose pins from frame assembly.

- If a threaded adapter is used, using a No. 3 or 0.213 inch (5.41 millimeter) diameter drill, drill head of pin to a depth of 9/16 inch (14.3 millimeter); then, using 1/4 x 28 tap, tap head of pin. Remove all metal chips from area.

  NOTE: Use an M36 cobalt drill and a high chrome tap to prevent breakage.

- If a collet-type adapter is used, install collet over head of pin and tighten collet; then thread puller into collet.



Rework and Installation of Pins
Figure 903

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1. B. (9) (b) 3 With 0.3815 inch (9.690 millimeter) ID bushings temporarily installed over holes from which pins have been removed, insert gage rod LTCT7675-14, detail of LTCT7675, through bushings and into holes. If gage rod does not enter hole, contact Engines, Systems & Services for disposition.

4 Remove 0.3815 inch (9.690 millimeter) ID bushings, from over mislocated holes and install new bushings in accordance with *Table 901.*

NOTE: Bushings and reamers to be used are determined by which pins are used.

5 Using reamers, select size of pin to be used by inserting 0.3855 inch (9.792 millimeter) (blue) (W) reamer into hole. Reamer should fit; if reamer does fit, use next size reamer (Y or Z).

6 Ensure cutting flutes of reamer are sharp with no nicks or burrs, and are clear of chips.

CAUTION: TO ENSURE PROPER MACHINING DEPTHS, CLEAN AND REMOVE ALL CHIPS FROM HOLES DURING AND BETWEEN STEPS BY FLUSHING WITH SOLVENT OR USING VACUUM CLEANER. DO NOT USE COMPRESSED AIR.

DO NOT EXERT ANY MORE THAN MINIMUM FORCE NECESSARY TO REAM HOLES.

7 Using a tap handle or low speed (approximately 200 RPM) drill motor, ream all mislocated pin holes. Remove reamer periodically to clean off chips.

NOTE: Reamer will stop cutting when it is fully bottomed in hole.

8 Using a clean cloth moistened with acetone, or equivalent, remove all chips.

9 Install headless bushing (orange) in gage assembly LTCT7675-08, detail of LTCT7675.

10 Using a depth micrometer, measure distance from top of gage assembly LTCT7675-08, detail of LTCT7675, to frame assembly. Record as dimension A.

11 Set stop on counterbore to obtain a depth of 0.195 to 0.205 inch (4.95 to 5.21 millimeter).

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Table 901. Pin and Tool Requirements

PINS Inches (Millimeters)	BUSHINGS Inches (Millimeters)	REAMERS Inches (Millimeters)	COLOR CODE
2-063-017-04 0.3875 0.3872 (9.843) (9.835)	0.3857 (9.797)	0.3855 (9.792) (**W)	Blue
2-063-017-05 0.4012 0.4009 (10.191) (10.183)	0.3994 (10.145)	0.3992 (10.140) (**Y)	White
2-063-017-06 0.4150 0.4147 (10.541) (10.533)	0.4132 (10.495)	0.4130 (10.490) (**Z)	Red
*COUNTERBORE			Grey
*CHAMFER			Pink

*USED WITH ANY SIZE HOLES

**REAMER DESIGNATION

1. B. (9) (b) 12 Using a low speed (approximately 200 RPM) drill motor and a 0.5625 inch (14.283 millimeter) diameter counterbore, counterbore reamed holes. Remove counterbore periodically to clear chips.

13 Using a depth micrometer, measure distance from top of gage assembly to bottom of counterbore hole. Record as Dimension B Subtract dimensions A from Dimension B. Result should be 0.195 to 0.205 inch (4.95 to 5.21 millimeter).

14 Using tap handle with light pressure and a chamfer tool (pink), break edge.

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1. B. (9) (b) 15 Using a clean cloth moistened with acetone or equivalent, clean reworked surfaces and remove all chips.

16 Assemble automatic recessing tool as follows:

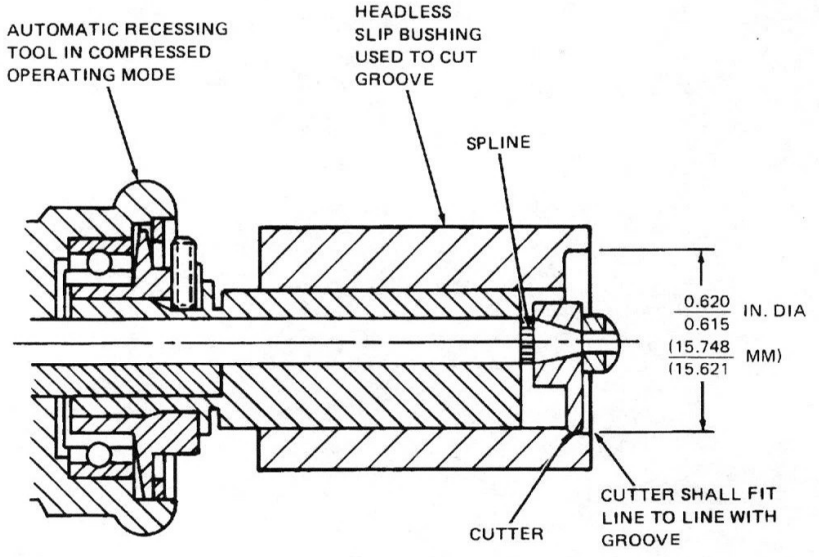
NOTE: The automatic recessing tool is assembled and cutting diameter set at Engines, Systems & Services; however, prior to cutting any ring grooves, cutter setting must be verified. *(See Figure 904.)*

a Remove thimble (3, *Figure 905)* from body subassembly by removing both setscrews (2 and 13).

NOTE: For later assembly, observe that longer setscrew (2) contains a brass insert.

b Slide off shell cam (5).

c Loosen spindle setscrew (12) in shell cam.



Cutter Dimensional Verification for Automatic Recessing Tool
Figure 904 (Sheet 1 of 2)

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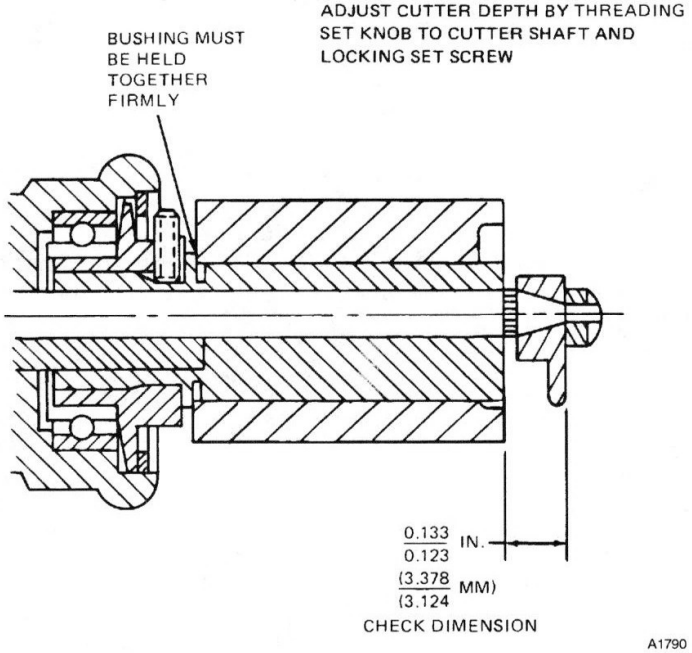
1. B. (9) (b) 16 d With spindle setscrew (12) held at 6 o'clock, position cutter cam (4) by turning serrated end of cutter shaft (6).

e Assemble shell cam and spindle subassembly by aligning inclined flat of spindle with spindle setscrew. Tighten spindle setscrew as required.

f Install body cam (14) over shell cam/spindle assembly, aligning pins with slots and placing adjusting screw (1) at 12 o'clock opposite spindle setscrew (12).

g Turn parts upside down and place top of shank (15) against a suitable flat surface, such as a table. While applying a slight downward force on shell cam (5) with one hand, turn serrated cutter shaft slightly with other hand until pins enter slots.

NOTE: If assembled properly, cutter shaft will rotate when compressing shell cam/spindle assembly and body cam. If cutter shaft does not rotate, reposition cutter cam by turning serrated end of cutter shaft in the opposite direction.



Cutter Dimensional Verification for Automatic Recessing Tool
Figure 904 (Sheet 2)

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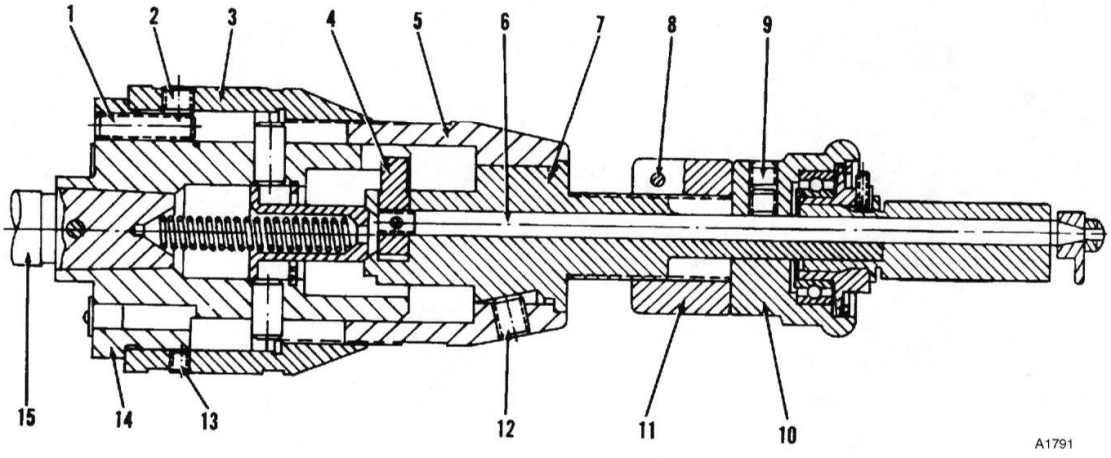
1. B. (9) (b) 16 h While continuing to apply a downward force to keep pins within slots, slide thimble (3) over shell cam (5) until it abuts the step in the body cam (14).

i Install and tighten setscrews (2 and 13) ensuring that setscrew (2) with the brass insert is aligned with adjusting screw (1).

j Install gage head locknut subassembly, sliding it over spindle (7) with cap screw (8) toward top of tool. When locknut meets threaded portion of spindle, rotate it until a few threads are engaged.

NOTE: Do not engage all threads or tighten cap screw. Final location of locknut will be determined when setting tool for groove location.



1. ADJUSTING SCREW
2. ADJUSTING SCREW SETSCREW
3. THIMBLE
4. CUTTER CAM
5. SHELL CAM
6. CUTTER SHAFT
7. SPINDLE
8. LOCKNUT CAP SCREW
9. GAGE HEAD SETSCREW
10. GAGE HEAD ASSEMBLY
11. GAGE HEAD LOCKNUT
12. SPINDLE SETSCREW
13. THIMBLE SETSCREW
14. BODY CAM
15. SHANK

Automatic Recessing Tool Model A-1
Figure 905

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CAUTION: DO NOT OVERTIGHTEN GAGE HEAD SETSCREW; BENDING OF CUTTER MAY RESULT.

1. B. (9) (b) 16 k Slide gage head assembly (10) over spindle with setscrew (9) aligned with flat on spindle. Tighten setscrew sufficiently to hold gage head subassembly temporarily on spindle.

NOTE: Final location of gage head assembly (10) will be determined when tool is set for groove location.

17 Install automatic recessing tool (*Figure 904*) into low speed (approximately 200 RPM) drill motor; then install headless bushing (orange) over cutting end of recessing tool. Fully insert recessing tool into hole. Cut ring groove.

NOTE: Force is required to fully cut groove. Repeat operation, if necessary.

18 Visually inspect ring groove.

19 Using a clean cloth moistened with acetone or equivalent, clean reworked surface and remove all chips.

CAUTION: DO NOT ALLOW CHROME-PICKLE SOLUTION TO CONTACT FIXTURE BUSHINGS.

20 Using chrome-pickle solution, surface treat reworked holes.

NOTE: Chrome pickle solution shall be composed of 24 ounces (680 grams) sodium dichromate and 1.5 pints (0.71 liter) nitric acid (specific gravity 1.42) per gallon (3.8 liters) water prepared at ambient temperature.

21 Coat pin shanks with retaining compound primer and retaining compound 640-21. (Refer to manufacturer's instructions.)

NOTE: Do not coat counterbore or ring groove.

WARNING: USE CARE TO AVOID TOUCHING PINS WITH BARE HANDS AFTER FREEZING.

22 Using liquid nitrogen, liquid argon, or dry ice and isopropyl alcohol, freeze pins for approximately 3 minutes prior to installation.

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1. B. (9) (b) 23 Using installer LTCT7675-30, detail of LTCT7675, and a ball peen hammer, install pins. Remove excess compound.

NOTE: Strike installer continuously until pin is seated. If pin installation process is interrupted, pin may seize before being fully seated due to Loctite curing.

Gage and reaming assembly must be used to aid in pin installation.

24 Remove reaming assembly after pins have been replaced.

25 Using gage assembly LTCT7675-03, detail of LTCT7675, recheck pins for proper location. (Refer to preceding Step (6).)

26 Install retaining rings 2-073-005-01 as necessary.

27 Remove all masking material.

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SUPPORT FRAME ASSEMBLY – REPAIR-11

1. Repair of Corrosion and Fretting on Accessory Gearbox Mounting Pad Contact Surface at the 21.297 to 21.303 Inch (540.09 to 541.10 Millimeter) Dimension – Repair-11

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Aluminum Oxide Abrasive (70 Grit)	05-11
Magnaflux Cleaner (SKC-NF/2C-7B)	
Magnesium (AMS4350, AMS4377)	08-19, -21
or	
Magnesium (AZ61A-F, AZ31B-H24)	08-19A, -21A
Primer	01-09
Steel Alloy (AMS5735)	
Thread Locking Compound	01-05
Zinc Chromate Sealant	01-31, -31A

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Machine Screws	MS24693-S202			

1. B. Procedure

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

(1) Remove Rosan inserts and locating pin; then measure diameter of pin hole in housing. (*See Figure 901.*) Hole diameter shall be 0.2382 to 0.2492 inch (6.304 to 6.330 millimeter). If hole diameter is within limits, touch up. (Refer to 70-30-18, SPM.) If hole diameter is not within limits, repair as follows:

(a) Using existing center line, ream hole to maximum depth of 0.600 inch (15.24 millimeter).

NOTE: Measure hole depth from unaffected surface. Reamed diameter shall not exceed 0.3082 inch (7.828 millimeter).

(b) Touch up machined hole. (Refer to 70-30-18, SPM.)

(c) (Using steel alloy, fabricate pin similar to pin MS9390-420, except, "A" diameter may be varied to maintain 0.0005 to 0.0020 inch (0.013 to 0.051 millimeter) tight fit with reamed hole. (*See Figure 901.*) Save pin for installation. (Refer to Step (16).)

(2) Machine 1.000 inch (25.400 millimeter) reference dimension to 0.906 to 0.908 inch (23.01 to 23.06 millimeter). (*See Figure 902.*)

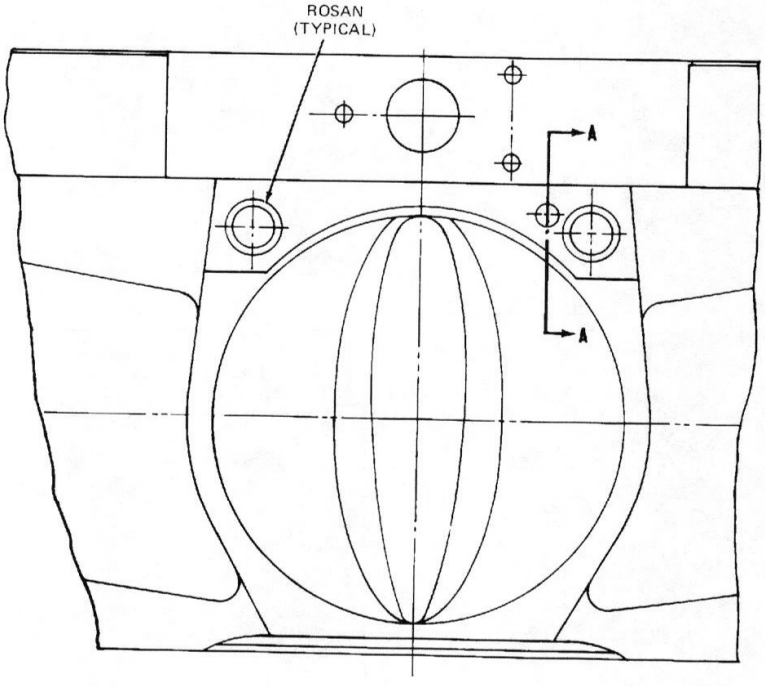
(3) Using magnesium alloy fabricate special shim 0.091 inch (2.31 millimeter) thick to conform with gearbox mounting pad configuration. (*See Figure 903.*) Machine pin hole in shim 0.010 inch (0.25 millimeter) larger than corresponding pin hole in mounting pad.

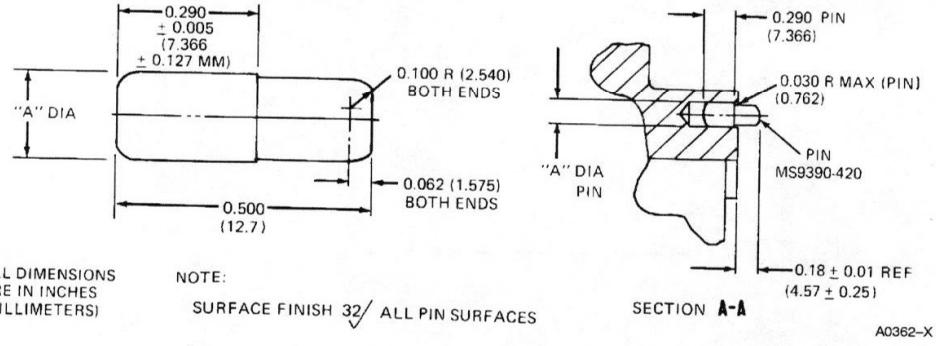
(4) Mask areas on housing not to be bonded.

(5) Using acetone or magnaflux cleaner, thoroughly clean housing and shim areas to be bonded.

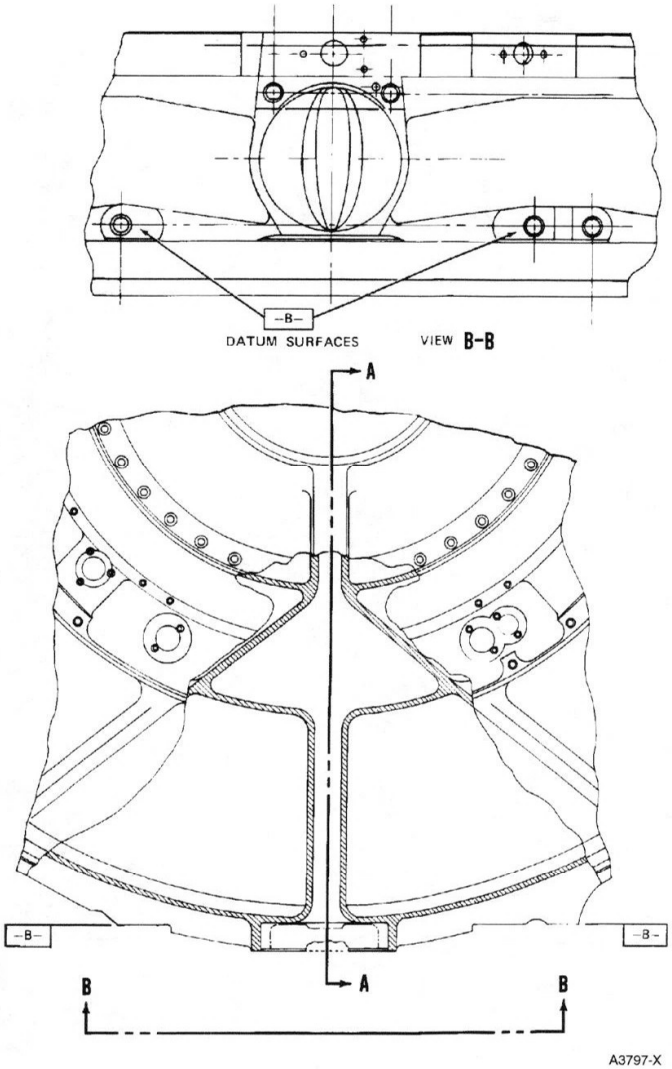
(6) Using aluminum oxide grit delivered at 65 psi (448.175 kN/m^2) suction pressure, grit-blast surfaces to be bonded.

(7) Using a clean, dry air blast, remove all residual grit.

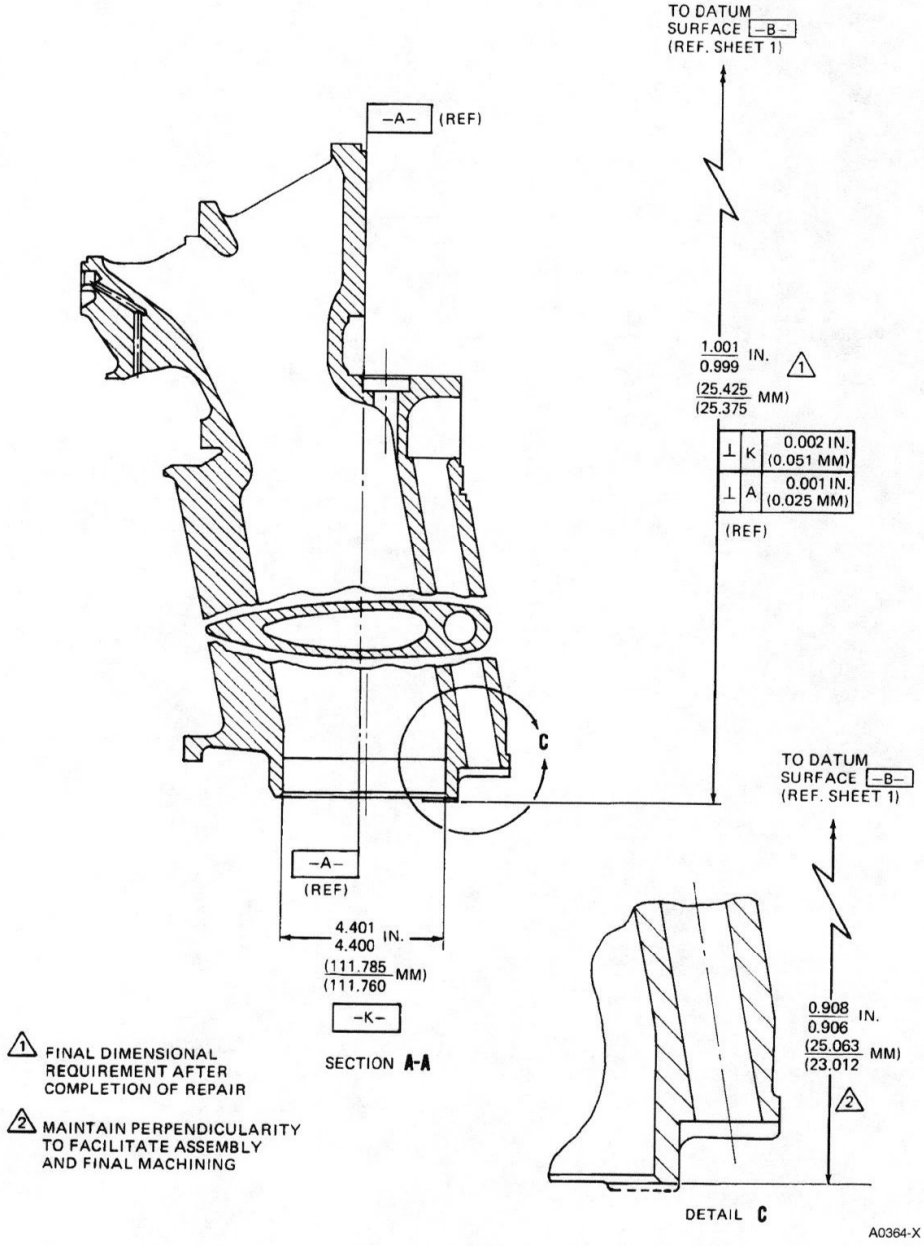




Pin Location and Fabrication
Figure 901



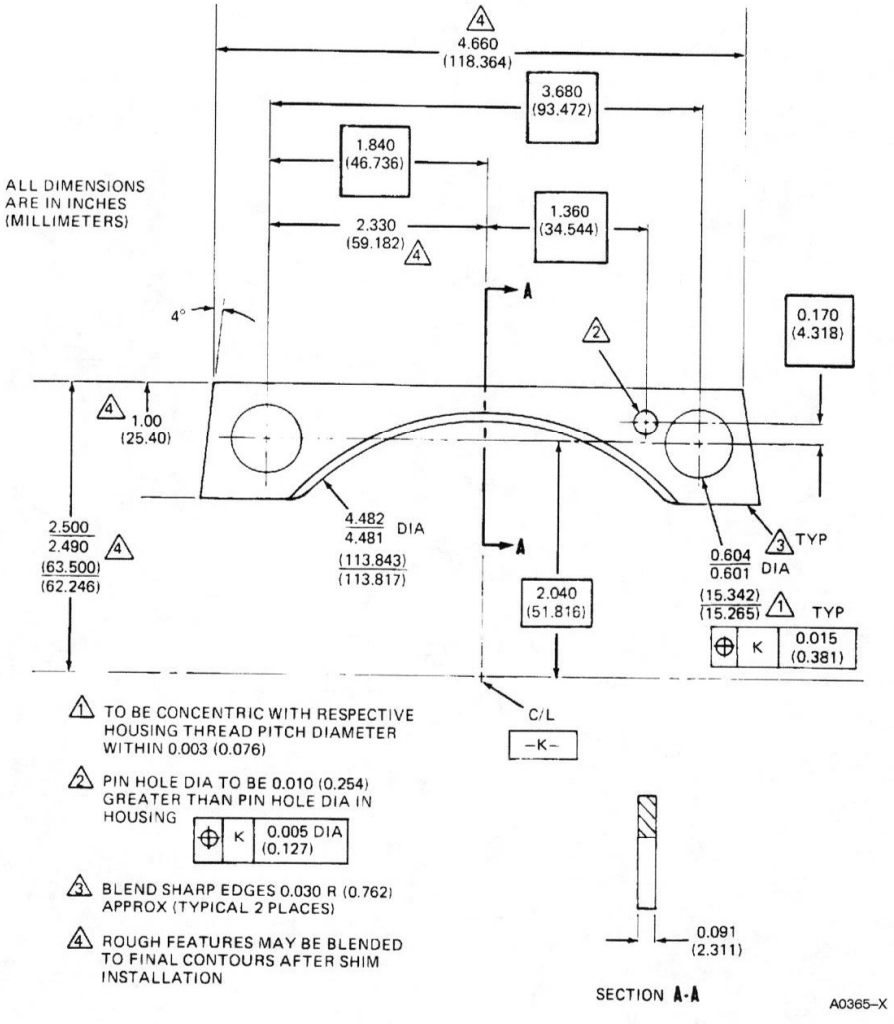
Mounting Pad Repair Area
Figure 902 (Sheet 1 of 2)



1 FINAL DIMENSIONAL REQUIREMENT AFTER COMPLETION OF REPAIR

2 MAINTAIN PERPENDICULARITY TO FACILITATE ASSEMBLY AND FINAL MACHINING

Mounting Pad Repair Area
Figure 903 (Sheet 2)



Fabrication of Shim
Figure 903

1. B. (8) Apply Loctite primer and retaining compound between shim and housing. (Refer to manufacturer's instructions.)

(9) Install shim, aligning pin hole in shim with pin hole in housing. Allow compound to cure in accordance with manufacturer's instructions.

(10) Machine four holes to specified dimensions. (*See Figure 904.*)

(11) Apply Loctite primer and retaining compound to screw and hole threads (Refer to manufacturer's instructions); then install screws. Screws shall bottom tightly onto shim.

(12) Using clean cotton swab moistened with acetone, remove excess retaining compound.

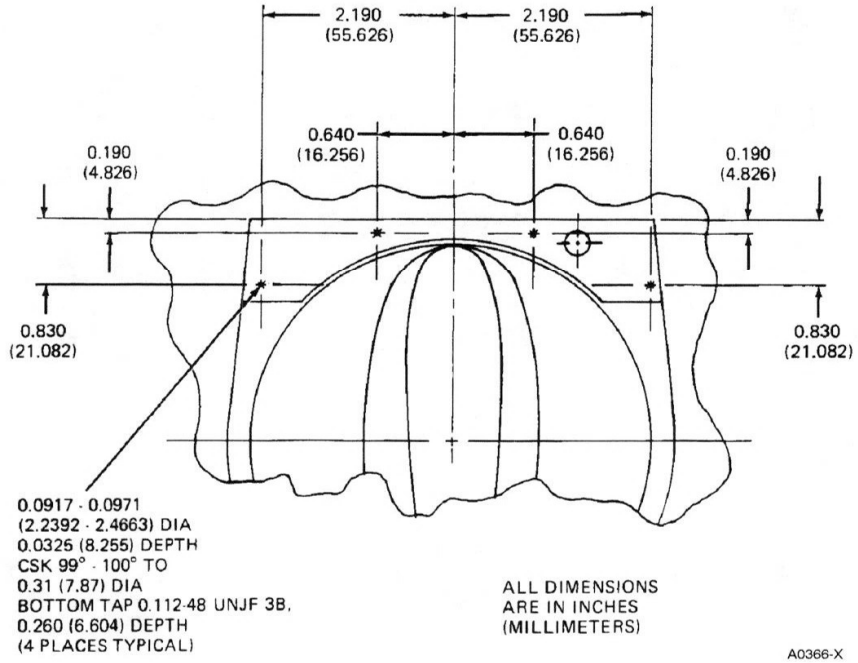
(13) Dimensionally inspect housing; then, if required, machine housing to specified dimensions. (*See Figure 902.*)

NOTE: Final dimensions shall be met after all surface treatment.

(14) Replace Rosan inserts, or repair if necessary. (Refer to 72-32-04, Repair-07.)

(15) Touch up repair area. (Refer to 70-30-19, SPM.)

(16) Apply zinc chromate primer to locating pin and pin hole; then install pin into housing while still wet. Maintain 0.17 to 0.19 inch (4.3 to 4.8 millimeter) protrusion above surface of housing. (*See Figure 901.*)



Screw Locations
Figure 904

SUPPORT FRAME ASSEMBLY – REPAIR-12

1. Repair of Stripped No. 12 Bearing Assembly Support Holes Using Plugs – Repair-12

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
Model D314L	Angle Drill (Desautter Co, Livonia, MI)
SR19D	Step Drill (Rosan Inc, Newport Beach, CA)
SR19R	Removal Tool (Rosan Inc, Newport Beach, CA)
SR19S-A	Swage Tool (Rosan Inc, Newport Beach, CA)
SR19W-A	Drive Tool (Rosan Inc, Newport Beach, CA)
77413	Spindle Drive (Desautter Co, Livonia, MI)

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy (AMS4150 or AMS4117)	08-11 or -09
Magnesium (AMS4350, AMS4352, AMS4377) or Magnesium (AZ61A-F, ZK60A-T5, AZ31B-H24)	08-19, -20, -21 or 08-19A, -20A, -21A
Primer	01-09
Thread Locking Compound	01-05
Slimsert (SR192L)	

B. Procedure

(1) If necessary, remove damaged Rosan insert. (Refer to 70-25-03, SPM.)

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/ NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

(2) Using angle drill and spindle or step drill SR19D and existing centerlines, drill and tap holes as required. (*See Figure 901.*)

(3) Touch-up repair area. (Refer to 70-30-18, SPM.)

(4) Using magnesium alloy or aluminum alloy, fabricate plug. (*See Figure 902.*)

1. B. (5) Apply retaining compound primer and retaining compound to threads of plug and hole.

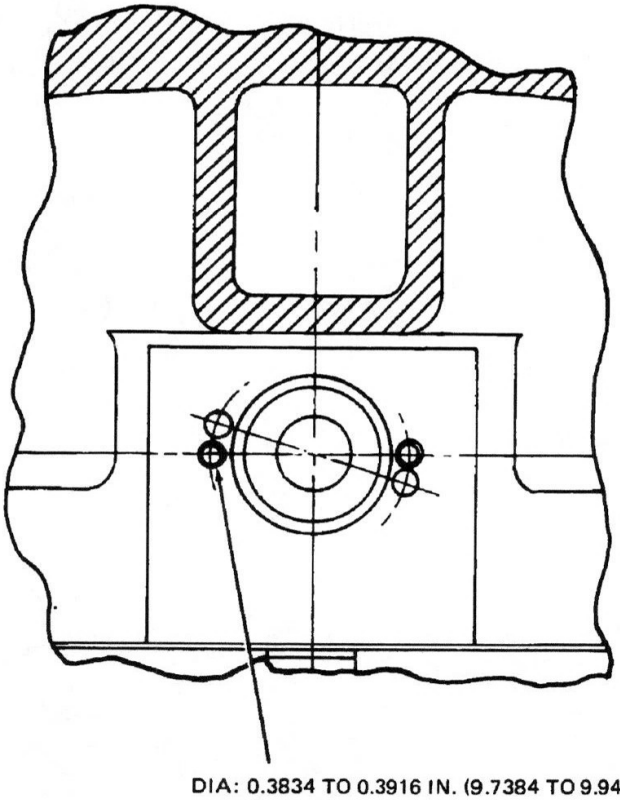
(6) Install plug, stake securely, and machine flush with existing contour.

NOTE: Torque must be applied continuously until plug bottoms in hole.

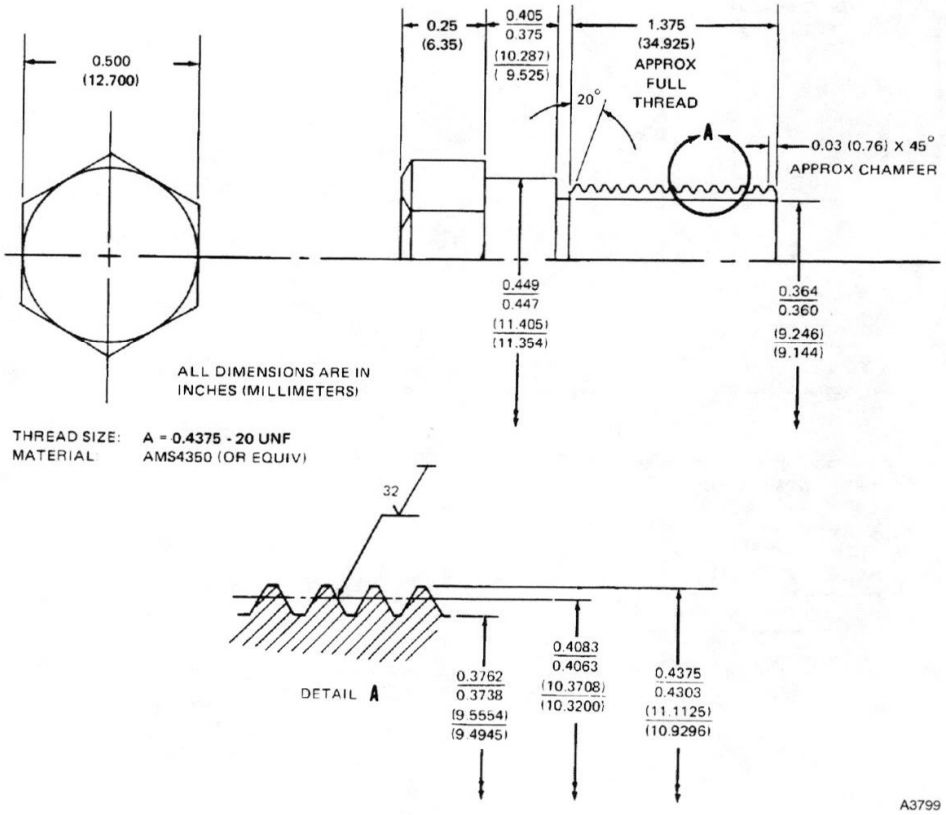
(7) Using angle drill and spindle or step drill SR19D, drill and tap holes for 1/4-28 Rosan inserts. (*See Figure 903.*)

(8) Touch up repaired area. (Refer to 70-30-14, SPM and 70-30-20, SPM.)

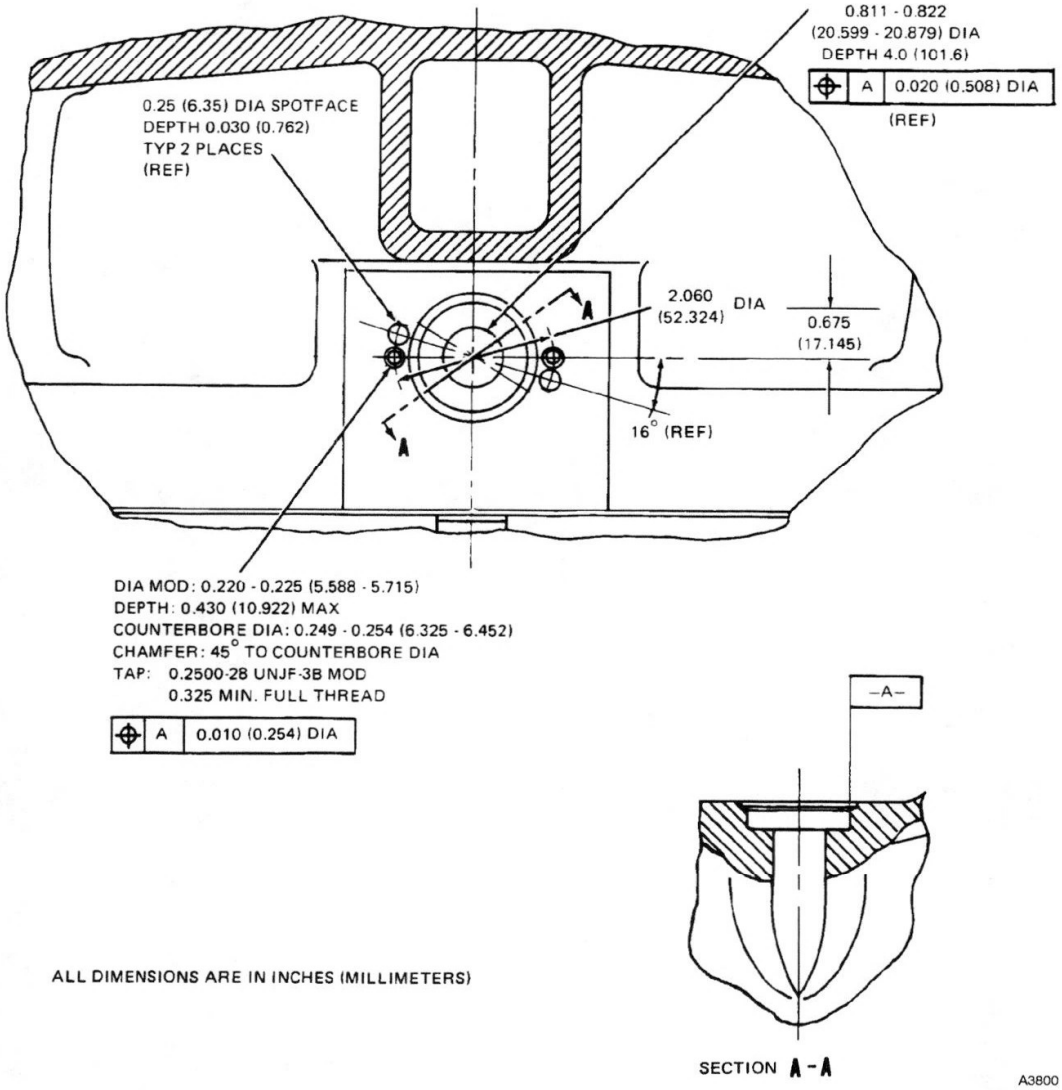
(9) Install Rosan slimserts SR192L. (Refer to 70-25-03, SPM.)



Insert Hole Drilling Requirements
Figure 901



Fabrication of Plug
Figure 902



No. 12 Bearing Support Hole Drilling Requirements
Figure 903

SUPPORT FRAME ASSEMBLY – REPAIR-13

1. Repair of 1.430 to 1.434 Inch (36.32 to 36.42 Millimeter) Diameter No. 12 Bearing Support Hole Using a Plug – Repair-13

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Aluminum Alloy	08-09 or -11
Magnesium (AMS4350, AMS4352, AMS4377) or Magnesium (AZ61A-F, ZK60A-T5, AZ31B-H24)	08-19, -20, -21 or 08-19A, -20A, -21A
Primer	01-09
Retaining Compound	01-07

   B. Procedure

      WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

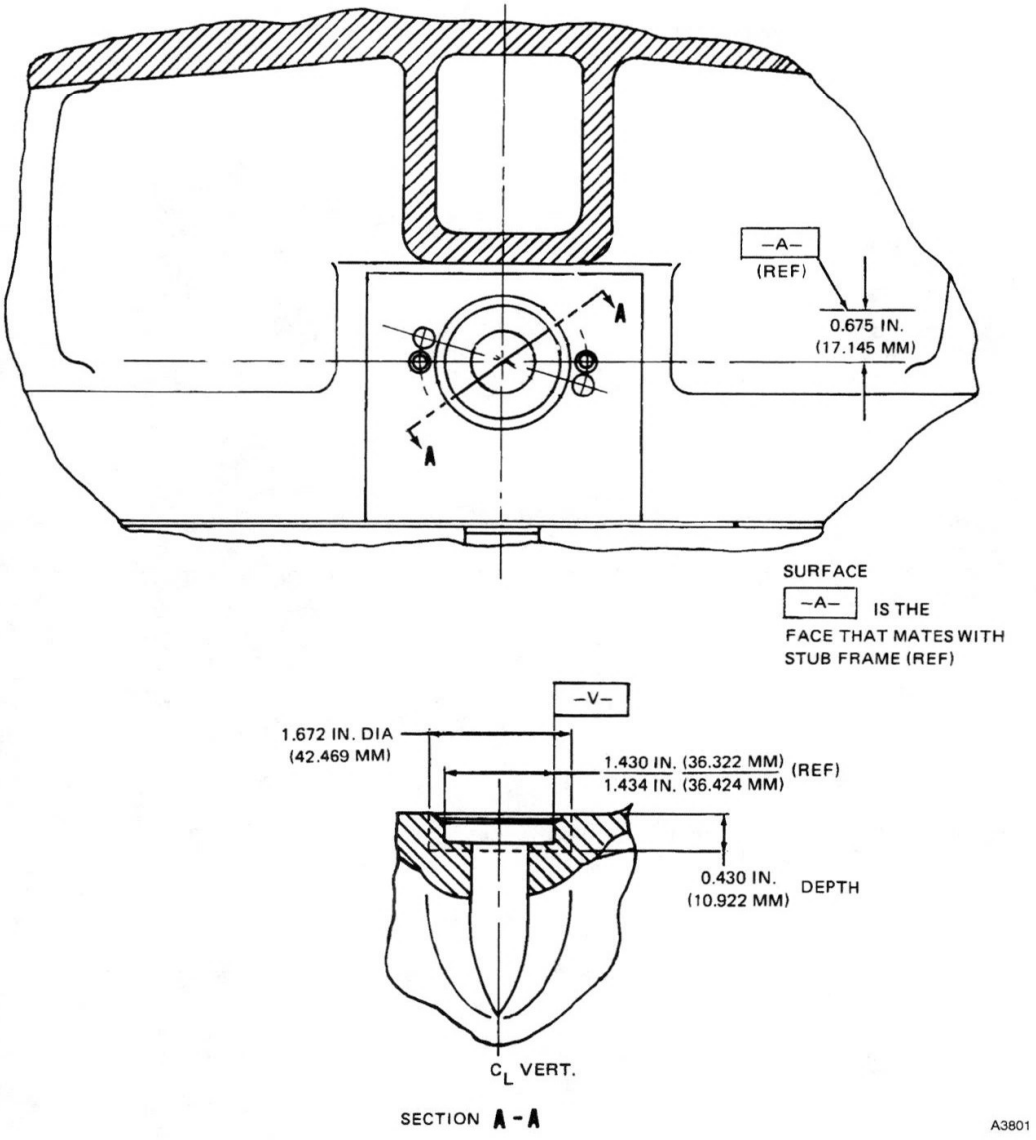
      (1) Using existing centerline, bore No. 12 bearing support hole to specified dimensions.

         NOTE: If hole requires further machining, counterbore to specified dimensions. (*See Figure 901 or Figure 902.*)

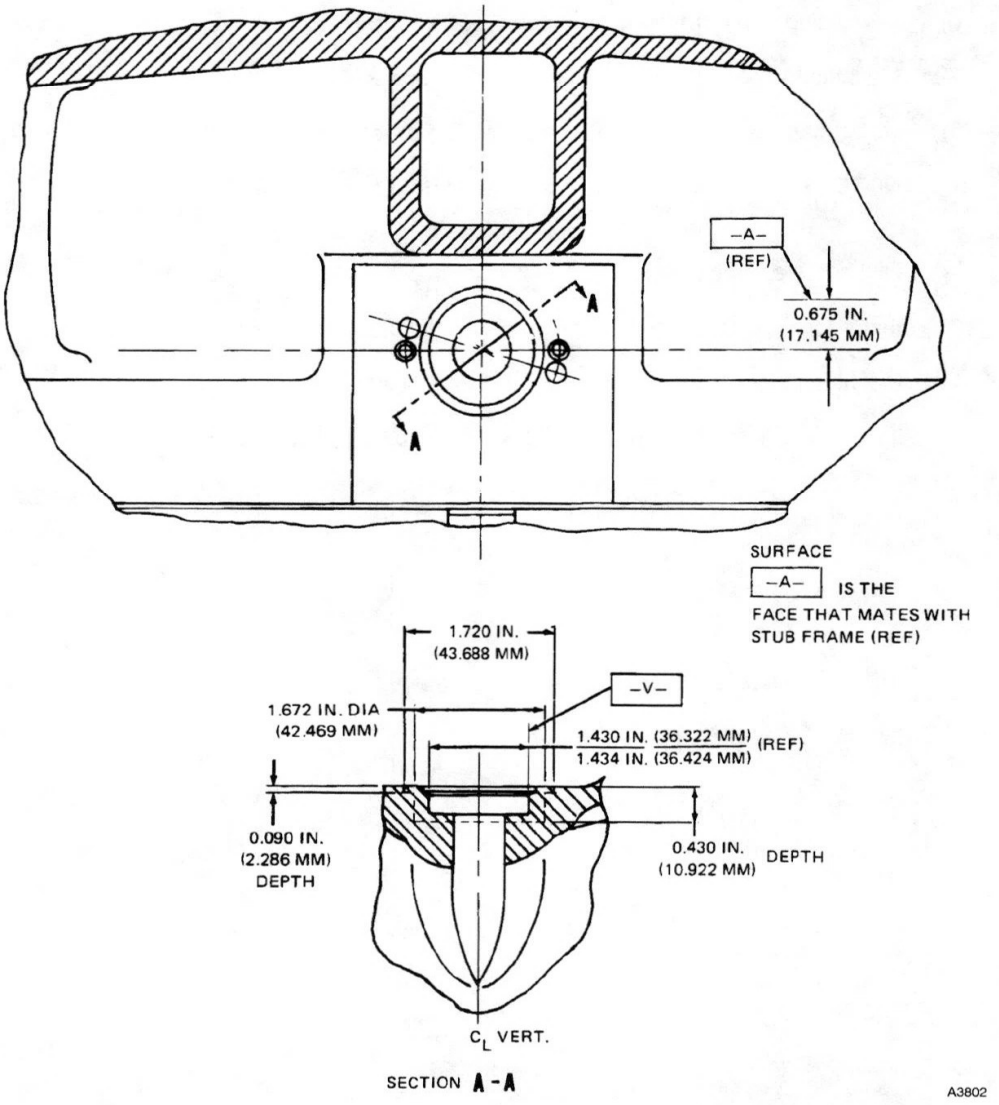
      (2) Touch-up repair area. (Refer to 70-30-18, SPM.)

      (3) Using magnesium alloy or aluminum alloy, fabricate appropriate special plug. (*See Figure 903 or Figure 904.*)

         NOTE: Touch-up required if aluminum alloy is used to fabricate plug. (Refer to 70-30-07, SPM.)



Fan Frame Assembly Bore Machining Dimensions
Figure 901



Fan Frame Assembly Bore and Optional Counterbore Machining Dimensions
Figure 902

1. B. (4) Using acetone or equivalent, clean plug and bore.

(5) Apply retaining compound primer and retaining compound to bottom and sides of plug per manufacturers instructions.

(6) Install plug in fan frame. Ensure plug bottoms in hole.

(7) Machine to specified dimensions. (*See Figure 905.*)

(8) Using magnesium alloy or aluminum alloy, fabricate lock pin. (*See Figure 906.*)

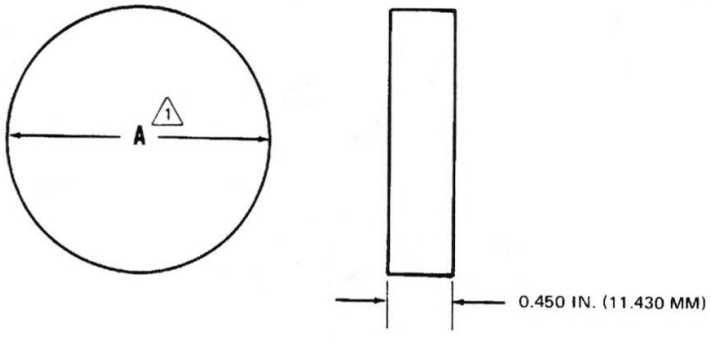
NOTE: Touch-up if aluminum alloy is used to fabricate pin. (Refer to 70-30-07, SPM.)

(9) Drill and ream lock pin hole. (*See Figure 905.*)

(10) Install lock pin. (*See Figure 905.*)

(11) Machine to final dimensions. (*See Figure 907.*)

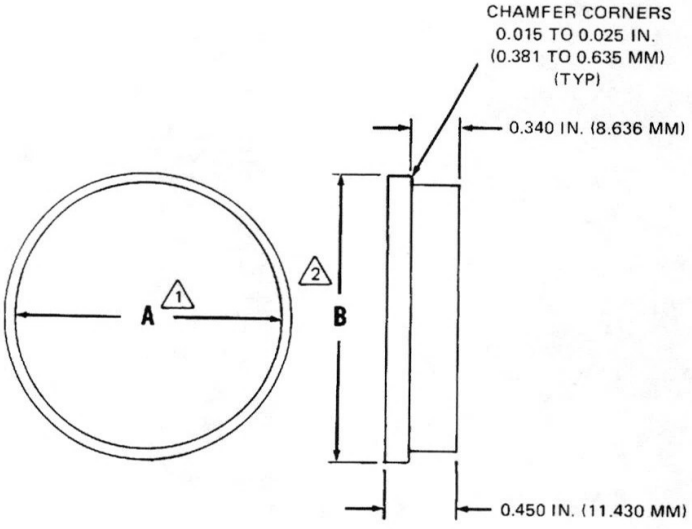
(12) Touch-up repair area. (Refer to 70-30-19 and 70-30-20, SPM.)



1 DIAMETER **A** TO BE MACHINED AS REQUIRED TO OBTAIN 0.001 TO 0.002 INCH (0.025 TO 0.051 MILLIMETER) TIGHT FIT WITH 1.672 INCH (42.469 MILLIMETER) BORE IN FAN FRAME

A0350

Fabrication of Plug
Figure 903

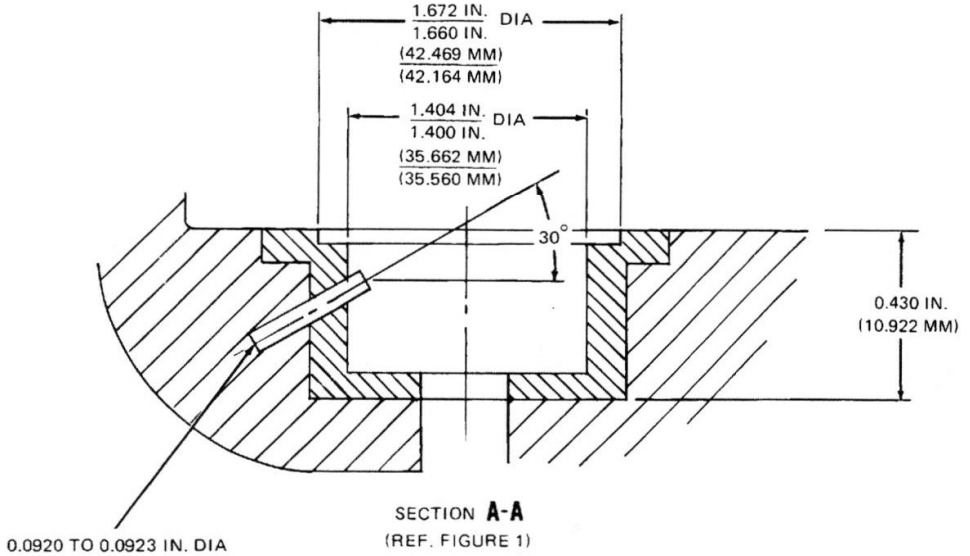


1 DIAMETER **A** TO BE MACHINED AS REQUIRED TO OBTAIN 0.001 TO 0.002 INCH (0.025 TO 0.051 MILLIMETER) TIGHT FIT WITH 1.672 INCH (42.469 MILLIMETER) BORE IN FAN FRAME

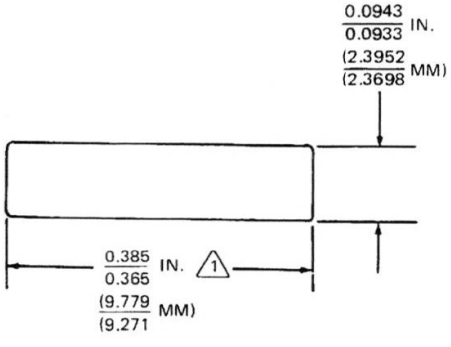
2 DIAMETER **B** TO BE MACHINED AS REQUIRED TO OBTAIN 0.001 TO 0.002 INCH (0.025 TO 0.051 MILLIMETER) LOOSE FIT WITH 1.720 INCH (43.688 MILLIMETER) COUNTERBORE

A0351

Fabrication of Optional Counterbored Plug
Figure 904



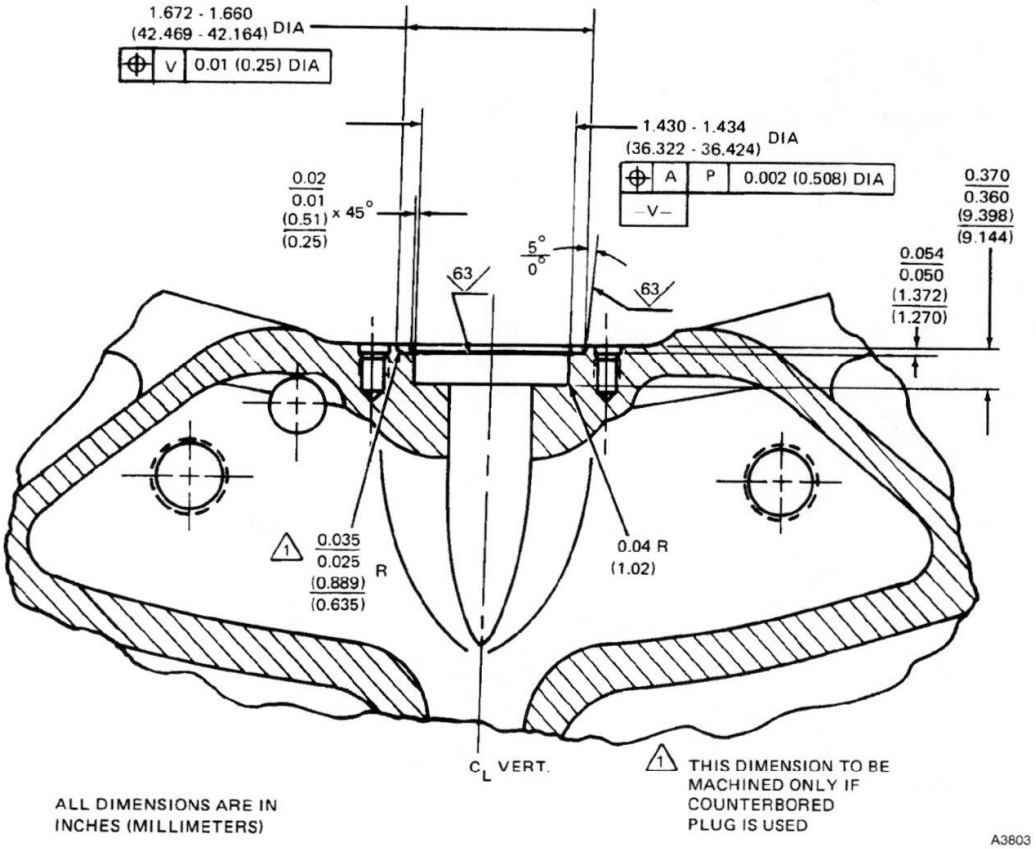
Initial Machining Dimensions
Figure 905



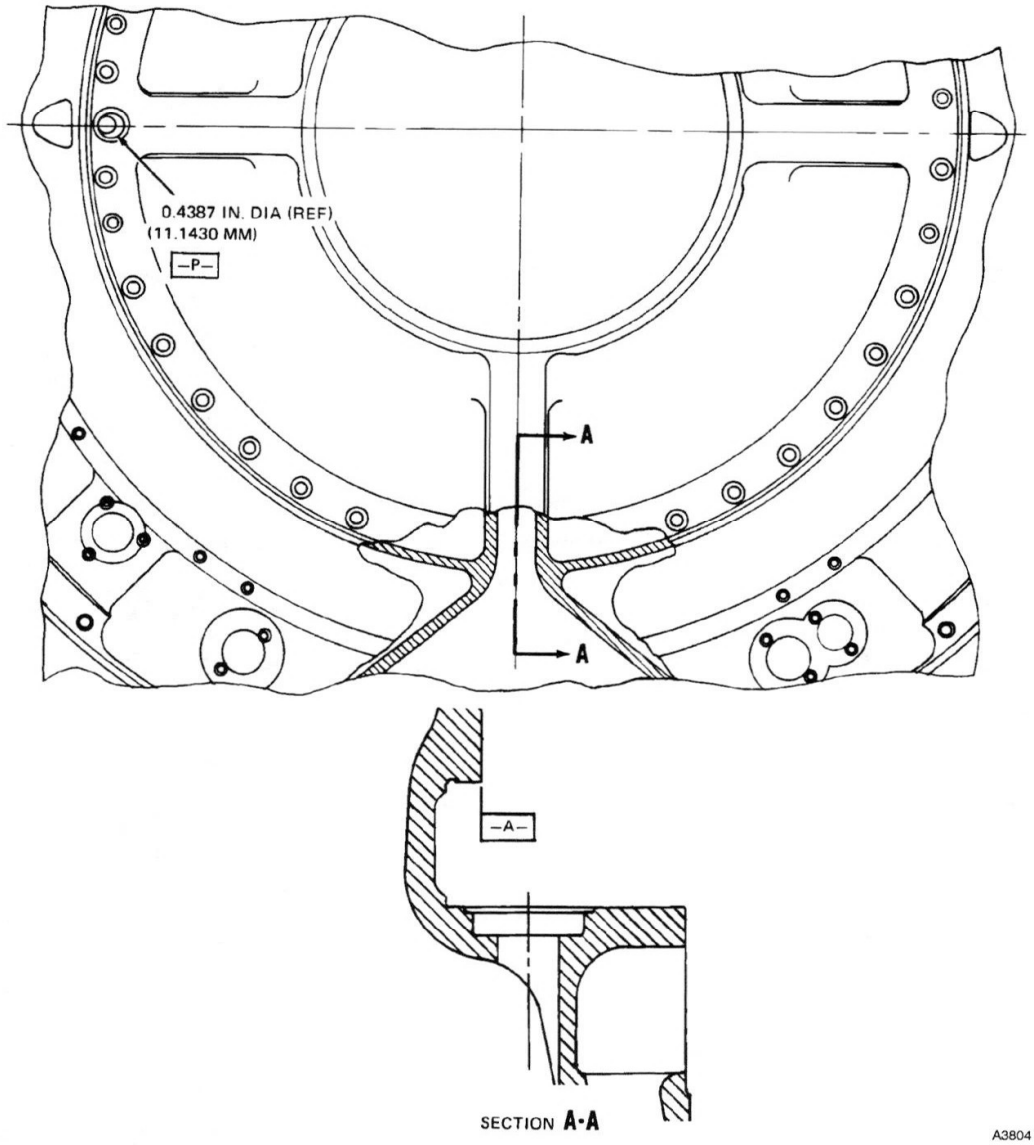
1 BREAK SHARP EDGES 0.003 TO 0.015 INCH (0.076 TO 0.381 MM). LOCKPIN TO BE STRAIGHT WITHIN 0.001 IN. (0.025 MM).

A0353

Fabrication of Lock Pin
Figure 906



Final Machining Dimensions
Figure 907 (Sheet 1 of 2)



Final Machining Dimensions
Figure 907 (Sheet 2)

SUPPORT FRAME ASSEMBLY – REPAIR-14

1. Repair of Holes in Inner Struts – Repair-14

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Welding Wire (AMS4396 or QE22A)	03-21

B. Procedure

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

CAUTION: DO NOT THIN OR REDUCE PARENT METAL.

(1) Using a carbide burr or wire brush, rout existing hole(s) to remove all tears, burrs, and other surface irregularities.

(2) Using acetone or equivalent, clean all surfaces.

NOTE: Surfaces must be clean of oxide film before welding.

CAUTION: DURING WELDING, USE CARE TO MINIMIZE HEAT AFFECTED ZONE.

(3) Using welding wire and fusion welding method, weld-repair hole. (Refer to 70-45-01, SPM.)

(a) For fan frame Part No. 2-063-010-26 and previous dash numbers, weld using weld wire AMS4396.

(b) For fan frame Part No. 2-063-010-27, weld using weld wire QE22A with chemistry in accordance with AMS4418. After welding, heat treat for 8 hours ±15 minutes at 400 ±25°F (204 ±14°C).

1. B. (4) Blend weld repaired areas flush with parent metal. (Refer to 70-25-01, SPM.) Maintain smooth airfoil profile.

(5) Visually and fluorescent-penetrant inspect weld. (Refer to 70-20-02 and 70-20-05, SPM.) Cracks and crack-like indications are not acceptable.

(6) Using blue or gray epoxy resin method, as applicable, touch-up repaired area. (Refer to 70-30-20, SPM.)

SUPPORT FRAME ASSEMBLY – REPAIR-15

1. Repair of Minor Wear to Carrier Contact Surface – Repair-15

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

(1) Lightly stone worn surface as required to remove applied resin coating.

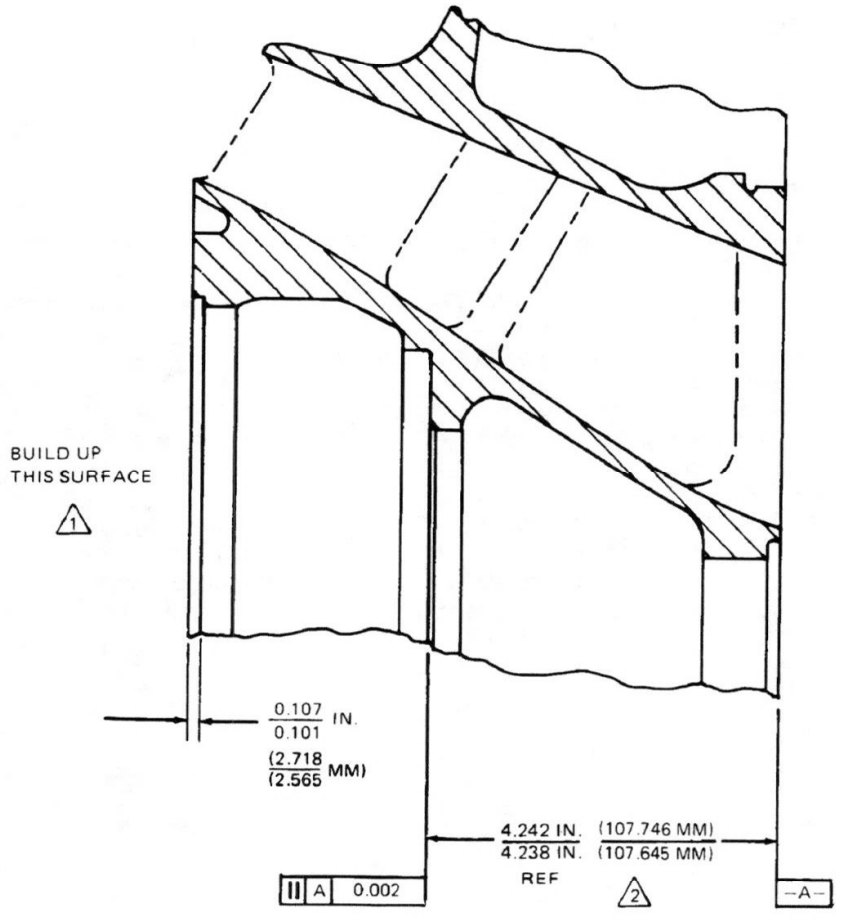
(2) Apply chrome pickle solution to worn surface. (Refer to 70-30-18, SPM.)

(3) Mask area as required, including locating pins and retaining ring grooves.

(4) Prior to sealant application, fixture frame assembly horizontally.

(5) Using suitable spray gun, apply synthetesine sealant (machinable friction-reducing coating) to thickness required to restore affected surface. (Refer to 70-30-14, SPM and *Figure 901.*)

NOTE: Perform all cure cycles with part fixtured horizontally. Suitable heat lamps may be used if oven curing is impossible or impractical. Use suitable heat paint or contact thermocouples when heat lamps are used to ensure proper cure temperatures are maintained.



1 NO BUILDUP ALLOWED IN RADIUS.

2 MACHINE COATING IF NECESSARY TO MEET THESE REQUIREMENTS.

A3805

Repair of Carrier Contact Surface
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-16

1. Repair of 13.338 to 13.340 Inch (338.79 to 338.84 Millimeter) Reduction Gear Carrier and Carrier Retaining Spring Pilot Diameter – Repair-16

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum	08-04, -09
Magnesium (AMS4350, AMS4377) or Magnesium (AZ61A-F, AZ31B-H24)	08-19, -21 08-19A, -21A

B. Procedure

(1) Mask adjacent holes and passages to prevent introduction of machining chips.

(2) Following existing centerline of 13.338 to 13.340 inch (338.79 to 338.84 millimeter) diameter, bore diameter oversize to 13.600 inches (345.44 millimeters) ensuring 4.238 to 4.242 inch (107.65 to 107.75 millimeter) reference diameter is held for depth. (*See Figure 901.*)

(3) Using magnesium AMS4377 or equivalent, fabricate sleeve. (*See Figure 902.*)

(4) Install sleeve until sleeve bottoms in bore.

(5) Machine a 0.0920 to 0.0930 inch (2.337 to 2.362 millimeter) diameter to a depth of 0.280 inch (7.11 millimeter), eight places equally spaced. (*See Figure 903.*)

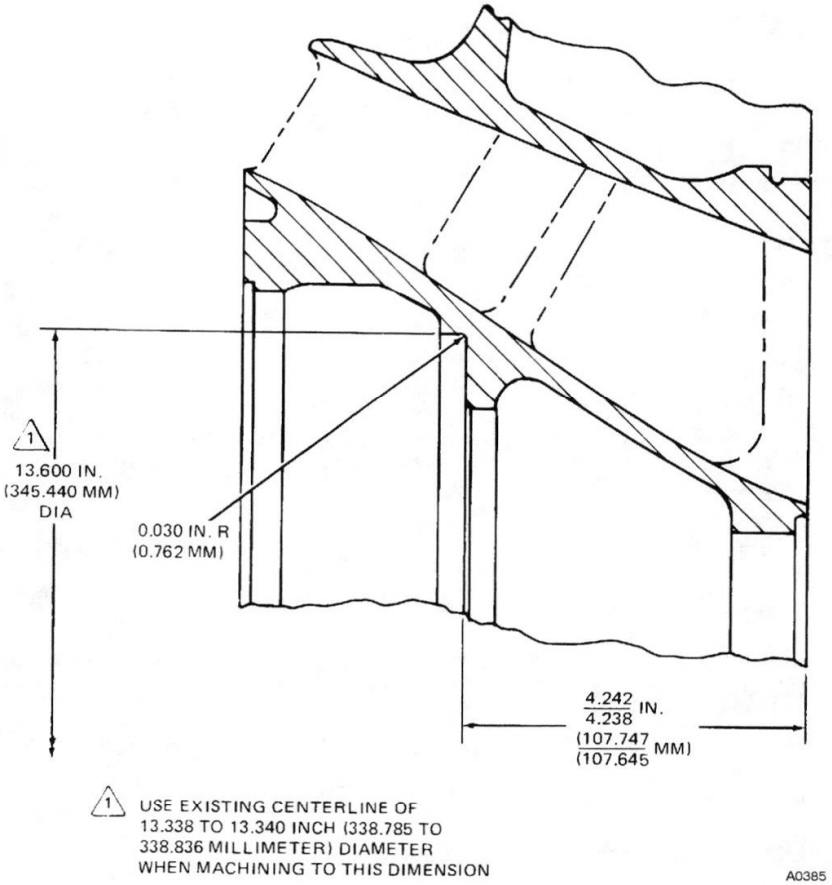
(6) Using magnesium AMS4350 or equivalent, fabricate eight lock pins. (*See Figure 904.*)

(7) Install pins into housing until pins bottom in holes.

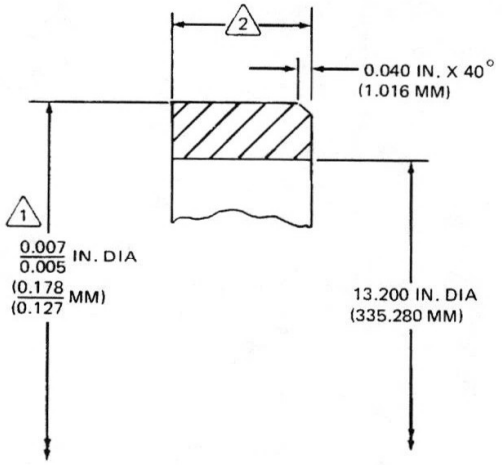
(8) Machine excess sleeve and lock pin material flush to surrounding contours.

(9) Machine to specified dimensions. (*See Figure 905.*)

(10) Touch-up surfaces as required. (Refer to 70-30-12, SPM.)



Machining of 13.338 to 13.340 Inch (338.79 to 338.84 Millimeter) Diameter to Accept Sleeve
Figure 901

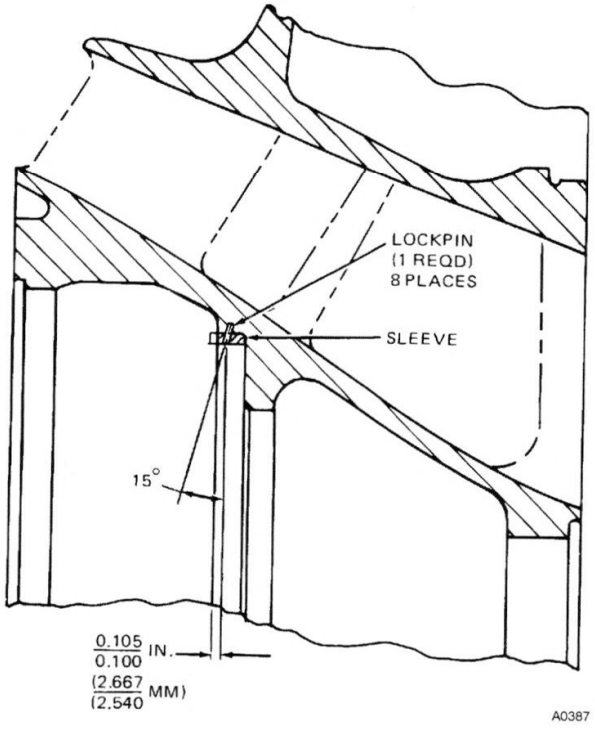


1 DIAMETER TO BE TIGHT FIT WITH OVERSIZE BORE

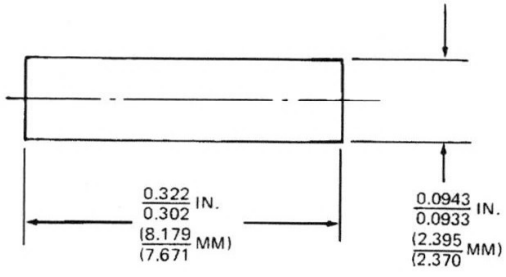
2 DIMENSION IS NOT MANDATORY PROVIDED FINAL MACHINING REQUIREMENTS ARE MET

A0386

Fabrication of Sleeve
Figure 902



Installation of Lock Pin (Typical)
Figure 903

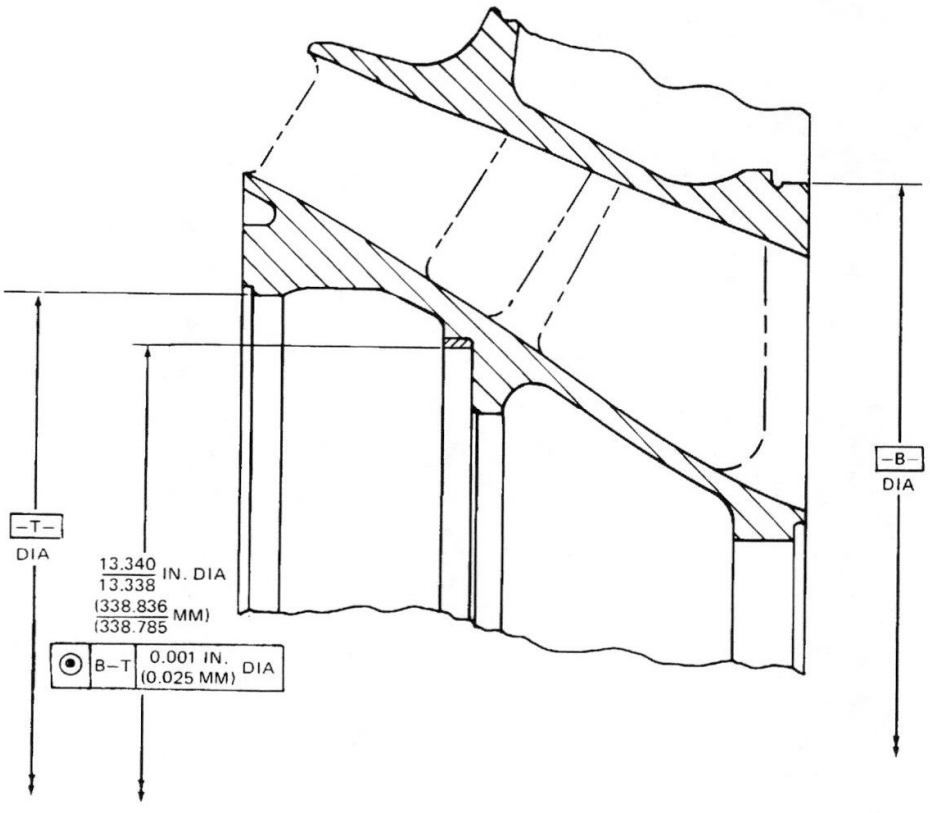


NOTES

1. PINS TO BE STRAIGHT WITHIN 0.001 IN. (0.025 MM)
2. BREAK SHARP EDGES 0.003 TO 0.015 IN. (0.076 TO 0.381 MM) RADIUS

A0388

Fabrication of Pin
Figure 904



NOTE:
1. MACHINING DIMENSIONS SHALL BE MET AFTER ALL SURFACE TREATMENTS.

A0389

Final Machining of 13.338 to 13.340 Inch (338.79 to 338.84 Millimeter) Diameter Dimension
Figure 905

SUPPORT FRAME ASSEMBLY – REPAIR-17

1. Repair of Discrepant 0.90 to 0.98 Inch (22.9 to 24.9 Millimeter) Depth of 0.640 to 0.649 Inch (16.26 to 16.49 Millimeter) Diameter Holes in Engine Mount Pad – Repair-17

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Aluminum Alloy	08-11 or -09
Magnesium (AMS4350, AMS4352, AMS4377) or Magnesium (AZ61A-F, ZK60A-T5, AZ31B-H24)	08-19, -20, -21 08-19A, -20A, -21A
Masking Tape	10-22
Primer	01-09
Retaining Compound	01-07
Zinc Chromate Sealant	01-31

B. Procedure

(1) Remove lock ring and insert from discrepant hole. (Refer to Repair-03.)

CAUTION: WHEN MACHINING DISCREPANT HOLE, USE CARE NOT TO DAMAGE EXISTING THREADS.

(2) Using existing centerline, machine 0.640 to 0.649 inch (16.26 to 16.49 millimeter) diameter hole depth through. (*See Figure 901.*)

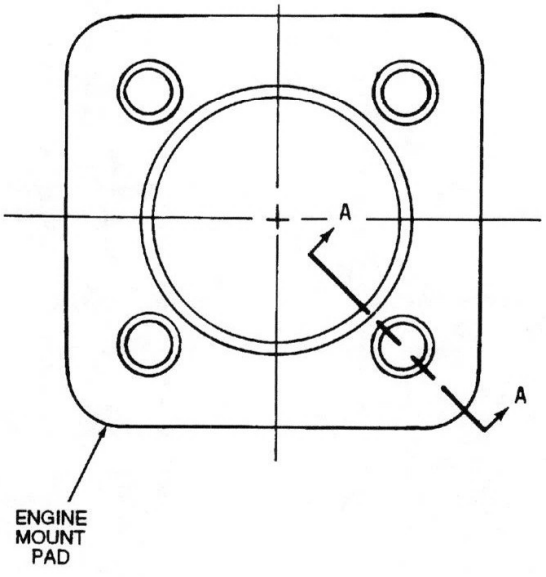
CAUTION: WHEN TAPPING DISCREPANT HOLE, USE CARE NOT TO DAMAGE EXISTING THREADS.

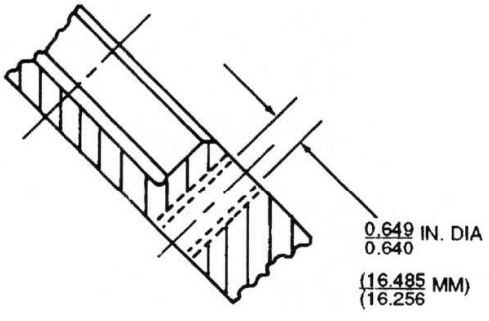
(3) Using 0.750-10 UNC-3B tap, chase existing threads through to inside diameter of support frame assembly.

(4) Touch-up machined surfaces. (Refer to 70-30-18, SPM.)

(5) Fabricate plug from magnesium alloy. (*See Figure 902.*)

(6) Touch-up machined surfaces. (Refer to 70-30-18, SPM.)





SECTION A-A

A0370

Machining of 0.640 to 0.649 Inch (16.26 to 16.49 Millimeter) Diameter on Engine Mount Pad
Figure 901

1. B. (7) Apply Loctite primer and retaining compound to threads in tapped hole in accordance with manufacturer's instructions; then install plug from machined through side. (*See Figure 903.*)

NOTE: Retaining compound shall be cured in accordance with manufacturer's instructions.

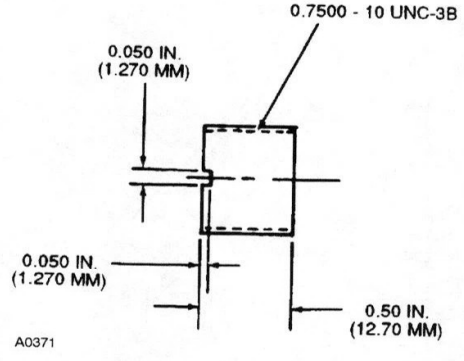
(8) Machine plug flush to mounting pad surface. (*See Figure 903.*)

(9) Touch-up exposed plug. (Refer to 70-30-12, SPM.)

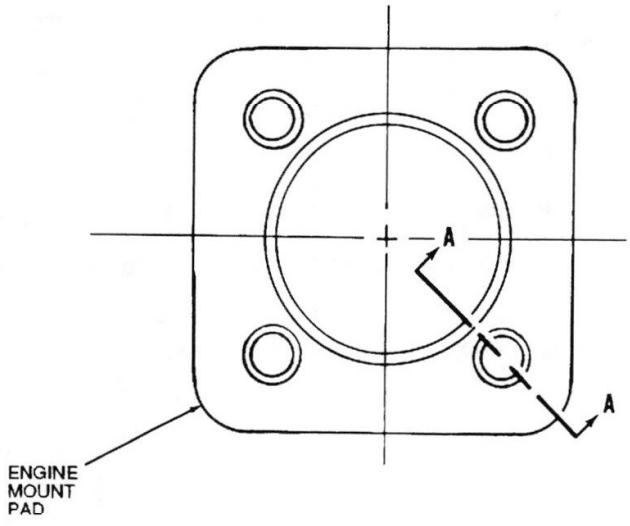
(10) Coat threads of both hole and insert with zinc chromate primer.

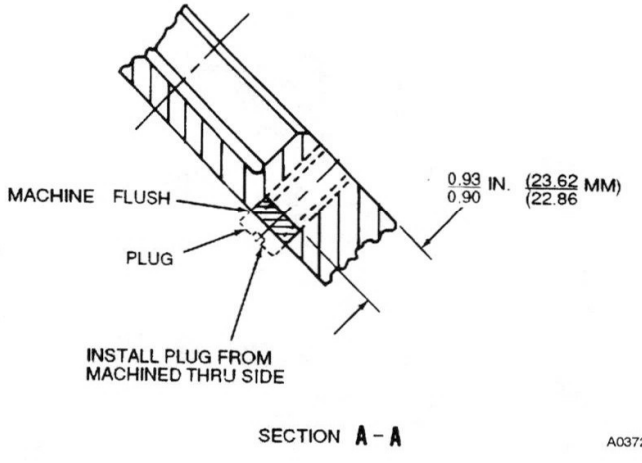
(11) Install new Rosan insert and lock ring into wet zinc chromate primer. (Refer to 70-25-03, SPM.)

(12) Mask threads and apply sealant to repaired area. (Refer to 70-30-19, SPM.)



Fabrication of Plug
Figure 902





Machining of Plug
Figure 903

SUPPORT FRAME ASSEMBLY – REPAIR-18

1. Repair of a Cracked or Deformed Engine Mount Pilot – Repair-18

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Compound Sealant	01-32
Epoxy Adhesive	01-04
Primer	01-09
Retaining Compound	01-07
Silicon Carbide Sandpaper	05-23
Steel	08-47, -49, -51, or -52
Zinc Chromate Sealant	01-31

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
SR258L (Rosan Inc.) or M45932/1-13L (Alternate)	Insert			
MS511991E210	Insert			
RLRR565B-11E0238	Lockring			
MS24693-C293	Screws			

1. B. Procedure

NOTE: Do not use this repair if the insert holes have been repaired before with an oversized plug or insert. Also, do not use this repair on more than one mount pad per support frame assembly.

(1) Remove inserts from the damaged engine mount pad. (Refer to 70-25-03, SPM.)

(2) Machine the face of the mounting pad as necessary until the 21.04 inch (534.4 millimeter) dimension to the frame assembly center is met. (*See Figure 901.*)

(3) Use a mount pad pilot hole surface that is not damaged as a reference to find the existing centerline of the 3.000 to 3.001 inch (76.20 to 76.23 millimeter) diameter bore.

(4) Using the existing bore centerline, machine the 3.000 to 3.001 inch (76.20 to 76.23 millimeter) diameter bore through to 3.2010 to 3.2020 inch (81.305 to 71.340 millimeter) diameter. (*See Figure 901.*)

(5) Add a radius and a chamfer to the machined bore as shown in *Figure 901.*

(6) Machine the 0.2855 to 0.2865 inch (7.252 to 7.277 millimeter) locator hole as shown. (See *Figure 901*, Section A-A.)

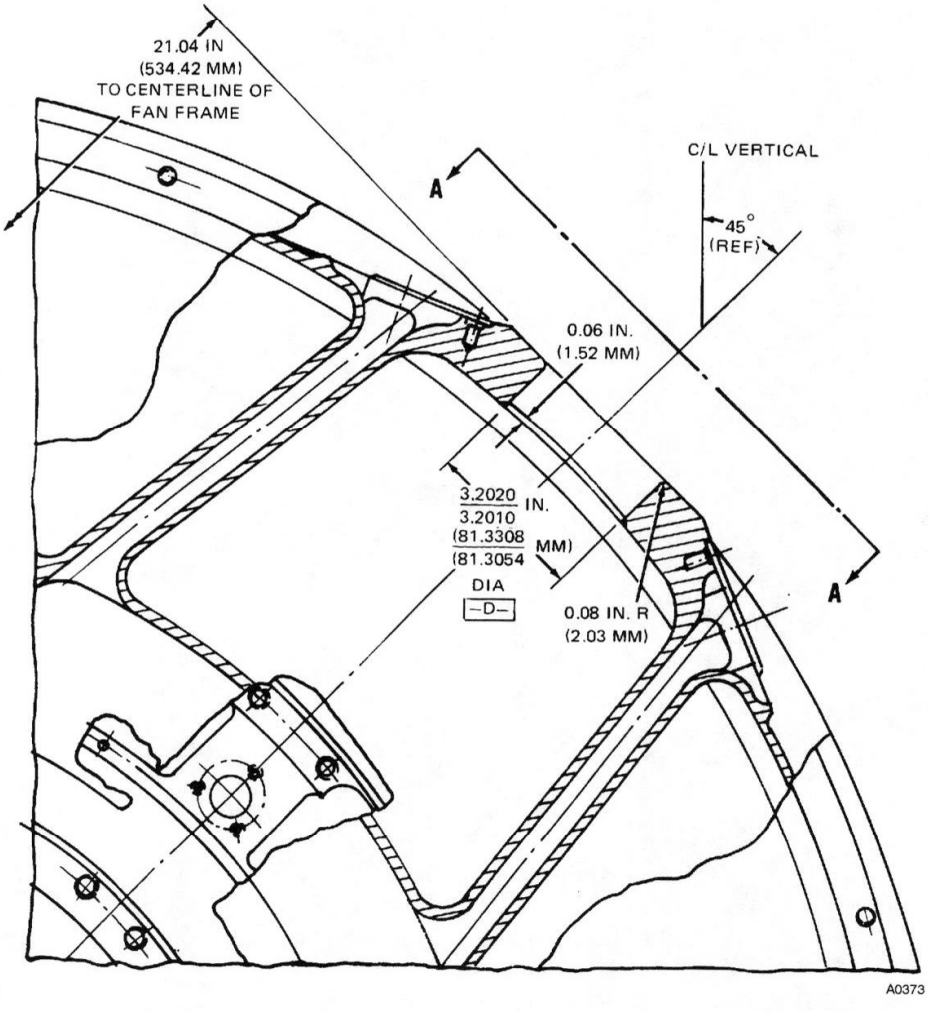
(7) Add a corner radius and a countersink to the insert holes; then, chase the threads with a 0.750-10 UNC-3B tap. (See *Figure 901*, Section A-A.)

(8) Check that the minimum thread depth of the 0.750-10 UNC-3B insert holes is 0.625 inch (15.88 millimeter). If the thread depth is less than the limit given, use a suitable tap to chase the threads to get the necessary thread depth. (See *Figure 901*, Section A-A.)

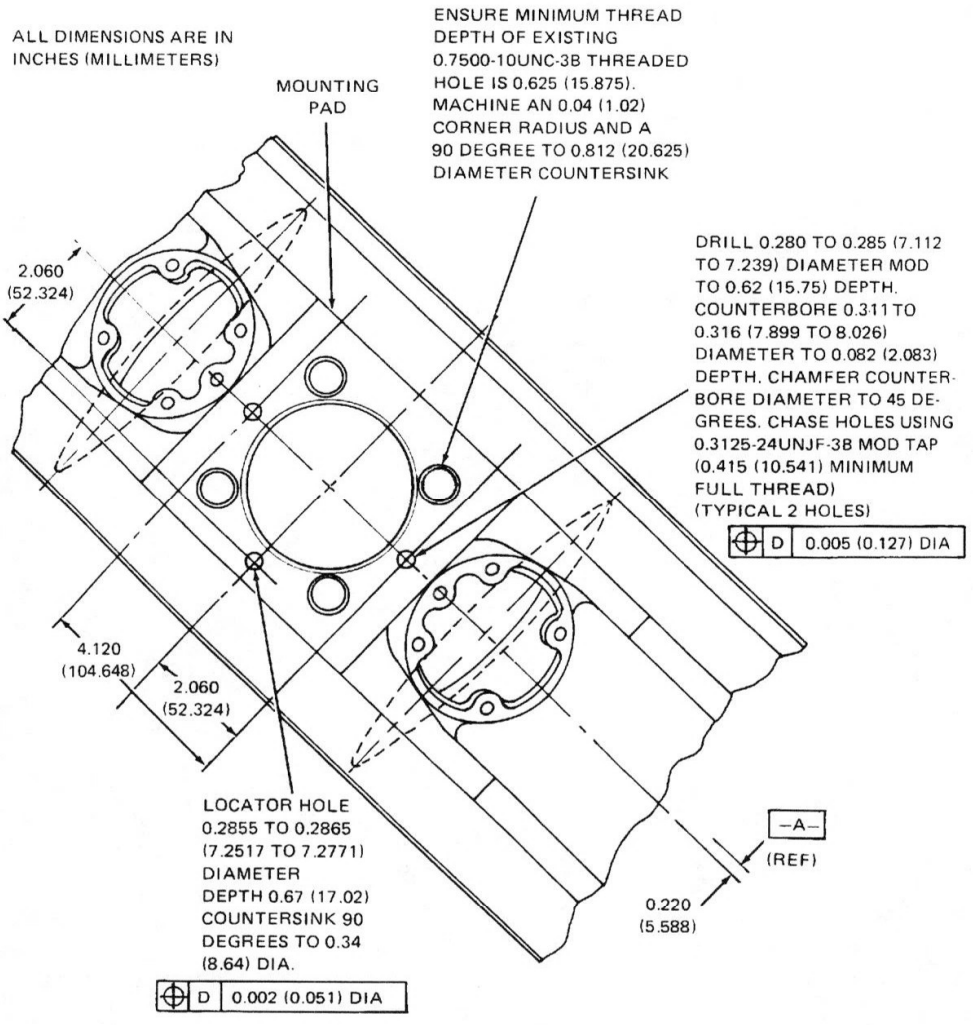
(9) Drill and tap the 0.280 to 0.285 inch (7.11 to 7.24 millimeter) diameter holes as shown. (See *Figure 901*, Section A-A.)

(10) Fluorescent-penetrant inspect the machined areas for cracks. (Refer to 70-20-05, SPM.)

(11) Touch-up machined surfaces with chrome-pickle solution. (Refer to 70-30-18, SPM.)



Machining of the Frame Assembly Mounting Pad and Pilot
Figure 901 (Sheet 1 of 2)



VIEW **A–A**

A0374

Machining of the Frame Assembly Mounting Pad and Pilot
Figure 901 (Sheet 2)

1. B. (12) Apply zinc chromate primer to the OD of the new inserts SR258L or M45932/1-13L; then install the insert in the 0.3125-24 UNJF thread holes while primer is still wet. (Refer to 70-25-03, SPM.)

NOTE: Inserts faces are to be flush with fan frame surface.

(13) Fill the insert serrations with epoxy.

(14) Requalify the mount pad pilot diameter and the 21.04 inch (534.4 millimeter) dimension. (*See Figure 901.*) If required, reapply the chrome-pickle solution. (Refer to 70-30-18, SPM.)

NOTE: All the dimensions are to be met after putting the clear epoxy coating on the mount pad. (Refer to 70-30-19, SPM.)

(15) Find the locations of the 0.7500-10 UNC-3B threaded holes from the indicator and the engine mount pilot holes and note their locations.

(16) Make a sleeve from steel AMS5645 or AMS5636. (*See Figure 902.*)

(17) Locate the 0.888 to 0.891 inch (22.56 to 22.63 millimeter) diameter thru holes based on the locations of the threaded 0 7500-10 UNC-3B holes. (Refer to Preceding Step (15).)

NOTE: Use the engine mount hole as a reference and the locator hole as an index. (*See Figure 902.*)

(18) Prebroach the 0.888 to 0.891 inch (22.56 to 22.63 millimeter) diameter to make it ready for the installation of the lockrings. (Refer to following Step (34).)

(19) Make a locator pin from steel AMS5737 or AMS5732. (*See Figure 903.*)

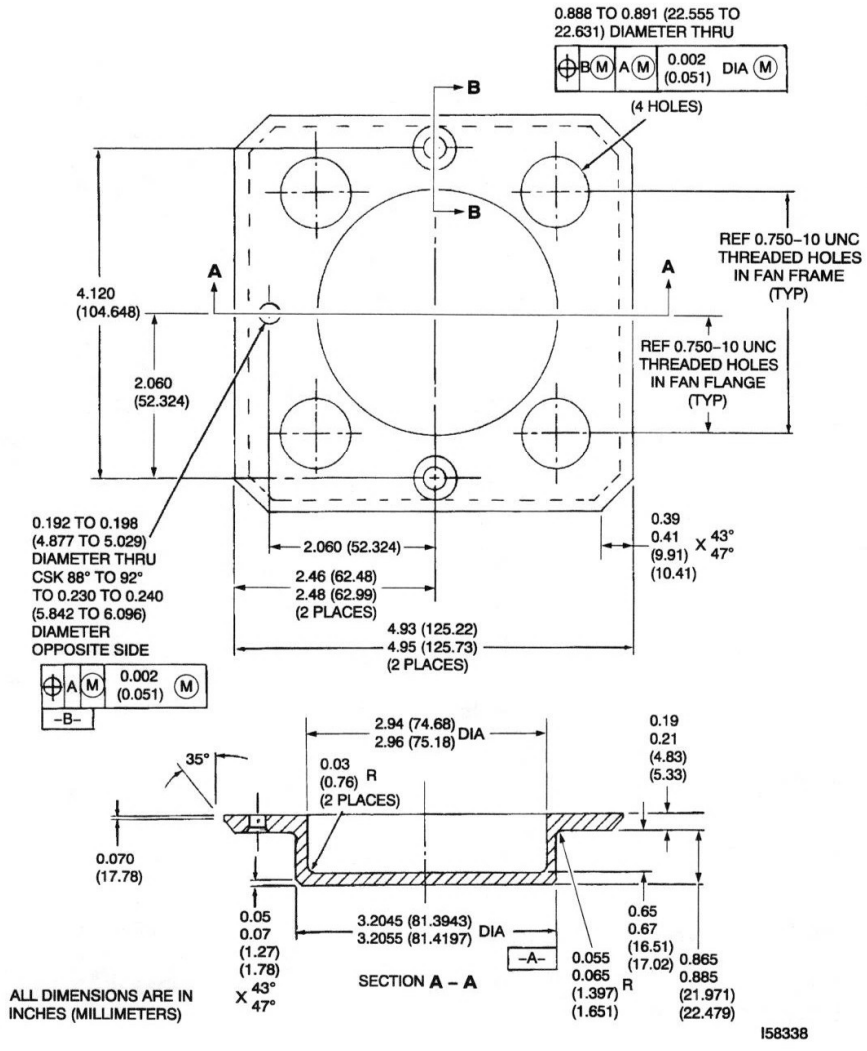
NOTE: The dimensions are to be met after putting on the epoxy coating. (Refer to following Step (21).)

(20) Passivate the fabricated sleeve and locator pin. (Refer to 70-30-15, SPM.)

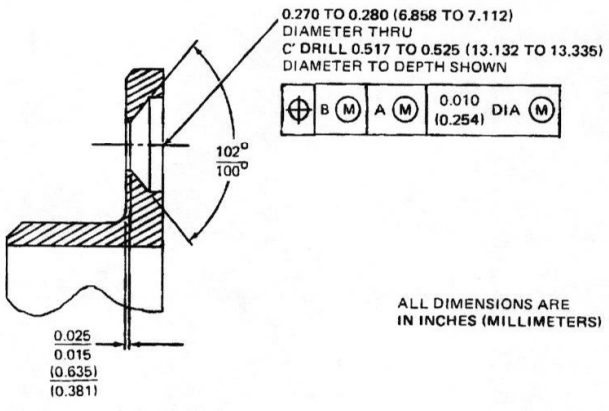
(21) Coat the fabricated sleeve and locator pin all over with clear epoxy. (Refer to 70-30-14, SPM.)

(22) Heat the support frame assembly to 190 to 210°F (88 to 99°C).

(23) Coat the locator pin with zinc chromate primer; then push the locator pin into the frame assembly while primer is still wet.



Fabrication of the Sleeve
Figure 902 (Sheet 1 of 2)



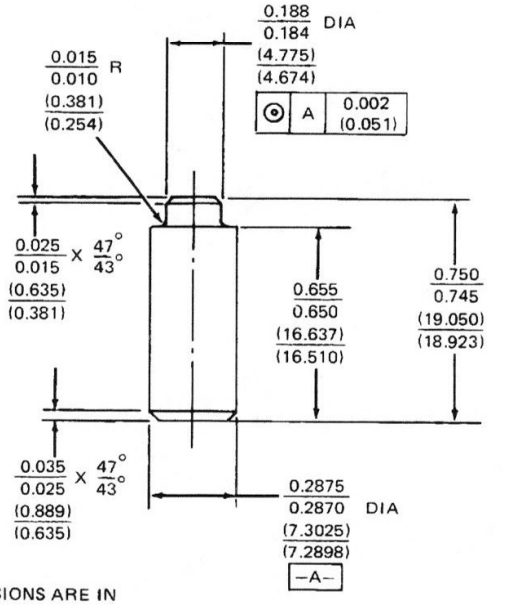
Fabrication of the Sleeve
Figure 902 (Sheet 2)

1. B. (24) Put zinc chromate primer on the outer diameter and bottom surface of the flange of the fabricated sleeve. (Refer to 70-30-21, SPM.)

(25) While primer is still wet, push the sleeve into the heated frame assembly until the sleeve flange touches the frame assembly making sure the locator pin is flush with the locator holes in the sleeve.

NOTE: For ease of lining up the parts, use 0.750-10 UNC studs threaded into the four sleeve holes to help guide the sleeve as it is pushed in.

(26) Coat the threads of two screws MS24693-C293 with primer (Loctite Primer-T) and retaining compound (Loctite 620) according to manufacturer's instructions.



Fabrication of the Locator Pin
Figure 903

1. B. (27) Assemble the two screws MS24693-C293 into the threaded countersunk holes in each mounting pad.

NOTE: The screw heads must be 0.005 inch (0.13 millimeter) below the mounting pad surface after machining.

(28) Using acetone or equivalent, clean the bottom of the installed sleeve.

(29) Check to make sure that the face of the sleeve is flush with the frame assembly surface.

(30) Finish-machine the sleeve face and pilot ID. (*See Figure 904.*)

(31) Build up the air stream surface below the sleeve and fillet around the flange outer edge using polysulfide rubber as follows: (*See Figure 904.*)

(a) Surface treat exposed magnesium using chrome pickle solution (for unpainted surfaces). (Refer to 70-30-18, SPM.) Allow to dry thoroughly.

(b) Apply zinc chromate sealant to the repair area. Allow to dry for 30 minutes minimum.

(c) Prepare chromated polysulfide sealant compound per manufacturer's instructions.

(d) Apply compound to repair area using spatula. Conform with local flowpath contours.

(e) Fillet around flange outer edge using spatula or extrusion equipment.

(f) Allow sealant to cure for 72 hours.

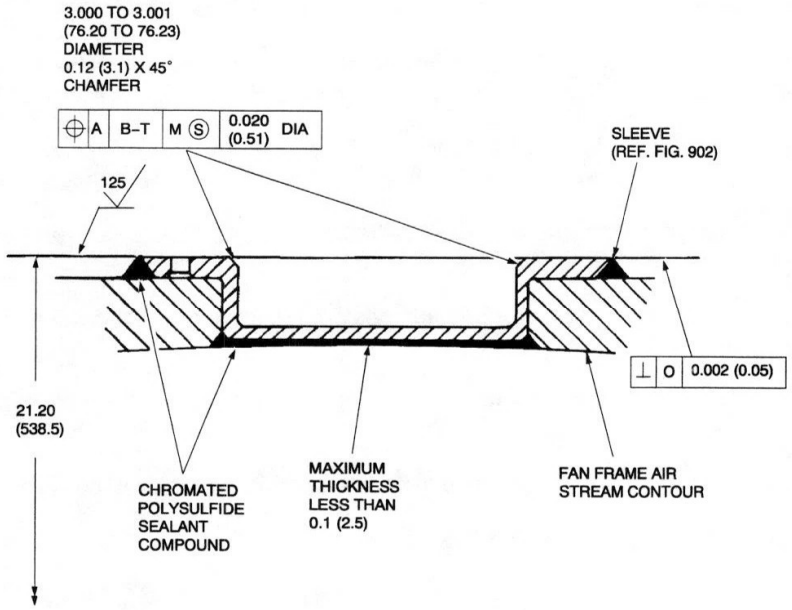
(32) Apply zinc chromate sealant to the OD of the new inserts MS51991E210, and lockrings RLRR56SB-11E0238. (Refer to 70-30-21, SPM.)

(33) While sealant is still wet, install the inserts MS51991E210 and lockrings RLRR56SB-11E0238 into the 0.750-10 UNC threaded holes. (Refer to 70-25-03, SPM.)

NOTE: The ends of the lockrings should be flush with or below the surface of the sleeve.

(34) Touch-up all the reworked areas including inserts, screws, and locator pins with gray epoxy paint. (Refer to 70-30-14, SPM.)

(35) Fill the heads of the screws and lockrings with gray epoxy paint until the surfaces are flush with the sleeve face. (Refer to 70-30-14 SPM.)



Application of Epoxy Coating to Reworked Area
Figure 904

SUPPORT FRAME ASSEMBLY – REPAIR-19

1. Repair of Oil Transfer Hole When Depth of Damage is Between 0.035 to 0.258 Inch (0.89 to 6.55 Millimeter) – Repair-19

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Apply epoxy compound to restore the gouged and/or worn surface. (Refer to 70-30-22, SPM and *Figure 901.*)

      (2) Allow epoxy compound to cure. (Refer to 70-30-22, SPM.)

      (3) Machine surface to specified dimensions or contour. (*See Figure 901.*)

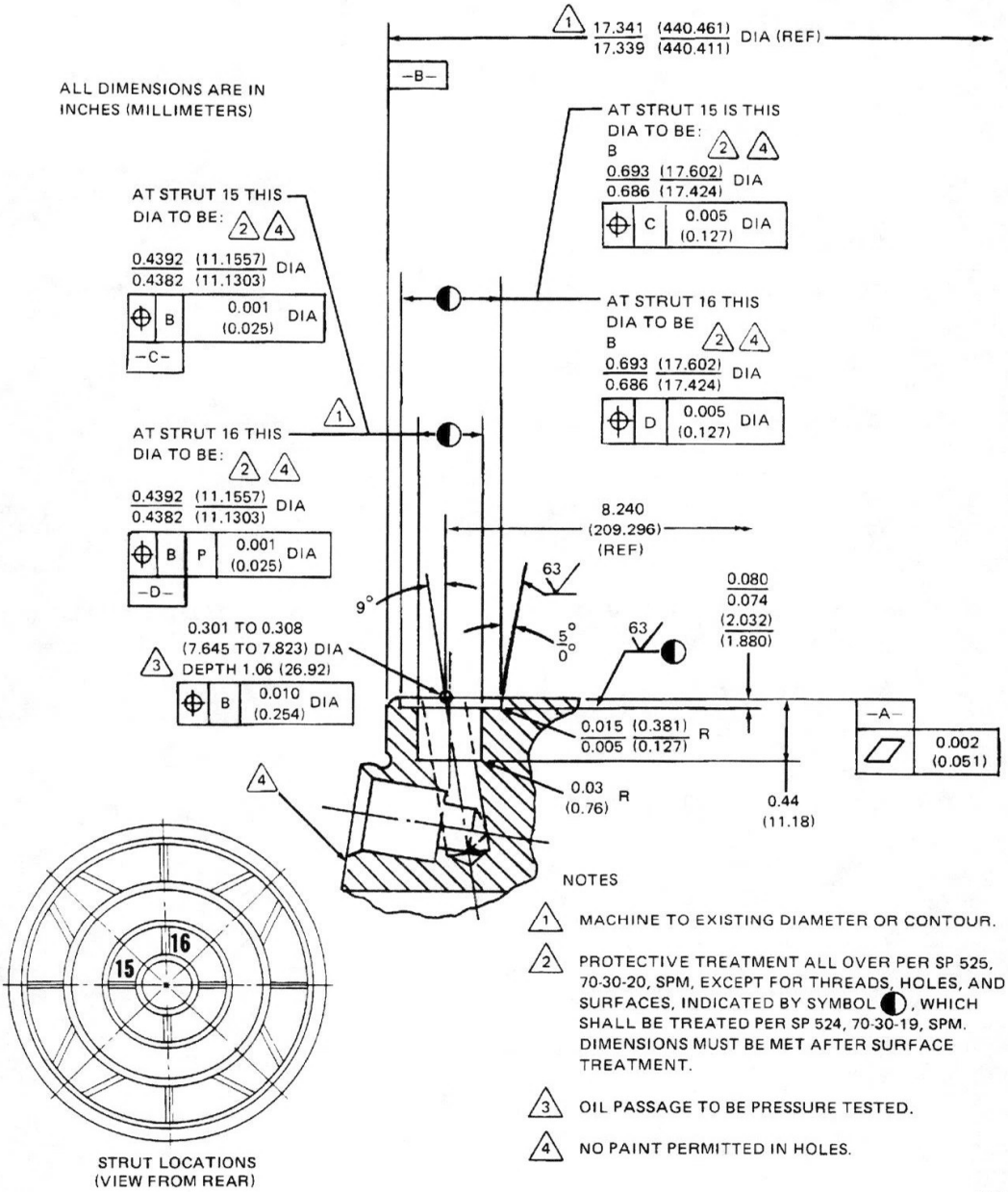
         NOTE: Final dimensions shall be met after surface treatment.

      (4) Touch up machined surfaces specified in *Figure 901.* (Refer to 70-30-19 and 70-30-20, SPM.)

      (5) Hydraulic pressure test passages at 200 psi (1379 kN/m^2) in accordance with AMS2616. Leakage is not allowed.

         NOTE: Pneumatic pressure testing using compressed air or bottled nitrogen regulated to 200 psi (1379 kN/m^2) is an allowable alternate to hydraulic pressure testing.

      (6) Inspect oil transfer hole. (Refer to 72-32-04, Inspection/Check.)



NOTES

1. MACHINE TO EXISTING DIAMETER OR CONTOUR.
2. PROTECTIVE TREATMENT ALL OVER PER SP 525, 70-30-20, SPM, EXCEPT FOR THREADS, HOLES, AND SURFACES, INDICATED BY SYMBOL ◐, WHICH SHALL BE TREATED PER SP 524, 70-30-19, SPM. DIMENSIONS MUST BE MET AFTER SURFACE TREATMENT.
3. OIL PASSAGE TO BE PRESSURE TESTED.
4. NO PAINT PERMITTED IN HOLES.

A0390

Repair of Oil Transfer Hole
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-20

1. Repair of Oil Transfer Hole When Wear Depth is Less than 0.035 Inch (0.89 Millimeter) – Repair-20

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

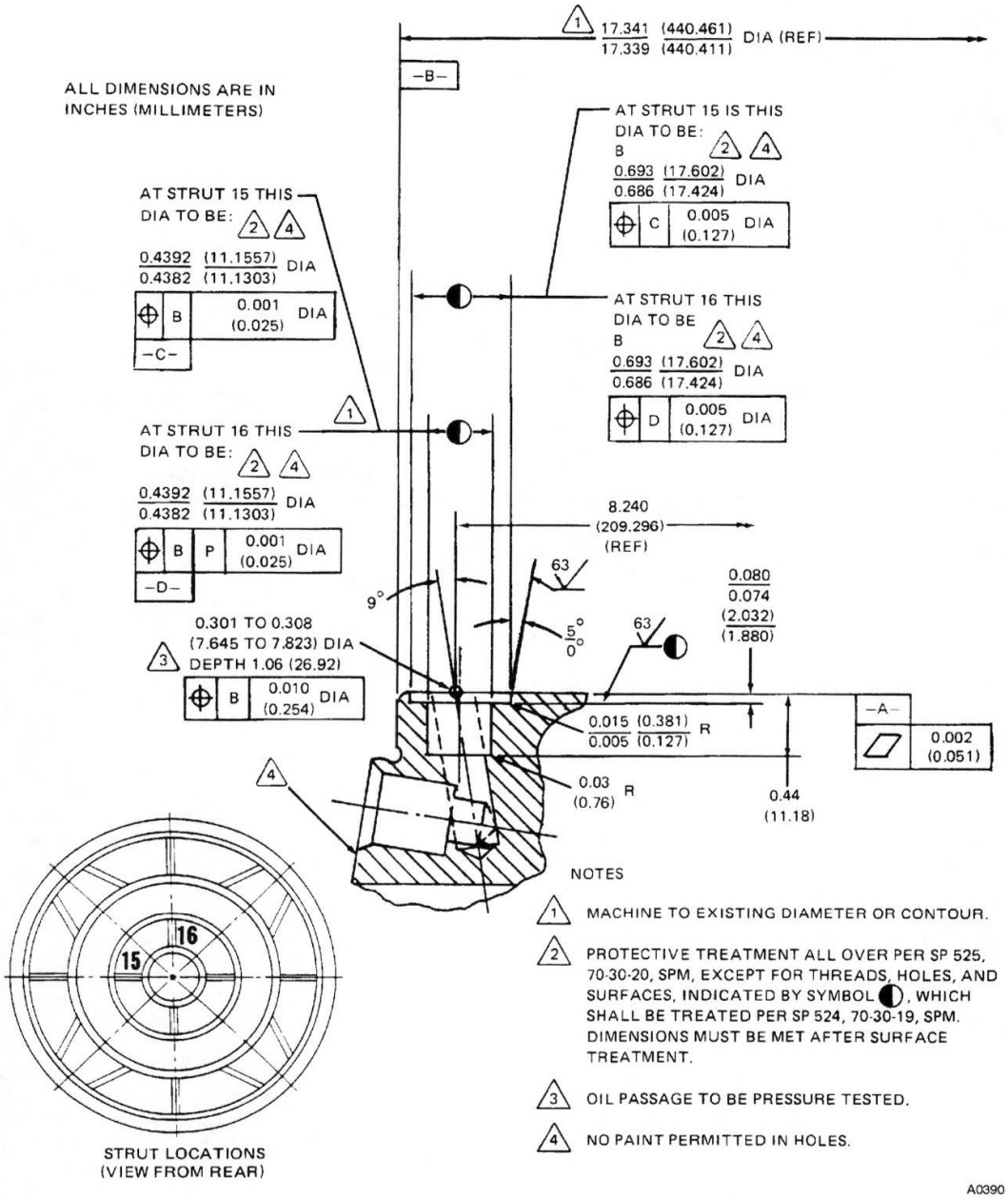
      (1) Touch up surfaces specified in *Figure 901*. (Refer to 70-30-19 and 70-30-20, SPM.)

         NOTE: Final dimensions shall be met after surface treatment.

      (2) Hydraulic pressure test passages at 200 psi (1379 kN/m^2) in accordance with AMS2616. Leakage is not allowed.

         NOTE: Pneumatic pressure testing using compressed air or bottled nitrogen regulated to 200 psi (1379 kN/m^2) is an allowable alternate to hydraulic pressure testing.

      (3) Inspect oil transfer hole. (Refer to 72-32-04, Inspection/Check.)



NOTES

1. MACHINE TO EXISTING DIAMETER OR CONTOUR.
2. PROTECTIVE TREATMENT ALL OVER PER SP 525, 70-30-20, SPM, EXCEPT FOR THREADS, HOLES, AND SURFACES, INDICATED BY SYMBOL ◐, WHICH SHALL BE TREATED PER SP 524, 70-30-19, SPM. DIMENSIONS MUST BE MET AFTER SURFACE TREATMENT.
3. OIL PASSAGE TO BE PRESSURE TESTED.
4. NO PAINT PERMITTED IN HOLES.

A0390

Repair of Oil Transfer Hole
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-21

1. Repair of Corrosion and Fretting on the Outer Accessory Gearbox Mounting Pad Contact Surface at the 0.999 to 1.001 Inch (25.38 to 25.43 Millimeter) Dimension – Repair-21

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Aluminum Oxide Abrasive (70 Grit)	05-11
Aluminum	08-04, -09
Magnaflux Cleaner	
Magnesium (AMS4350, AMS4377)	08-19, -21
or	
Magnesium (AZ61A-F, AZ31B-H24)	08-19A, -21A
Primer	01-09
Retaining Compound	01-08

Repair Parts:

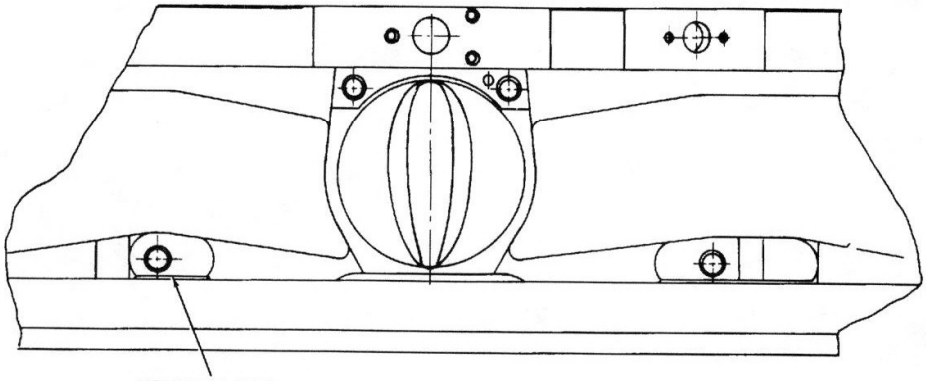
Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Machine Screw	MS51960-64			

B. Procedure

WARNING: THE SUPPORT FRAME ASSEMBLY MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING AND MACHINING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

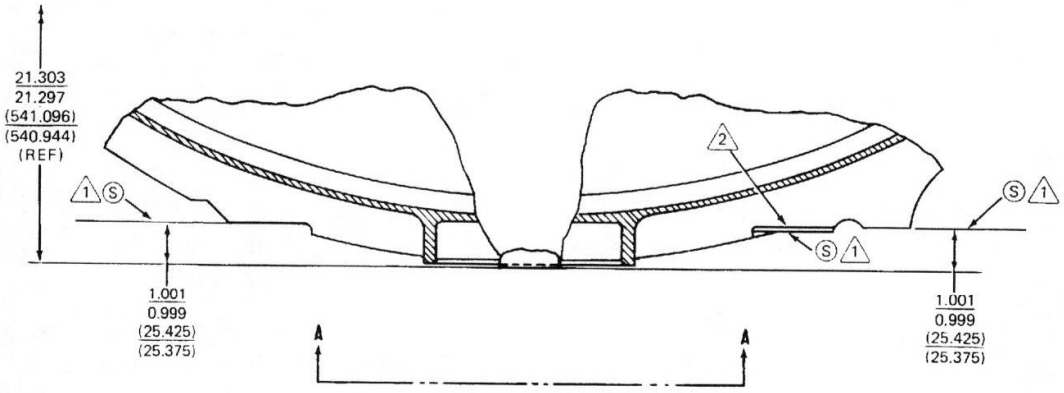
(1) Remove Rosan inserts from affected outer pad. (Refer to Repair-07.)

(2) Remove corrosion/fretting by machining affected outer pad area (*Figure 901*) to a depth no greater than 0.100 inch (2.54 millimeter) and no less than 0.050 inch (1.27 millimeter).



VIEW **A-A**

ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)



NOTES:

1. TWO SURFACES MARKED (S) SHALL LIE IN THE SAME PLANE WITHIN 0.001 (0.025)
2. EPOXY AND SHIM TYPICAL ON EITHER OR BOTH PADS WHERE APPLICABLE.

A0367–X

Outer Accessory Gearbox Mounting Pad Repair Area
Figure 901

1. B. (3) Using magnesium alloy, AMS4350 or equivalent, fabricate shim to conform with outer gearbox mounting pad configuration. (*See Figure 902.*)

NOTE: Shape and thickness may vary as needed provided finish requirements are met. (*See Figure 901.*)

(4) Mask areas on housing not to be bonded.

(5) Using aluminum oxide grit delivered at 65 psi (448 kN/m^2) suction pressure, grit blast surfaces to be bonded.

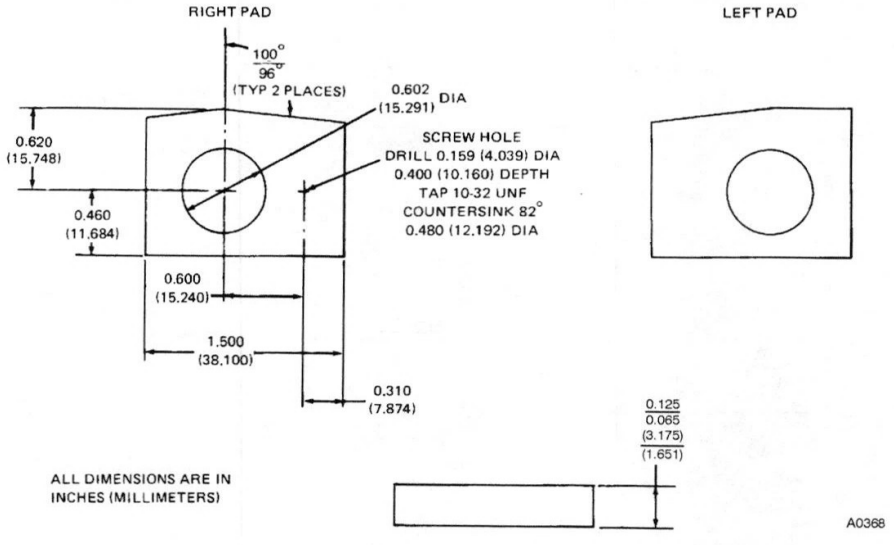
NOTE: In extreme cases where grit blasting is not possible, surface roughing may be accomplished. (Refer to 70-30-22, SPM.)

(6) Using a clean, dry air blast, remove all residual grit.

(7) Using acetone, thoroughly clean housing and shim surfaces to be bonded.

(8) Apply epoxy compound between shim and housing. (Refer to 70-30-22, SPM.)

(9) Install shim, aligning hole in shim with Rosan counterbore in housing. Allow epoxy compound to cure with a 0.003 to 0.005 inch (0.08 to 0.13 millimeter) bond line between shim perimeter and mating part.



Fabrication of Shim
Figure 902

1. B. (10) Drill, thread, and countersink screw hole in location as shown in *Figure 902.*

(11) Apply Loctite primer and retaining compound to screw threads; then install screw and tighten 25 to 30 inch pounds torque.

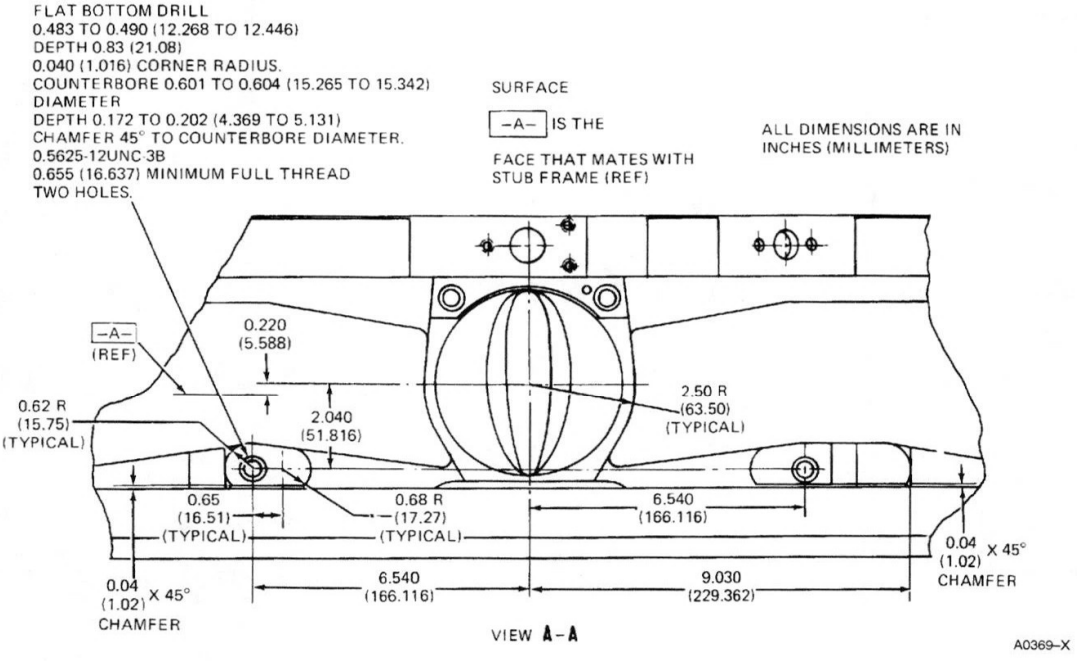
(12) Using clean cotton swab moistened with acetone, remove excess primer and retaining compound.

(13) Machine surface to specified dimensions. (*See Figure 903.*)

NOTE: Final dimensions shall be met after all surface treatment. (Refer to Step (15).)

(14) Replace Rosan insert or repair if necessary. (Refer to Repair-07.)

(15) Touch-up repair area. (Refer to 70-30-19, SPM.)



Final Machining Dimensions
Figure 903

SUPPORT FRAME ASSEMBLY – REPAIR-22

1. Repair of Worn Frame Coupling Anti-Rotation Pin Slot Area in the No. 4 Strut Tube Assembly – Repair-22

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

   B. Procedure

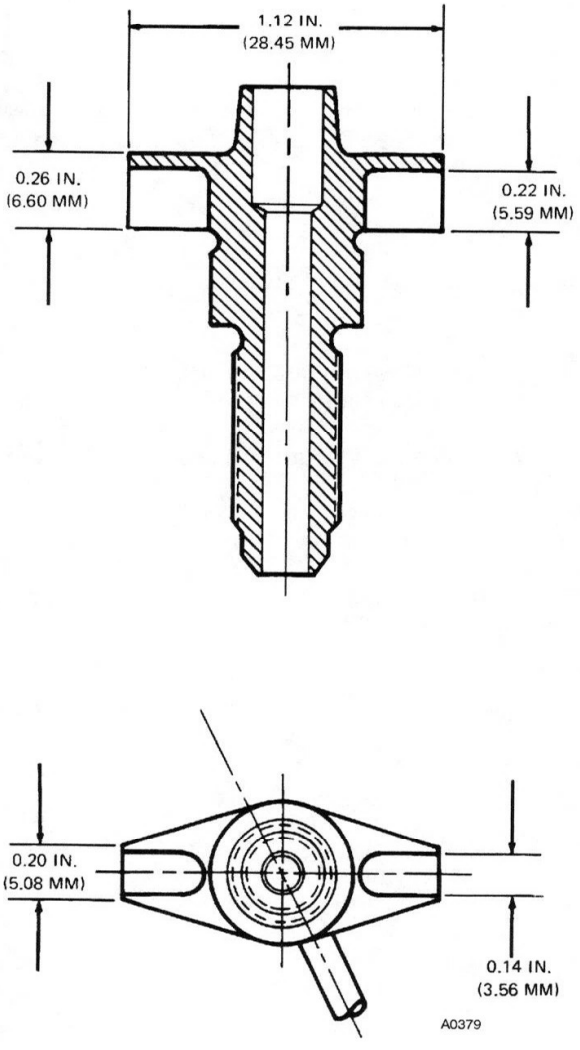
      (1) Using vapor-degreasing method, thoroughly clean coupling in preparation for welding. (Refer to 70-15-01, SPM.)

      (2) Using welding wire AMS5680 and fusion welding method, weld build-up worn area to Class IV requirements. (Refer to 70-45-01, SPM.)

         NOTE: Build up minimum amount necessary to achieve final dimensions. (*See Figure 901.*)

      (3) Blend area to specified dimensions. (*See Figure 901.*)

      (4) Fluorescent-penetrant inspect welds to Class IV requirements as specified in 70-45-01, SPM. (Refer to 70-20-05, SPM.)



No. 4 Strut Tube Assembly Frame Coupling Final Dimensions
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-23

1. Repair of Worn Frame Coupling Anti-Rotation Pin Slot Area in the No. 5 or 7 Strut Tube Assembly – Repair-23

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-25

B. Procedure

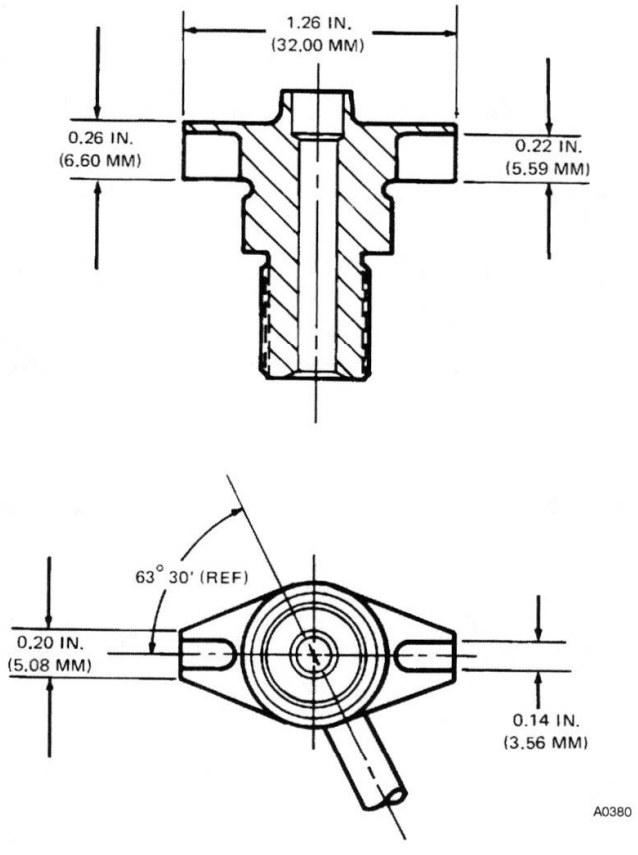
(1) Using vapor-degreasing method, thoroughly clean coupling in preparation for welding. (Refer to 70-15-01, SPM.)

(2) Using welding wire AMS5680 and fusion welding method, weld buildup worn area to Class IV requirements. (Refer to 70-45-01, SPM.)

NOTE: Build up minimum amount necessary to achieve final dimensions. (*See Figure 901.*)

(3) Blend area to specified dimensions. (*See Figure 901.*)

(4) Fluorescent-penetrant inspect welds to Class IV requirements as specified in 70-45-01, SPM. (Refer to 70-20-05, SPM.)



No. 5 or 7 Strut Tube Assembly Frame Coupling Final Dimensions
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-24

1. Removal/Prevention of Corrosion in Thru Holes at No. 6 Strut – Repair-24

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Compound Sealant	01-32
Release Film	06-16
Zinc Chromate Sealant	01-30

B. Procedure

NOTE: If no corrosion is present, this procedure is optional to prevent corrosion caused by collection of moisture and salt.

(1) Remove bolts from holes and note location. (*See Figure 901.*)

Clean bolts and brush or spray bolts with one or two light coats of release film RAM GS-3. Air dry or equivalent. Allow 5 minutes drying time between coats and 30 minutes final drying time.

(2) Using suitable mechanical means, remove corrosion or old filler compound from insert holes.

(3) Treat exposed magnesium surface with chrome pickle solution (unpainted surfaces). (Refer to 70-30-18, SPM.) Allow to dry thoroughly.

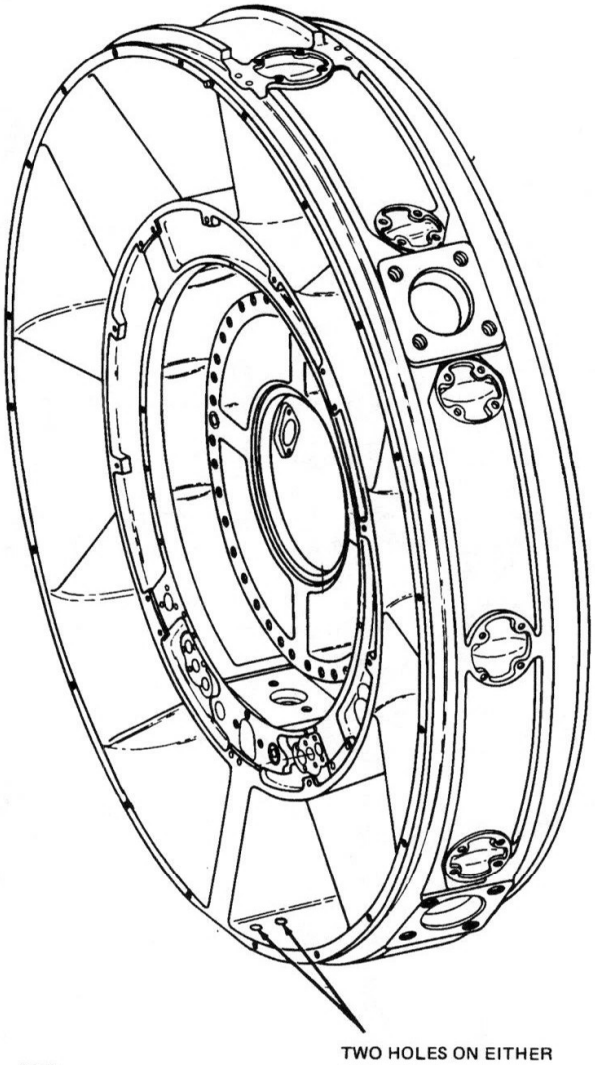
(4) Apply zinc chromate primer to the repair area and inside of the holes. Allow to dry for 30 minutes minimum.

(5) Install bolts into their original locations.

(6) Prepare chromated polysulfide sealant compound in accordance with manufacturer's instructions.

(7) Using spatula, apply sealant to area conforming to local flowpath.

(8) Allow sealant to cure 72 hours.



A2080

Support Frame Assembly Through Holes Locations
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-25

1. Repair of Oil Transfer Tube Hole With Sleeve Insert – Repair-25

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Coating Material	06-06A
Aluminum/Ceramic Coating (AMS2473, AMS4115, AMS4116, AMS4117)	08-08
Aluminum/Nickel Coating	08-09
Aluminum Alloy	08-11 or -09
Magnesium (AMS4350, AMS4352, AMS4377)	08-19, -20, -21
or	
Magnesium (AZ61A-F, ZK60A-T5, AZ31B-H24)	08-19A, -20A, -21A
Primer	01-09
Retaining Compound	01-07

B. Procedure

(1) Using existing 0.4382 to 0.4392 inch (11.130 to 11.156 millimeter) diameter hole centerline, machine oil transfer tube hole to 0.562 inch (14.28 millimeter) diameter, depth 0.440 inch (11.18 millimeter) maximum. (*See Figure 901.*)

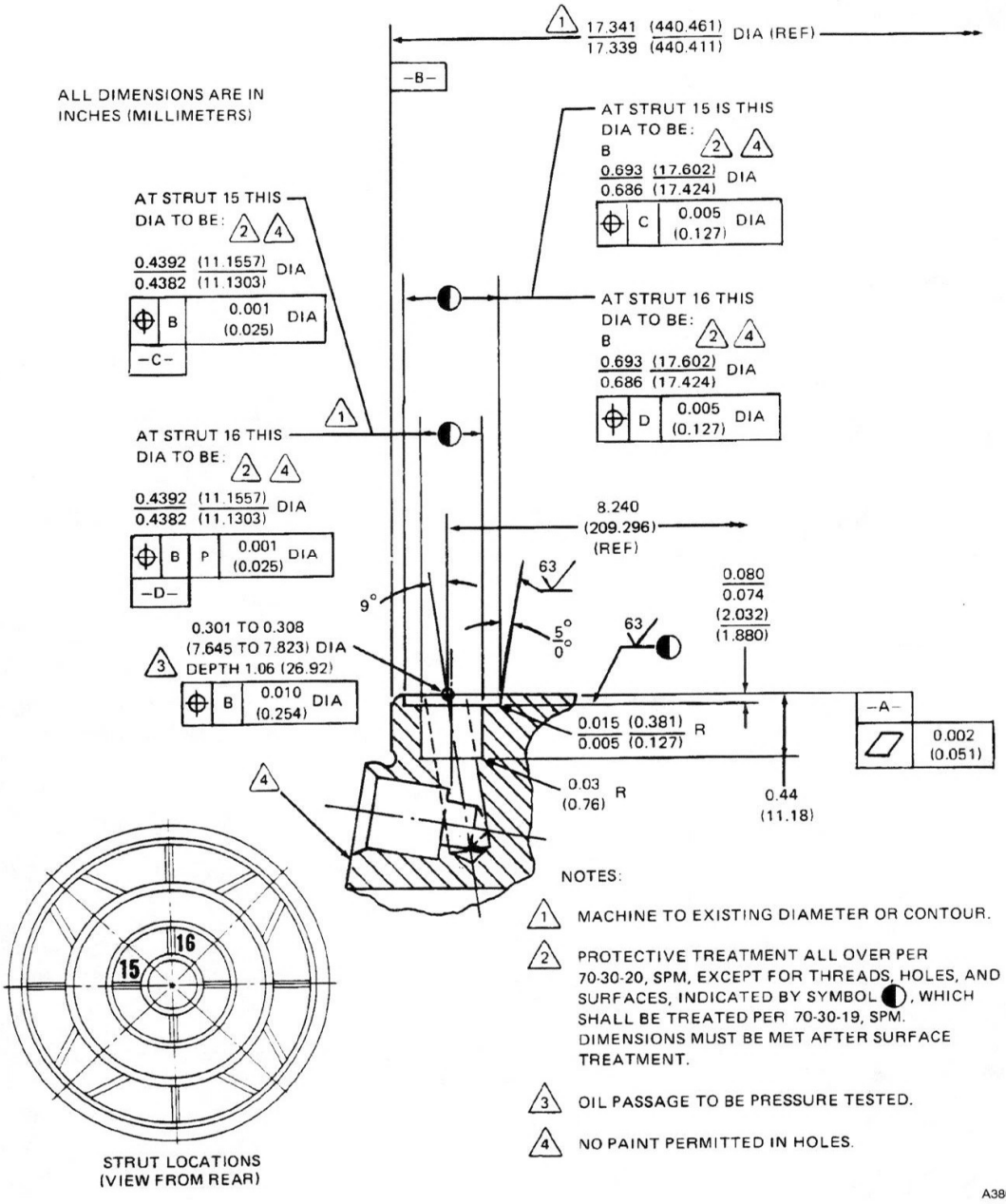
(2) If oil hole does not clean up completely, apply epoxy. (Refer to 70-30-22, SPM and 72-32-04, Repair-19.) Machine to clean up. Extent of epoxy application shall not exceed limits of Repair-19. Small areas in the top of the hole not cleaning up may be back-filled with epoxy or paint after installation of sleeved insert.

(3) Fabricate magnesium or aluminum sleeve. Diameter "A" to be 0.0005 to 0.001 inch (0.013 to 0.03 millimeter) tight fit with machined 0.562 inch (14.28 millimeter) diameter. Dimension "B" and the ID are non-mandatory. (*See Figures 901 and 902.*)

(4) Apply primer (Loctite Primer T) and retaining compound (Loctite 620) to surfaces to be bonded according to manufacturer's instructions. Install sleeve. (*See Figure 902.*)

(5) Machine hole. (*See Figure 901.*)

NOTE: All finish dimensions apply after surface treatments.



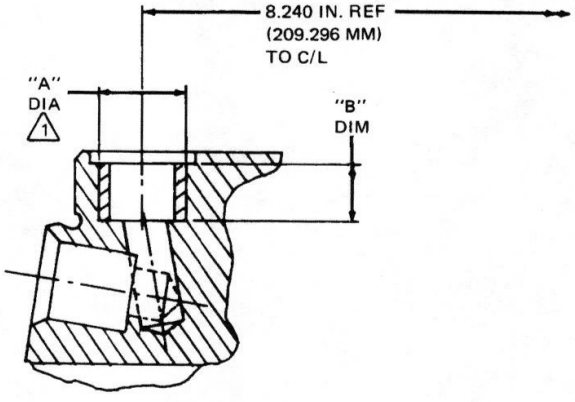
Repair of Oil Transfer Hole
Figure 901

1. B. (6) Touch up exposed and surrounding magnesium surfaces. (*See Figure 901.*) (Refer to 70-30-19 and 70-30-20, SPM.) If aluminum material was used for the sleeve, use Alodine 1200 (AMS2473) for the chrome pickle solution when surface treating the sleeve surfaces only.

(7) Hydraulic pressure test repaired passage(s) at 200 psi (1379 kN/m^2) in accordance with AMS2616. Leakage is not allowed.

NOTE: Pneumatic pressure testing using compressed air or bottled nitrogen regulated to 200 psi (1379 kN/m^2) is an allowable alternate to hydraulic pressure testing.

(8) Inspect oil transfer hole. (Refer to 72-32-04, Inspection/Check.)



Sleeve Installation
Figure 902

SUPPORT FRAME ASSEMBLY – REPAIR-26

1. Repair of Cracks Adjacent to Reduction Gear Carrier Assembly Locating Pins – Repair-26

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
No Number	Pencil Grinder

B. Procedure

WARNING: THIS PART MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

(1) If necessary, remove lock ring (circlip) and reduction gear carrier assembly locating pin from affected hole so as to permit access to the repair area.

(2) Using a pencil grinder or other suitable abrasive, blend-repair indication(s) as required. (Refer to 70-25-01, SPM and *Figure 901.*)

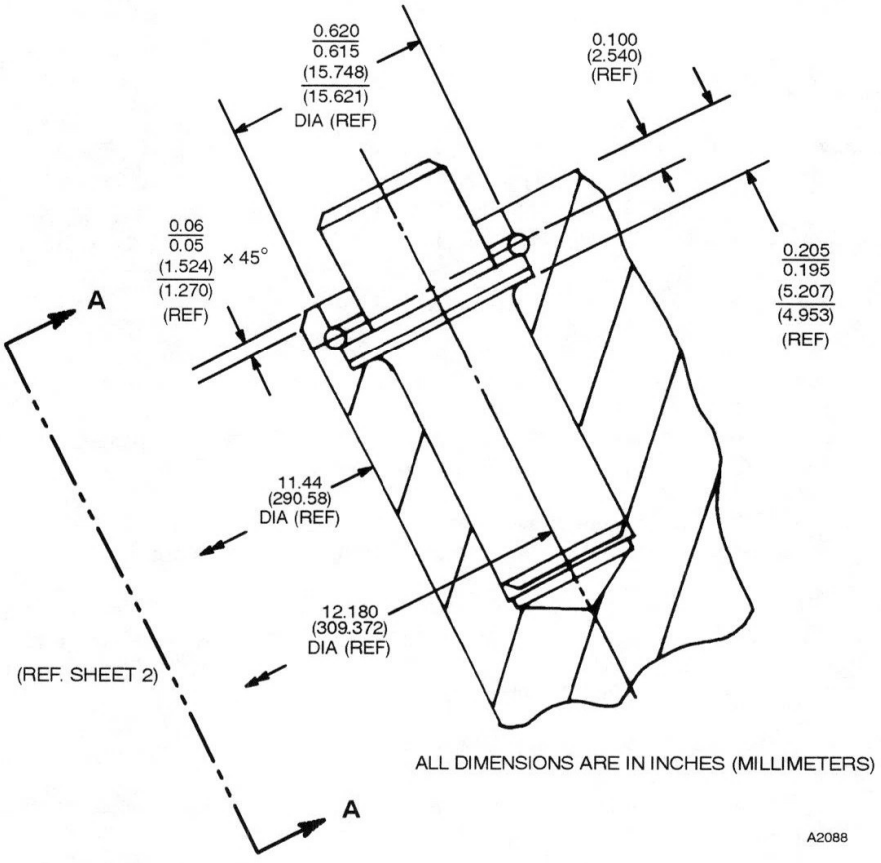
- Blend-repairs must have a bottom radius of 0.060 ±0.005 inch (1.52 ±0.13 millimeter) and transition smoothly with surrounding surfaces.
- Depth of blend shall be to the depth of the counterbore. (*See Figure 901.*) Under no circumstances shall any portion of the blend repair depth progress beyond depth of the counterbore. If crack or blend-repair depth extends beyond counterbore, reject support frame assembly.
- Break sharp edges and corners to a 0.030 inch (0.76 millimeter) radius.

(3) Fluorescent-penetrant inspect blend-repairs to make sure indication(s) are completely removed. (Refer to 70-20-05, SPM.)

(4) Touch up blend-repaired areas. (Refer to 70-30-19 or 70-30-20, SPM.)

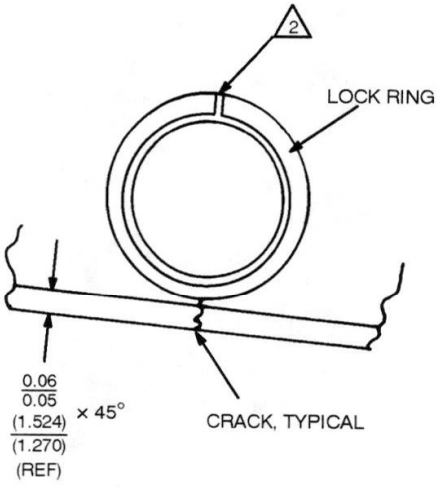
(5) If removed, reinstall, repair, or replace reduction gear carrier assembly locating pin. (Refer to Repair-10.)

(6) Reinstall lock ring (circlip), locating lock ring ends 180 degrees (furthest distance away) from blend repaired area. (*See Figure 901.*)

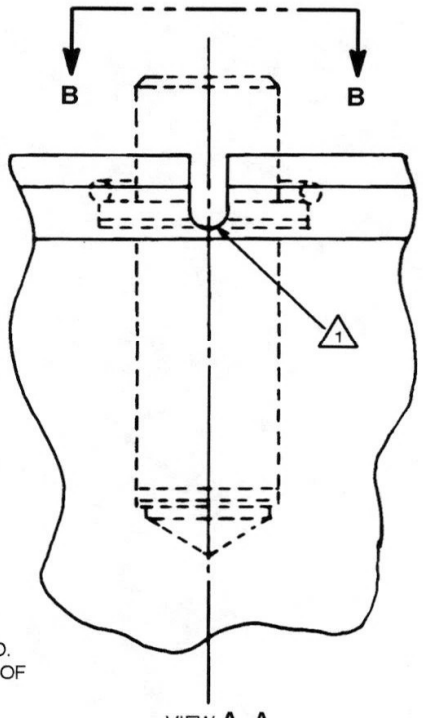


Repair of Carrier Assembly Locating Pin Hole
Figure 901 (Sheet 1 of 2)

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)



VIEW **B–B**



VIEW **A–A**
ROTATED –90 DEGREES

NOTES:

1. BLEND RADIUS OF 0.060 +/– 0.005 (1.524 +/– 0.127) REQUIRED. DEPTH OF REPAIR NOT TO EXCEED COUNTERBORE DEPTH OF 0.195 TO 0.205 (4.953 TO 5.207).
2. INSTALL LOCK RING (CIRCLIP) SO THAT THE SPLIT IS POSITIONED 180 DEGREES FROM THE BLEND AREA.

A2089

Repair of Carrier Assembly Locating Pin Hole
Figure 901 (Sheet 2)

SUPPORT FRAME ASSEMBLY – REPAIR-27

1. Repair of Corrosion and Fretting of the 26.989 to 26.999 Inch (685.52 to 685.78 Millimeter) Diameter Flange – Repair-27

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

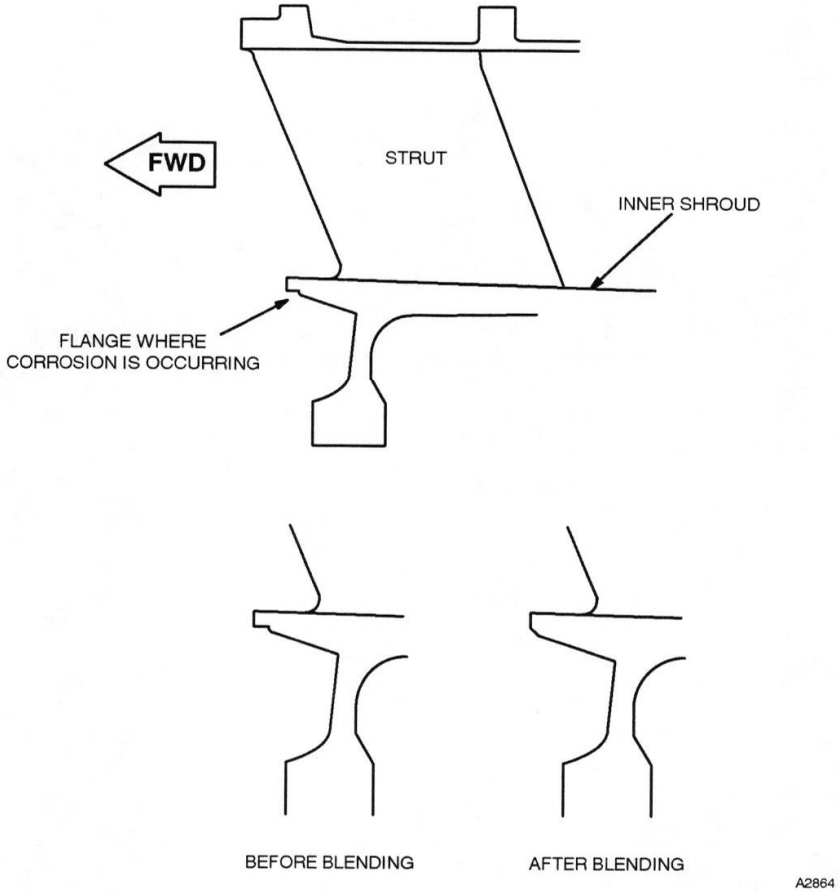
      None.

   B. Procedure.

      WARNING: THIS PART MAY BE COMPOSED OF A MAGNESIUM/NICKEL ALLOY CONTAINING RADIOACTIVE THORIUM; PARTICLES OF THIS METAL, RESULTING FROM BLENDING, ARE NOT HAZARDOUS UNLESS INGESTED OR OTHERWISE INTRODUCED INTO THE BODY. IF INJURY OCCURS, NO MATTER HOW SLIGHT, SEEK MEDICAL ATTENTION.

      (1) Remove nicks, burrs, scratches, minor cracks, and other surface defects by blend-repair. (Refer to 70-25-01, SPM and *Figure 901.*)

      (2) Using blue or gray epoxy resin method, as applicable, touch-up repaired area. (Refer to 70-30-20, SPM.)



26.989 to 26.999 Inch (685.52 to 685.78 Millimeter) Diameter Flange Repair Area
Figure 901

SUPPORT FRAME ASSEMBLY – REPAIR-28

1. Repainting of Fan Frame – Repair-28

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Complete strip and repaint of the support frame assembly is restricted to suppliers that have demonstrated the ability to perform this operation in accordance with 70-15-15, SPM.

      (2) For a list of approved suppliers contact:

      Honeywell Engines, Systems & Services
      Customer Support Center
      P.O. Box 29003
      M/S 26-06/2102-323
      Phoenix, AZ 85038-9003
      Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
      FAX: 1-602-365-3343

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SUPPORT FRAME ASSEMBLY – REPAIR-29

1. Weld Repair of Fan Frame – Repair-29

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Several weld repairs exist for restoring or repairing damaged features of the fan frame. In general, damage under 2 inches (51 millimeters) in length or 2 square-inches (1290 square-millimeters) in area can be repaired unless the aircraft mounting pad, gearbox mounting pad, or reduction gear carrier pin holes are involved. If these areas are involved, weld repair is subject to limitations.

      (2) Execution of this repair is limited to sources that have demonstrated the ability to perform the repair in accordance with Honeywell requirements. For a list of approved suppliers contact:

      Honeywell Engines, Systems & Services
      Customer Support Center
      P.O. Box 29003
      M/S 26-06/2102-323
      Phoenix, AZ 85038-9003
      Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
      FAX: 1-602-365-3343

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SUPPORT FRAME ASSEMBLY – REPAIR-30

1. Inhibiting Erosion on Fan Frame Leading Edges Using Viton Rubber Paint (Chemtac 20) – Repair-30

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Alcohol	07-19
Viton Rubber Paint (Chemtac 20)	

B. Procedure

NOTE: The use of Viton Rubber Paint (Chemtac 20) to inhibit erosion on the fan frame leading edges shall be at the sole discretion of the customer. Chemtac 20 shall be applied following complete strip and repainting of the fan frame or touch-up of repaired areas in accordance with 70-30-20, SPM.

WARNING: ETHYL ALCOHOL CONTAINS METHYL ALCOHOL AND CANNOT BE MADE NONPOISONOUS. KEEP AWAY FROM HEAT OR OPEN FLAMES. AVOID CONTACT WITH EYES. TO PREVENT INHALING FUMES, PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALATION OF FUMES.

(1) Clean affected area with ethyl alcohol. Allow 15 minutes for area to dry.

(2) Mask or shield surrounding areas not requiring treatment.

(3) Mix in accordance with manufacturers instructions.

NOTE: Once mixed, Chemtac 20 has a useful life of approximately 8 hours at 75°F (24°C). In the unmixed state, Chemtac components have an unlimited shelf life. The curing agent has a 1-year shelf life from the date of manufacture.

1. B. (4) Apply Chemtac 20 by brushing, dipping, rolling, or airless spraying. Thickness shall be 0.002 to 0.004 inch (0.05 to 0.10 millimeter).

(5) Remove masking and cure at 75°F (24°C) for 24 hours or heat for 20 minutes at 320°F (160°C) in an air-circulating oven.

(6) Visually inspect. The coating shall show no visible indications of defects such as blistering, entrapped air pockets, flaking, peeling, or scaling. Sags, runs, or voids are not allowed. When visually inspected without magnification, the finish shall be homogeneous, uniform, and smooth.

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ENGINE MANUAL
ALF502R

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TEMPORARY REVISION NO. 72-973

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 902, 72-32-04, REPAIR-30. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To increase thickness tolerance for leading edge paint application.

Use the following revised Step 1.B.(4) in lieu of the existing Step 1.B.(4).

1. B. (4) Apply Chemtac 20 by brushing, dipping, rolling, or airless spraying. Thickness shall be 0.005 to 0.020 inch (0.13 to 0.51 millimeter).

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SUPPORT FRAME ASSEMBLY – ASSEMBLY

1. Support Frame Assembly – Assembly

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Toluene Thinner	07-57
Zinc Chromate Sealant, Non-drying	01-31, -31A

   B. Assembly

      NOTE: During the following reassembly procedure, all nuts, bolts, washers, pins, studs, etc, that are installed in support frame assembly (78, *Figure 1001)* shall have non-drying zinc chromate sealant applied to them. The sealant shall be applied under the heads of bolts and nuts, under the heads of locking or locating pins and the exposed end of pins after the pins are installed. After reassembly is completed, the excess sealant shall be wiped off using a clean cloth dampened, not soaked, with toluol.

      (1) Place support frame assembly (78), forward end down, on a workbench.

      (2) Using ten bolts (1, *Figure 1002)*, secure five brackets (2), two brackets (3), and bracket (4) to support frame assembly.

      (3) Position No. 6 strut fuel-out fitting (69, *Figure 1001)* on support frame assembly (78) and install three bolts (68). Tighten bolts to standard torque.

      (4) Install two packings (70) and two packings (71) in grooves on No. 6 strut fuel-in tube assembly (72) and insert tube assembly into No. 6 strut. (See *Figure 1003* for strut locations.) Position No. 6 strut fuel-in fitting (67, *Figure 1001)* over tube assembly (72) and secure fitting to frame assembly with two bolts (63), two washers (64), bolt (65), and washer (66). Tighten bolts (63 and 65) to standard torque.

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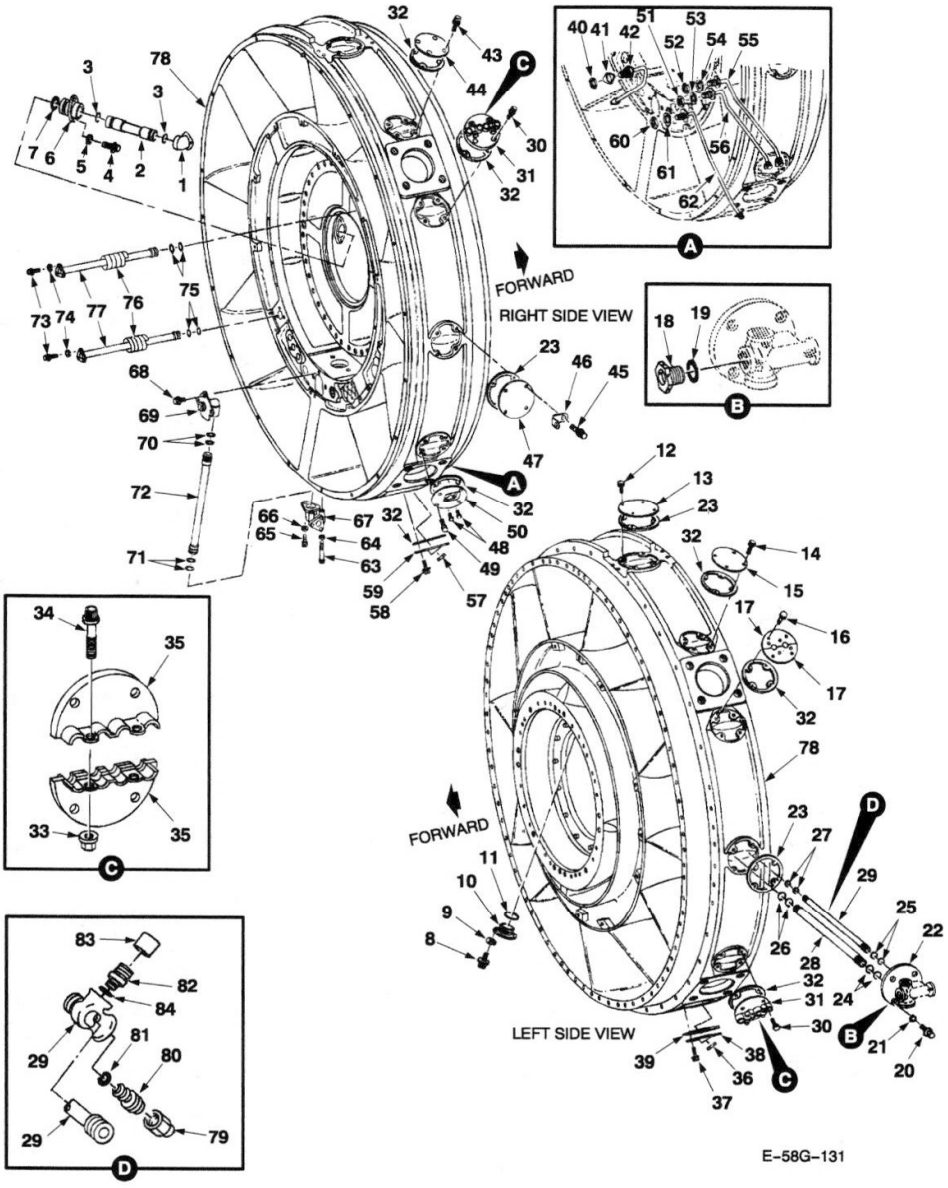

Support Frame Assembly
Figure 1001

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KEY TO FIGURE 1001

1. FLANGE ASSEMBLY
2. TUBE ASSEMBLY
3. PACKING
4. BOLT
5. WASHER
6. OIL TRANSFER ADAPTER
7. PACKING
8. BOLT
9. WASHER
10. FRAME PLUG
11. PACKING
12. BOLT
13. FRAME PLATE
14. BOLT
15. FRAME PLATE
16. BOLT
17. IGNITION LEAD PLATE
18. PLUG
19. PACKING
20. BOLT
21. WASHER
22. OIL PRESSURE/TEMPERATURE BULB COVER ASSEMBLY
23. GASKETS
24. PACKING
25. PACKING
26. PACKING
27. PACKING
28. OIL INLET TUBE ASSEMBLY
29. OIL INLET TUBE ASSEMBLY
30. BOLT
31. STRUT COVER ASSEMBLY
32. GASKETS
33. NUT
34. BOLT
35. STRUT COVER ASSEMBLY HALF
36. NUT
37. BOLT
38. NO. 7 STRUT COVER ASSEMBLY
39. GASKETS
40. NUT
41. RETAINING PLATE
42. NO. 7 STRUT TUBE ASSEMBLY
43. BOLT
44. FRAME PLATE
45. BOLT
46. BRACKET
47. FRAME PLATE
48. BOLT
49. BOLT
50. NO. 4 STRUT COVER
51. NUT
52. NUT
53. RETAINING PLATE
54. RETAINING PLATE
55. NO. 4 STRUT TUBE ASSEMBLY
56. NO. 4 STRUT TUBE ASSEMBLY
57. NUT
58. BOLT
59. NO. 5 STRUT COVER ASSEMBLY
60. NUT
61. RETAINING PLATE
62. NO. 5 STRUT TUBE ASSEMBLY
63. BOLT
64. WASHER
65. BOLT
66. WASHER
67. NO. 6 STRUT FUEL-IN FITTING
68. BOLT
69. NO. 6 STRUT FUEL-OUT FITTING
70. PACKING
71. PACKING
72. NO. 6 STRUT FUEL-IN TUBE ASSEMBLY
73. BOLT
74. WASHER
75. PACKING
76. SLEEVE
77. ANTI-ICING TUBE ASSEMBLY
78. SUPPORT FRAME ASSEMBLY
79. CAP
80. ADAPTER
81. PACKING
82. ADAPTER
83. CAP
84. PACKING

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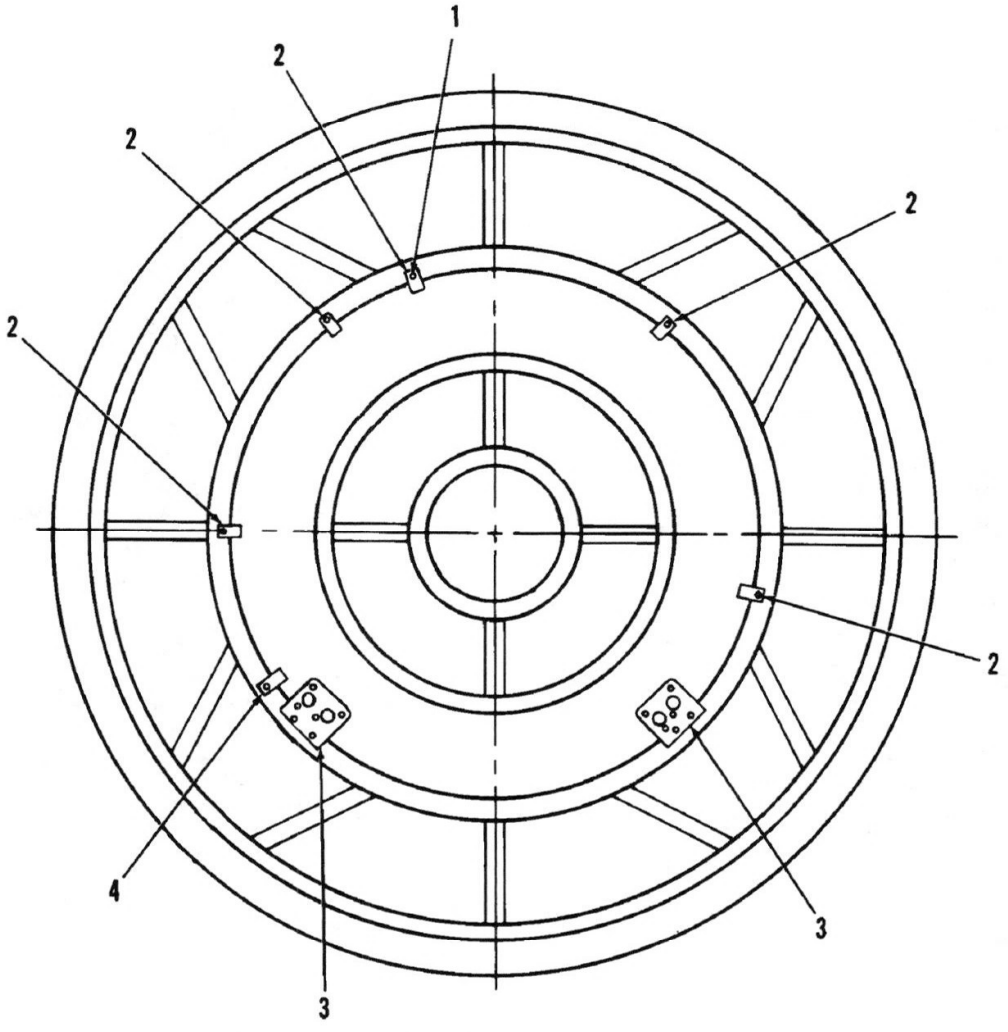

1. BOLT
2. BRACKET 2-183-030-01
3. BRACKET 2-163-452-01
4. BRACKET MS9592-008

Support Frame Assembly Bracket Locations
Figure 1002

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1. B. (5) Insert No. 5 strut tube assembly (62) into No. 5 strut. Secure inboard end of tube assembly with retaining plate (61) and nut (60). Position gasket (39) with No. 5 strut cover (59) on frame assembly, and install three bolts (58). Install nut (57) on tube assembly (62). Make sure that the pins in the frame assembly are engaged in the slots of both the inside and outside plates. Tighten bolts (58) to standard torque, and nuts (57 and 60), 75 to 100 pound-inches (8.5 to 11.3 newton-meters) torque.

(6) Insert No. 4 strut tube assemblies (55 and 56) into No. 4 strut. Secure inboard end of tube assembly (55) with retaining plate (54) and nut (52). Secure inboard end of tube assembly (56) with retaining plate (53) and nut (51). Position gasket (32) and No. 4 strut cover (50) on frame assembly, and install four bolts (49). Secure No. 4 strut tube assemblies (55 and 56) to cover (50) with two bolts (48). Make sure that the pins in the frame assembly are engaged into the slots of both the inside and outside plates. Tighten bolts (48 and 49) and nuts (51 and 52) to standard torque.

(7) Position gasket (23) and frame plate (47) on frame assembly, and install bracket (46) and four bolts (45).

(8) Secure two gaskets (32) and strut cover assemblies (31) to frame assembly with eight bolts (30).

(9) Secure gasket (32) and frame plate (44) to frame assembly with four bolts (43).

(10) Secure gasket (23) and frame plate (13) to frame assembly with four bolts (12).

(11) Secure gasket (32) and frame plate (15) to frame assembly with four bolts (14).

(12) Secure gasket (32) and two ignition lead plates (17) to frame assembly with four bolts (16).

(13) Tighten bolts (12, 14, 16, 30, 43, and 45) to standard torque.

(14) Insert No. 7 strut tube assembly (42) into No. 7 strut. Secure inboard end of tube assembly with retaining plate (41) and nut (40). Position gasket (39) and No. 7 strut cover (38) on frame assembly, and install three bolts (37). Install nut (36) on tube assembly (42). Make sure that the pins in the frame assembly are engaged in the slots of both the inside and outside plates. Tighten bolts (37) to standard torque, and nuts (36 and 40), 75 to 100 pound-inches (8.5 to 11.3 newton-meters) torque.

(15) Install packing (11) into groove on frame plug (10). Position frame plug on support frame assembly (78), and install two bolts (8) and two washers (9). Measure torque required to seat plug. Add this value to standard torque for bolt (8). Tighten bolts (8) to total torque value and lockwire.

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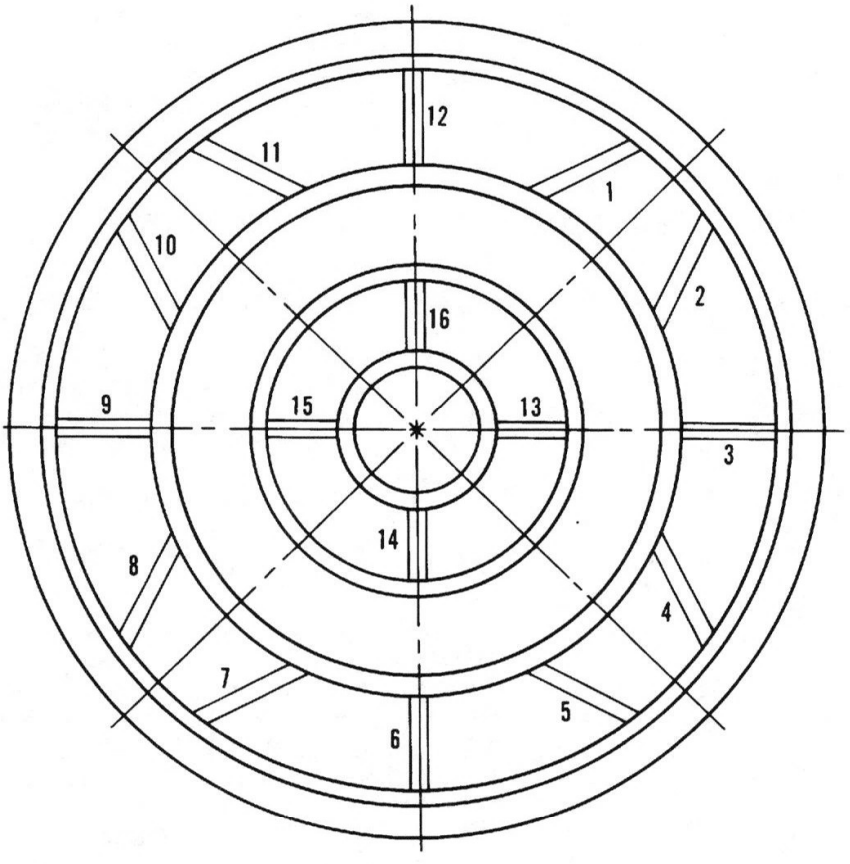

VIEW FROM REAR

A0396

Strut Locations
Figure 1003

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1. B. (16) **(Pre SB ALF/LF 72-1020)** Install a 3-inch (76 millimeter) section of sleeve (76) on each anti-icing tube assembly (77). (See *Figure 1004* for sleeve location.) Position two packings (75, *Figure 1001)* on each tube assembly (55). Insert tube assemblies through rear of support frame assembly (78) and into tube cavities. Install six bolts (73) and six washers (74). Measure torque required to seat tube assembly. Add this value to standard torque for bolt (73). Tighten bolts (73) to total torque value.

(17) **(Post SB ALF/LF 72-1020)** Install anti-icing transfer tubes (77) as follows:

(a) Partially install transfer tubes (2, *Figure 1005)* through the aft side of the fan frame. Install insulation (1) over the transfer tube(2). Install gasket (3) onto forward end of transfer tube (2).

(b) Insert the transfer tubes through the forward side of the fan frame and thread tubes into receptacles on the aft side of the second low pressure compressor vane assembly (4). Torque transfer tubes (2) to 100 pound-inch (11.3 Nm).

(c) Install the tube lock (5) over transfer tube (2) and install bolts (6) and lockwire.

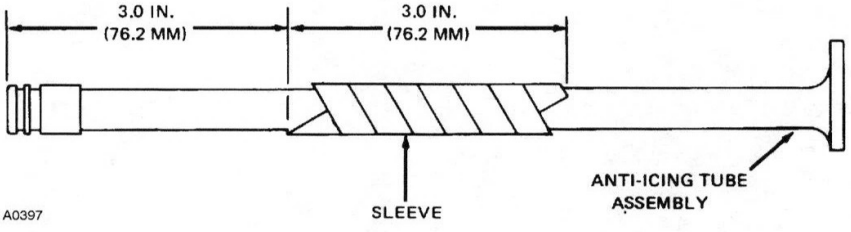
(18) Install packing (7) into groove of oil transfer adapter (6). Position oil transfer adapter on support frame assembly (78) and install two bolts (4) and two washers (5). Measure torque required to seat oil transfer adapter. Add this value to standard torque for bolt (4). Tighten bolts (4) to total torque value and lockwire.

NOTE: Ensure adapter is installed with thickest flange leg facing forward, or if marked, ensure that flange marked FWD is installed facing reduction gear.

(19) Install two packings (24) and two packings (26) on oil inlet tube assembly (28). Install tube assembly and packings into aft tube cavity of No. 9 strut of frame assembly (78).

(20) Install two packings (25) and two packings (27) on oil inlet tube assembly (29). Install tube assembly and packings into aft tube cavity of No. 9 strut of frame assembly (78).

NOTE: If gas producer module was removed to withdraw oil inlet tube (29), install tube assembly from inside the engine and then assemble gas producer module to fan assembly.



(Pre SB ALF/LF 72-1020) Anti-Icing Tube Assembly Sleeve Locations
Figure 1004

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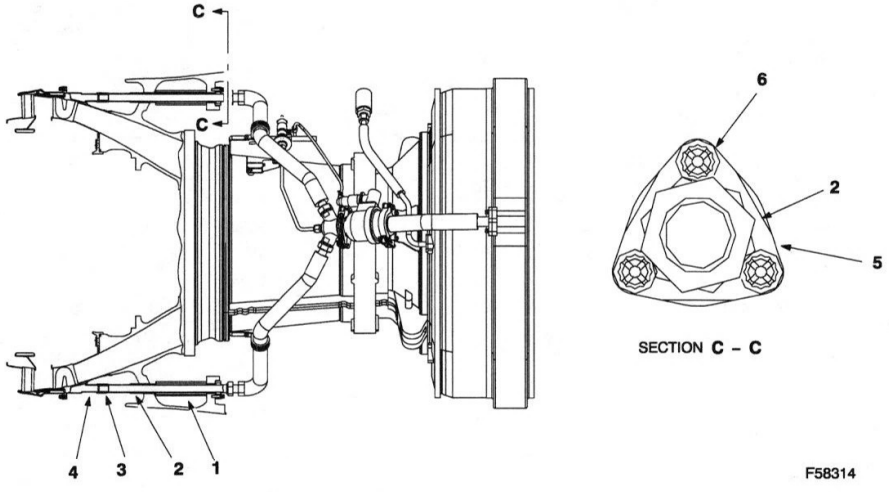
1. B. (21) Position gasket (23) on frame assembly (78) and oil pressure/temperature bulb cover assembly (22) on oil inlet tube assemblies (28 and 29) and gasket and install four bolts (20) and four washers (21). Measure torque required to seat oil pressure/temperature bulb cover assembly. Add this value to standard torque for bolt (20). Tighten bolts (20) to total torque value.

(22) Install plug (18) and packing (19).

(23) Install two packings (3) on tube assembly (2). Insert tube assembly into position in oil transfer adapter (6).

(24) Install flange assembly (1) on tube assembly (2).



1. INSULATION
2. TRANSFER TUBE
3. GASKET
4. LP COMPRESSOR VANE ASSEMBLY
5. TUBE LOCK
6. BOLT

(Post SB ALF/LF 72-1020) Anti-Icing Tube Assembly Installation
Figure 1005

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SUPPORT FRAME ASSEMBLY – TESTING

1. No. 5 Strut Tube Assembly – Testing

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Calibration Fluid (Type II)	02-04

B. Functional Test

NOTE: Perform following tests using calibration fluid at a temperature of 80°F (26.6°C). Test equipment shall be capable of providing fluid at required pressure.

(1) Leakage Check.

(a) Connect valve end of tube assembly to suitable test stand. (*See Figure 1301.*)

(b) Supply calibration fluid to tube assembly at 25 psi (172.375 kN/m^2) differential pressure.

(c) Check tube assembly for leakage. Leakage shall not exceed one drop per minute.

(d) Disconnect tube assembly from test stand.

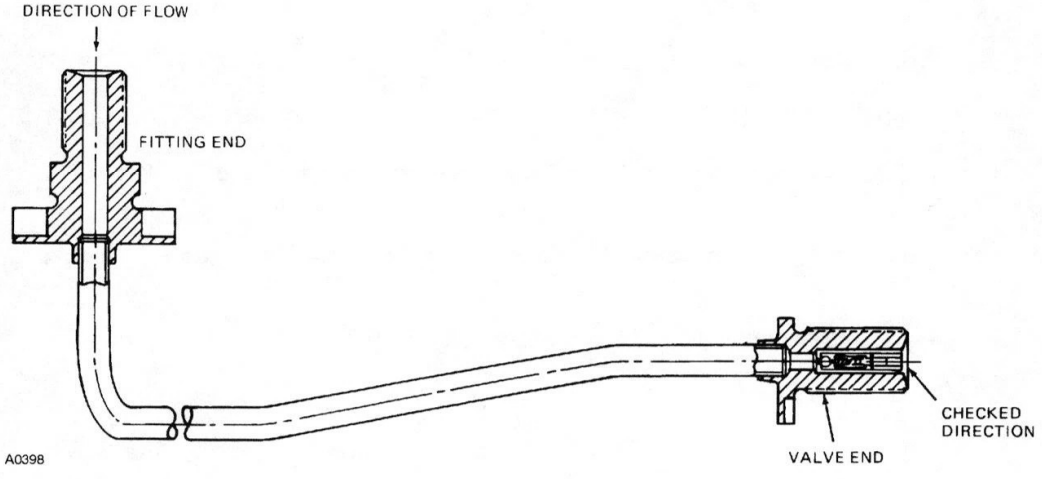
(2) Cracking Pressure Check.

(a) Connect fitting end of tube assembly to suitable test stand. (*See Figure 1301.*)

(b) Gradually increase fluid pressure in small increments and observe that fluid begins to flow (valve cracks) through tube assembly when fluid differential pressure is between 2 and 8 psi (13.79 and 55.16 kN/m^2).

(c) Disconnect tube assembly from test stand.

(3) If limits in Step (1) or (2) cannot be met, reject tube assembly.



No. 5 Strut Tube Assembly Test Connection Data
Figure 1301

CHAPTER 72 – REDUCTION GEAR AND SHAFT SECTION

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Repair-02		Deleted	
Repair Discrepant 1.4860 to 1.4900 Inch (37.744 to 37.846 Millimeter) Dimension – Repair-03		901	ALL
Repair Discrepant 14.3980 to 14.2990 Inch (363.169 to 363.195 Millimeter) Diameter – Repair-04		901	ALL
Repair Overmaximum 7.8742 to 7.8748 Inch (200.005 to 200.020 Millimeter) Diameter – Repair-05		901	ALL
Repair Overmaximum 5.9054 to 5.9059 Inch (149.997 to 150.010 Millimeter) Diameter – Repair-06		901	ALL
Repair Discrepant 13.340 to 13.350 Inch (338.84 to 339.09 Millimeter) Diameter – Repair-07		901	ALL
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FRONT BEARING SUPPORT ASSEMBLY – DISASSEMBLY

1. Disassembly of Front Bearing Support Assembly – Disassembly

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT14130-01	Puller

B. Procedure

(1) Remove ring (1, *Figure 501*) from support (22).

(2) Using puller LTCT14130-01, remove seal (2). Remove packing (3).

(3) Remove shim (4) and packing (5) from shaft (18).

(4) Remove driver and plate assembly (6) from shaft (18). Separate plate (7) from driver (8). Remove packing (9).

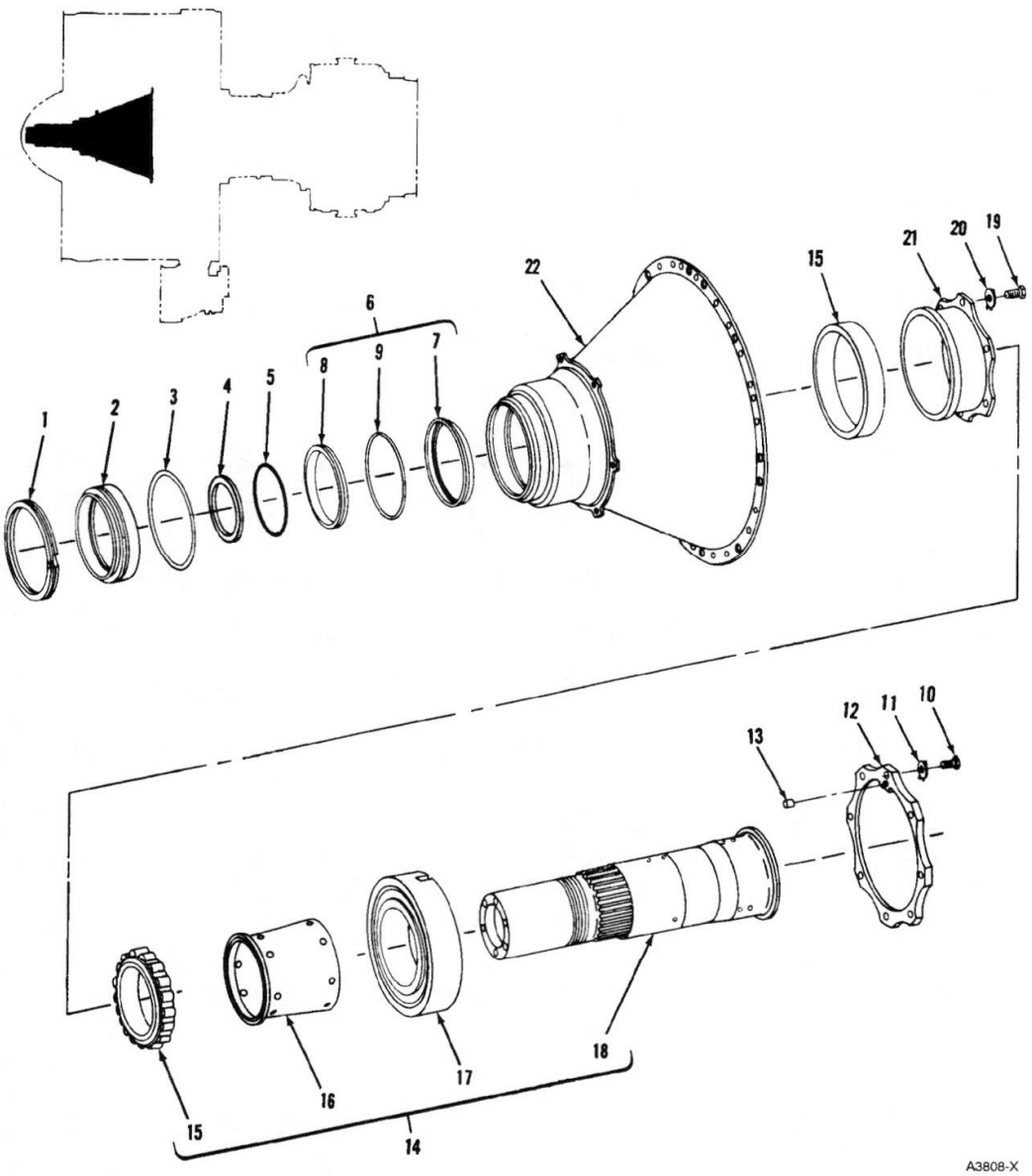
(5) Straighten tabs of eight tab washers (11). Remove eight bolts (10) and eight tab washers (11). Remove retainer (12) from support (22). Remove pin (13) from retainer.

(6) Press shaft and bearing assembly (14) rearward and remove from support (22).

(7) Press inner race of bearing (15), spacer (16), and bearing (17) from shaft (18).

(8) Straighten tabs of six tab washers (20). Remove six bolts (19) and six tab washers (20). Remove retainer (21).

(9) Using suitable aluminum stock and an arbor press, press outer race of bearing (15) from support (22).



Front Bearing Support Assembly
Figure 501

KEY TO FIGURE 501

1. RING
2. SEAL
3. PACKING
4. SHIM
5. PACKING
6. DRIVER AND PLATE ASSEMBLY
7. PLATE
8. DRIVER
9. PACKING
10. BOLT
11. TAB WASHER
12. RETAINER
13. PIN
14. SHAFT AND BEARING ASSEMBLY
15. BEARING
16. SPACER
17. BEARING
18. SHAFT
19. BOLT
20. TAB WASHER
21. RETAINER
22. SUPPORT

FRONT BEARING SUPPORT ASSEMBLY – ASSEMBLY

1. Front Bearing Support Assembly – Assembly

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT12871-01	Installing Tool
LTCT13966-01	Pusher

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Lubricating Oil	02-18
Packing Assembly Aid	02-05, -06

Expendable Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Packing				
Tab Washer				

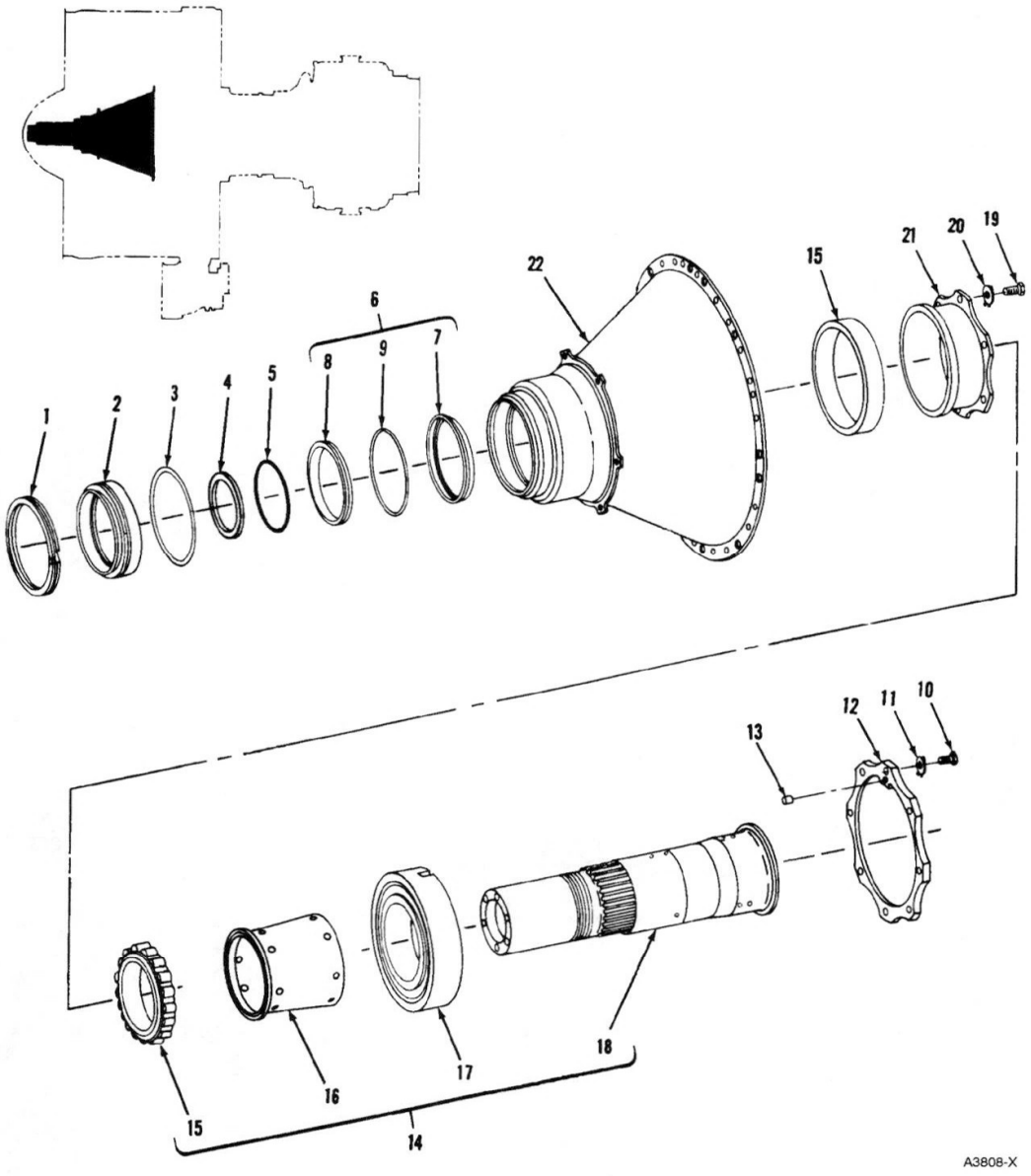
B. Procedure

NOTE: Fits and clearance requirements are listed in Paragraph 2.

(1) Lightly lubricate No. 9 bearing cavity in support (22, *Figure 1001*) with shortening or packing assembly aid. Using suitable aluminum stock and an arbor press, press outer race of bearing (15), with identification number down, into support (22).

(2) Position retainer (21) in support (22), and install six bolts (19) and six tab washers (20). Holding tabs of tab washers to their most counterclockwise position, tighten bolts to standard torque. Bend tabs of tab washers into bolts; do not shear.

(3) Lightly lubricate bearing journals of shaft (18) with shortening or packing assembly aid. Ensure that all oil holes are clear.



Front Bearing Support Assembly
Figure 1001

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ENGINE MANUAL
ALF502R

TEMPORARY REVISION NO. 72-969

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 1003, 72-33-01, ASSEMBLY. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add assembly procedure for pre and post SB ALF/LF 72-1090.

Use the following revised Step 1.B.(8) and NOTE in lieu of the existing Step 1.B.(8) and NOTE and add Step 1.B.(8a) and NOTE.

(8) **(Pre SB ALF/LF 72-1090)** Install packing (9) into groove of driver (8), then assemble driver (8) and plate (7) together. Using suitable hollow stock, install driver and plate assembly (6) on shaft (18), with large diameter up.

NOTE: Packing (5) and shim (4) are installed during final assembly of fan module.

CAUTION: REDUCED SERVICE LIFE WILL OCCUR IF OIL LUBRICANT IS USED TO ASSEMBLE PACKING (9) OR PLATE (7). DO NOT LUBRICATE PACKING (9) OR PLATE (7) SURFACE WITH OIL. ASSEMBLE DRY.

(8a) **(Post SB ALF/LF 72-1090)** Install packing (9) into groove of driver (8), then assemble driver (8) and plate (7) together. Do not use packing assembly aid. Using suitable hollow stock and with larger diameter of driver and face plate assembly (6) facing up, install driver and plate assembly (6) on shaft (18) of front bearing support and ring gear assembly.

NOTE: Packing (5) and shim (4) are installed during final assembly of fan module. (Refer to 72-01-00, Assembly.)

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18 OCT 2006

1. B. (4) Place suitable aluminum ring on arbor press; then place bearing (17), with ID chamfer up, on ring. Insert shaft (18) through bearing (17), and using suitable aluminum stock, press bearing until seated.

NOTE: Bearing (17) must be installed with ID chamfer against aft shoulder of shaft (18). (*See Figure 1002.*)

(5) Install spacer (16, *Figure 1001*), wide end down, and inner race of bearing (15), identification number up, on shaft (18). Insert shaft into suitable hollow stock, and using plate stock and an arbor press, seat spacer (16) and inner race of bearing (15) on shaft (18).

(6) Place shaft and bearing assembly (14) into support (22), and place on suitable hollow stock. Using plate stock and an arbor press, press shaft and bearing assembly (14) into support (22).

(7) If unpinned bearing retainer is being installed, position retainer (12), ID chamfer up, on support. If a pinned bearing retainer is being installed, engage pin in bearing outer race slot. Install eight bolts (10) and eight tab washers (11). Holding tabs of tab washers to their most counterclockwise position, tighten bolts 70 to 95 pound-inches (7.91 to 10.73 newton-meters) torque.

(8) Install packing (9) into groove of driver (8); then assemble driver (8) and plate (7) together. Using suitable hollow stock, install driver and plate assembly (6) on shaft (18), with large diameter up.

NOTE: Packing (5) and shim (4) are installed during final assembly of fan module. (Refer to 72-01-00, Assembly.)

KEY TO FIGURE 1001

1. RING
2. SEAL
3. PACKING
4. SHIM
5. PACKING
6. DRIVER AND PLATE ASSEMBLY
7. PLATE
8. DRIVER
9. PACKING
10. BOLT
11. TAB WASHER
12. RETAINER
13. PIN
14. SHAFT AND BEARING ASSEMBLY
15. BEARING
16. SPACER
17. BEARING
18. SHAFT
19. BOLT
20. TAB WASHER
21. RETAINER
22. SUPPORT

CAUTION: MAKE SURE INSTALLATION TOOL LTCT12871 IS POSITIONED WITH ITS COUNTERBORE FACING SEAL.

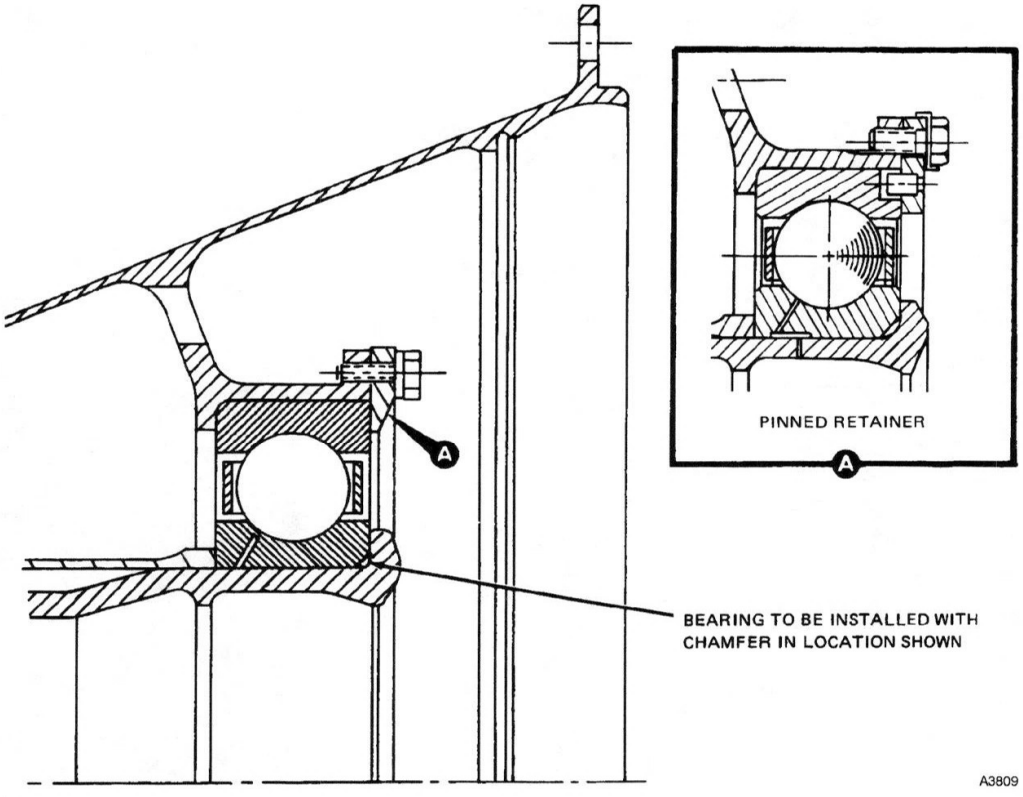
1. B. (9) Install packing (3, *Figure 1001*) into groove of seal (2). Do not stretch packing. Lubricate seal cavity in support (22) with shortening or packing assembly aid. Using installing tool LTCT12871-01 and pusher LTCT13966-01, install seal (2).

NOTE: Seal (2) faceplate may be wiped with clean lubricating oil (MIL-L-23699, Type II). Do not immerse seal in oil.

Packing may bulge out of slots in support (22). Continue installing seal until packing lines up with snap ring groove of support. Packing can be positioned back in place at this point.

Remove all traces of raised carbon (Refer to 72-33-09) on seal runner surface of plate (7) at every removal of seal (2).

(10) Install ring (1) into ring groove of support (22).



Location of Bearing Chamfer
Figure 1002

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TEMPORARY REVISION NO. 72-970

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 1004, 72-33-01, ASSEMBLY. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To revise assembly procedure.

Add the following CAUTION prior to Step 1.B.(9) in lieu of the existing CAUTION.

CAUTION: MAKE SURE INSTALLATION TOOL LTCT12871-01 IS POSITIONED WITH ITS COUNTERBORE FACING SEAL.

REDUCED SERVICE LIFE WILL OCCUR IF OIL CONTACTS SEAL (2) OR PLATE (7) SURFACE. DO NOT WIPE OR ALLOW OIL TO CONTACT SEAL (2) OR PLATE (7). ASSEMBLE DRY.

Use the following revised Step 1.B.(9) NOTE in lieu of the existing Step 1.B.(9) NOTE.

NOTE: Packing (3) may bulge out of slots in support (22). Continue installing seal until packing lines up with snap ring groove of support. Packing (3) can be positioned back in place at this point.

Remove all traces of raised carbon (Refer to 72-33-08) on seal runner surface of plate (7) at every removal of seal (2).

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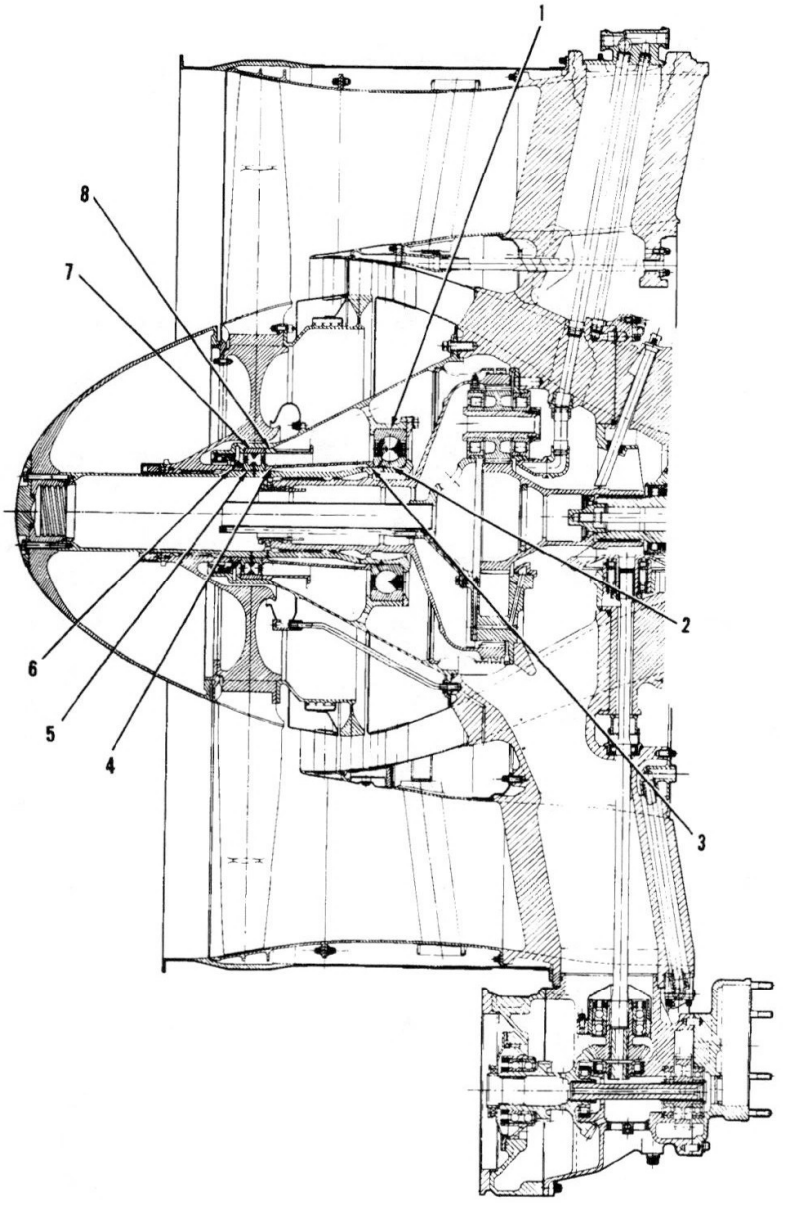
1. C. Fits and Clearances (*Refer to Table 1001*)

Table 1001. Fits and Clearances

DESCRIPTION	SEE FIGURE AND ITEM NO.	DIRECTION MEASURED	FITS AND CLEARANCES AT ASSEMBLY* INCH (MILLIMETER)		SEE FIGURE AND INDEX NO.
			MINIMUM	MAXIMUM	
	1001				**1003**
Fit Between Bearing and Support	17 22	OD ID	0.0002L (0.005L)	0.0013L (0.033L)	1
Fit Between Shaft and Bearing	18 17	OD ID	0.0005T (0.013T)	0.0001L (0.003L)	2
Fit Between Shaft and Spacer	18 16	OD ID	0.0001L (0.003L)	0.0014L (0.036L)	3
Fit Between Shaft and Spacer	18 16	OD ID	0.0002T (0.005T)	0.0011L (0.028L)	4
Fit Between Shaft and Bearing	18 15	OD ID	0.0005T (0.013T)	0.0001L (0.003L)	5
Fit Between Shaft and Driver	18 8	OD ID	0.0028L (0.071L)	0.0051L (0.130L)	6
Fit Between Bearing and Support	15 22	OD ID	0.0001T (0.002T)	0.0008L (0.020L)	7
Fit Between Retainer and Support	21 22	OD ID	0.0014L (0.036L)	0.0029L (0.099L)	8

*If limits cannot be met, reinspect parts. (Refer to 72-33-02 thru 72-33-11, Inspection/Check)



Fits and Clearances
Figure 1003

FRONT BEARING SUPPORT – CLEANING

1. Front Bearing Support (*See Figure 601*) – Cleaning

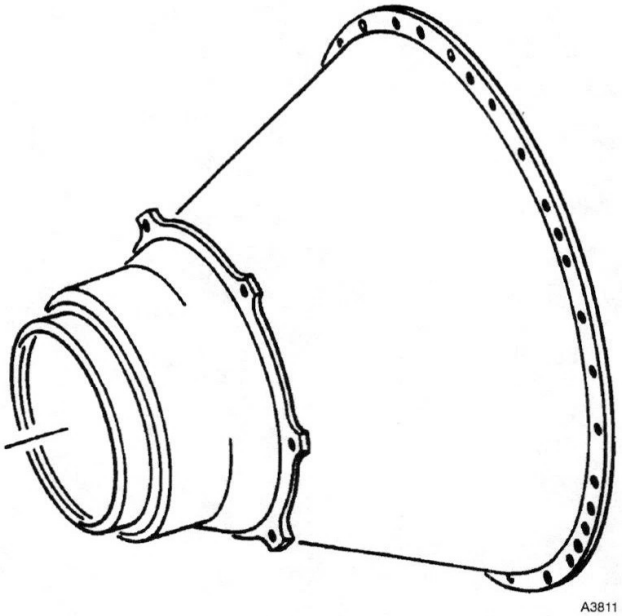
   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

      NOTE: Thoroughly clean so that no oil stains are visible on the exterior of the support. This will facilitate in-service inspections of the No. 9 seal for leakage.



Front Bearing Support
Figure 601

FRONT BEARING SUPPORT – INSPECTION/CHECK

1. Front Bearing Support – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

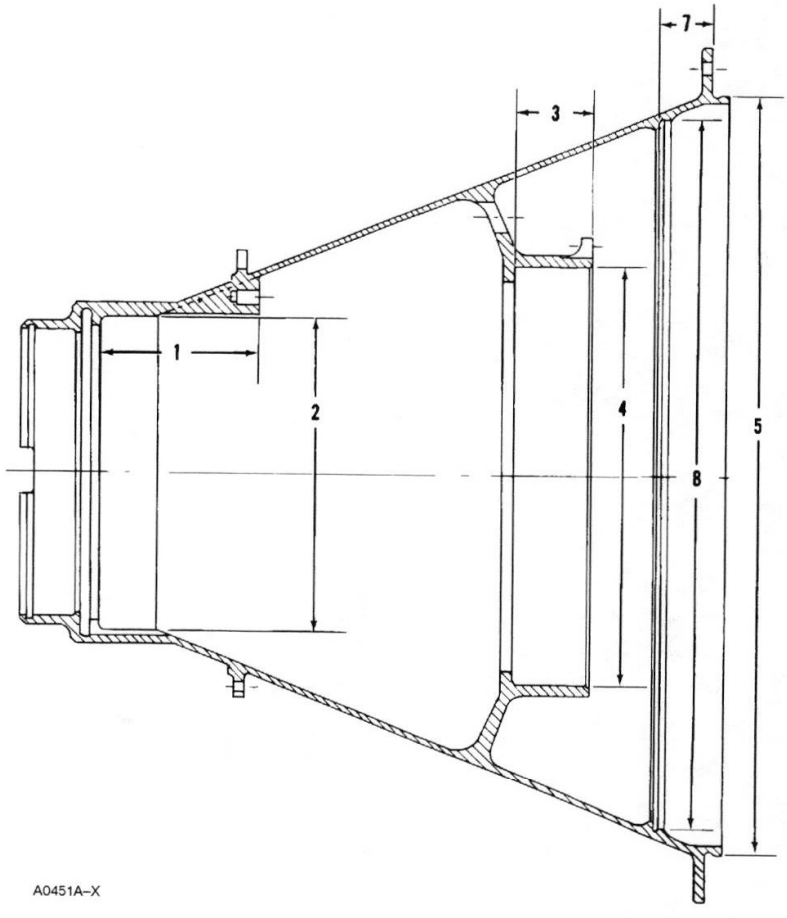
         (d) Cracks or distortions. Not acceptable. Replace.

         (e) Damaged or worn 13.340 to 13.350 inch (338.84 to 339.04 millimeter) diameter. Not acceptable. Repair. (Refer to 72-33-02, Repair-07.)

      (2) Dimensionally inspect. (*Refer to Table 801 and Figure 801.*) Repair (Refer to 72-33-02, Repair-01 thru -08) or replace as required.

Table 801. Front Bearing Support Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
					801
AXIAL	2.9320 (74.473)	2.9360 (74.574)	2.9319 (74.470)	2.9360 (74.574)	1
ID	5.9054 (149.997)	5.9059 (150.010)	5.9054 (149.997)	5.9060 (150.012)	2
AXIAL	1.4860 (37.744)	1.4900 (37.846)	1.4860 (37.744)	1.4900 (37.846)	3
ID	7.8742 (200.005)	7.8748 (200.020)	7.8742 (200.005)	7.8749 (200.003)	4
OD	14.2980 (363.169)	14.2990 (363.195)	14.2979 (363.167)	14.2990 (363.195)	5
AXIAL	0.988 (25.10)	0.992 (25.20)	0.988 (25.10)	0.992 (25.20)	7
ID	13.340 (338.84)	13.350 (339.09)	13.340 (338.84)	13.351 (339.12)	8



Front Bearing Support Dimensional Inspection Locations
Figure 801

FRONT BEARING SUPPORT – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-001-07/-11/R12	-01 and -03 thru -08	None

FRONT BEARING SUPPORT – REPAIR-01

1. Repair Discrepant 2.9320 to 2.9360 Inch (74.473 to 74.574 Millimeter) Dimension *(See Figure 901)* – Repair-01

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Plasma-Spray Powder	06-20
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine dimensions, if necessary, to obtain a 0.003 to 0.016 inch (0.08 to 0.41 millimeter) buildup thickness after final machining.

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

      (2) Clean repair areas using acetone or equivalent.

      (3) Mask all areas not to be plasma-sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. *(See Figure 901.)*

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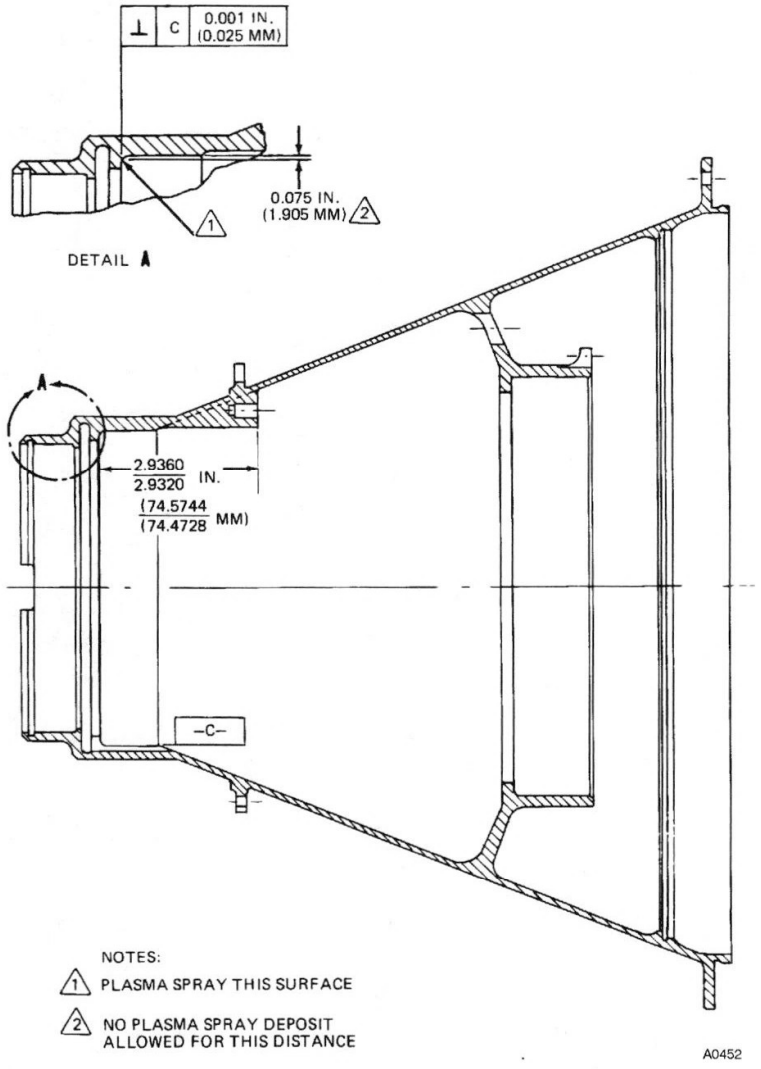

Support Repair Area
Figure 901

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FRONT BEARING SUPPORT – REPAIR-02

This repair is deleted.

FRONT BEARING SUPPORT – REPAIR-03

1. Repair Discrepant 1.4860 to 1.4900 Inch (37.744 to 37.846 Millimeter) Dimension *(See Figure 901)* – Repair-03

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Plasma-Spray Powder	06-19
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine dimension, if necessary, to obtain a 0.003 to 0.015 inch (0.08 to 0.38 millimeter) buildup thickness after final machining.

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

      (2) Clean repair areas using acetone or equivalent.

      (3) Mask all areas not to be plasma-sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. *(See Figure 901.)*

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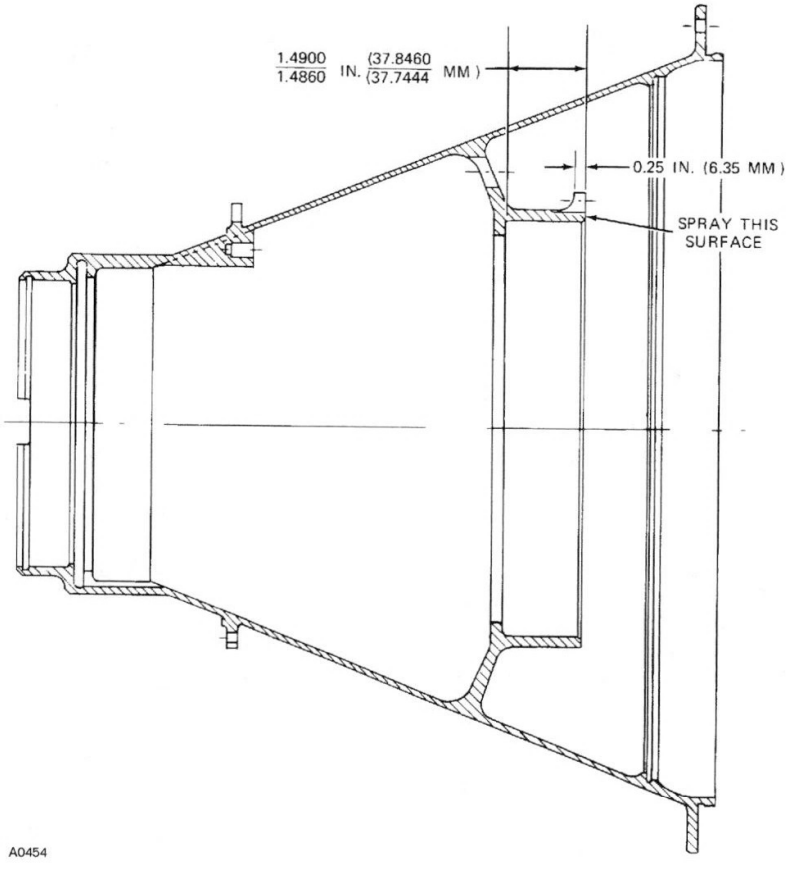

Support Repair Area
Figure 901

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FRONT BEARING SUPPORT – REPAIR-04

1. Repair Discrepant 14.2980 to 14.2990 Inch (363.169 to 363.195 Millimeter) Diameter *(See Figure 901)* – Repair-04

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Plasma-Spray Powder	06-19
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine dimension, if necessary, to obtain a 0.003 to 0.010 inch (0.08 to 0.25 millimeter) buildup thickness after final machining.

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

      (2) Clean repair areas using acetone or equivalent.

      (3) Mask all areas not to be plasma-sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. *(See Figure 901.)*

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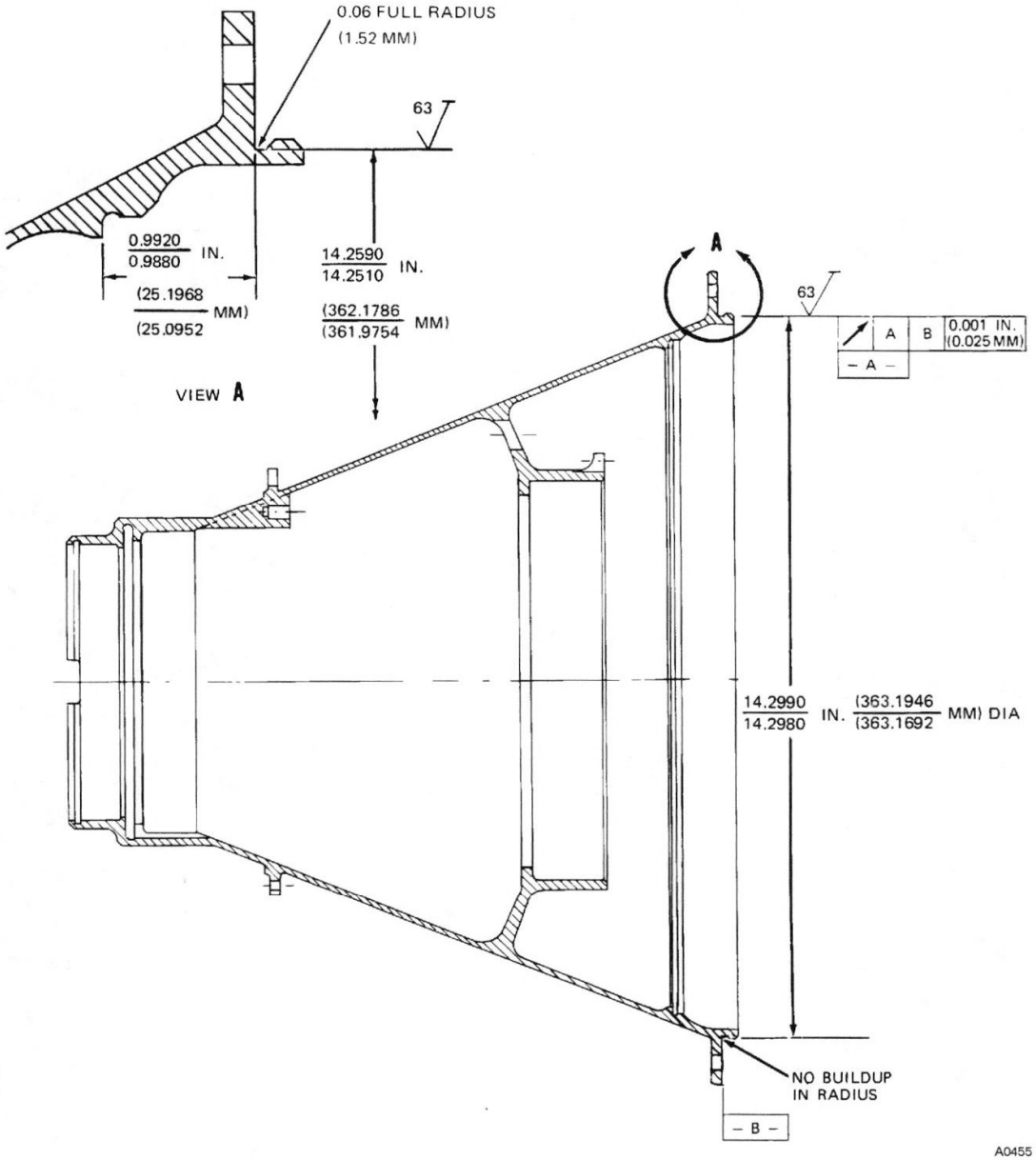

Support Repair Area
Figure 901

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FRONT BEARING SUPPORT – REPAIR-05

1. Repair Overmaximum 7.8742 to 7.8748 Inch (200.005 to 200.020 Millimeter) Diameter *(See Figure 901)* – Repair-05

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Plasma-Spray Powder	06-19
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine ID, if necessary, to obtain a 0.003 to 0.005 inch (0.08 to 0.13 millimeter) build-up thickness after final machining.

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

      (2) Clean repair areas using acetone or equivalent.

      (3) Mask all areas not to be plasma-sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. *(See Figure 901.)*

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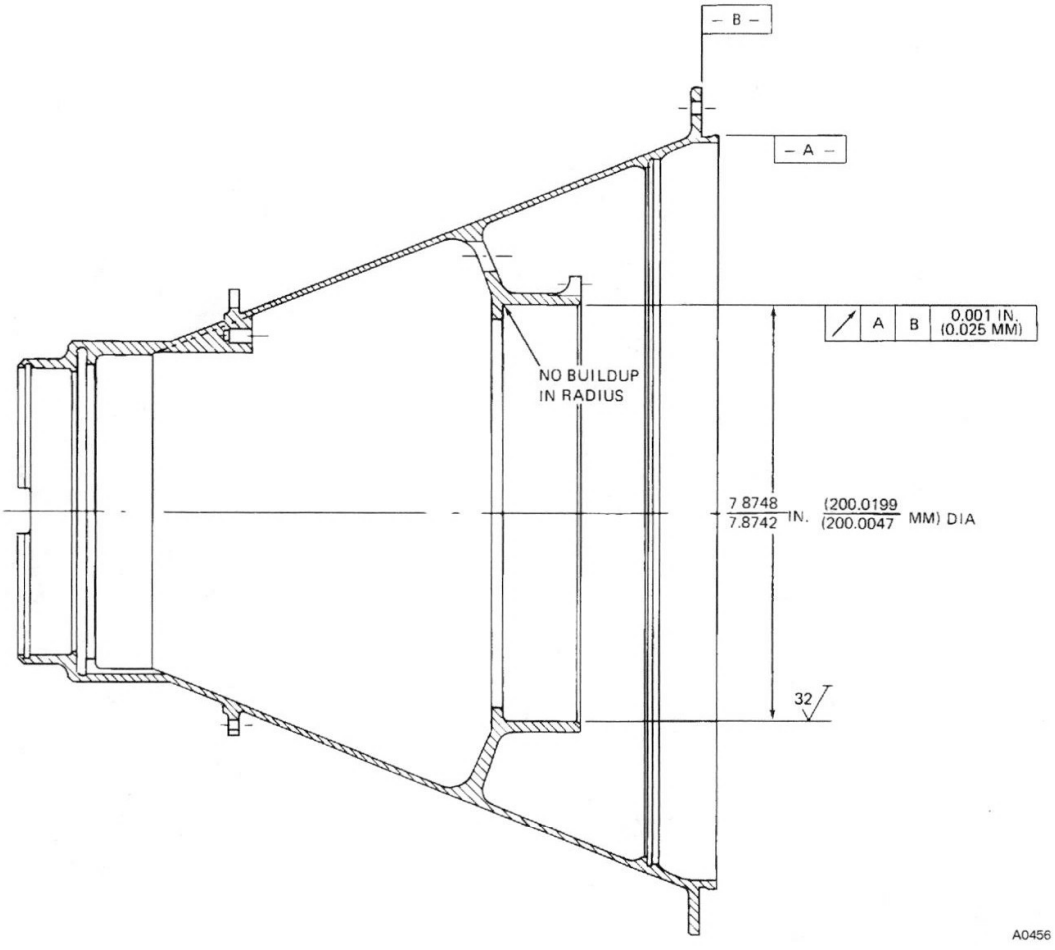

Support Repair Area
Figure 901

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FRONT BEARING SUPPORT – REPAIR-06

1. Repair Overmaximum 5.9054 to 5.9059 Inch (149.997 to 150.010 Millimeter) Diameter (*See Figure 901*) – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Plasma-Spray Powder	06-20
Silicon Carbide Grit (No. 24 to 26)	05-15

B. Procedure

CAUTION: THE GEOMETRY OF THIS PART IN THE AREA OF THE 5.9054 TO 5.9059 INCH (149.997 TO 150.010 MILLIMETER) DIAMETER PRECLUDES THE USE OF STANDARD PLASMA SPRAY EQUIPMENT. THIS REPAIR REQUIRES THE USE OF A MINIATURE PLASMA SPRAY TORCH AND ASSOCIATED EQUIPMENT. EXERCISE CAUTION IN DEVELOPING SUITABLE PROCESS PARAMETERS FOR THIS SURFACE. ENSURE THAT PLASMA SPRAY IS APPLIED APPROXIMATELY NORMAL TO THE SURFACE.

(1) Machine ID, if necessary, to obtain a 0.003 to 0.010 inch (0.08 to 0.25 millimeter) build-up thickness after final machining.

WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

(2) Clean repair areas using acetone or equivalent.

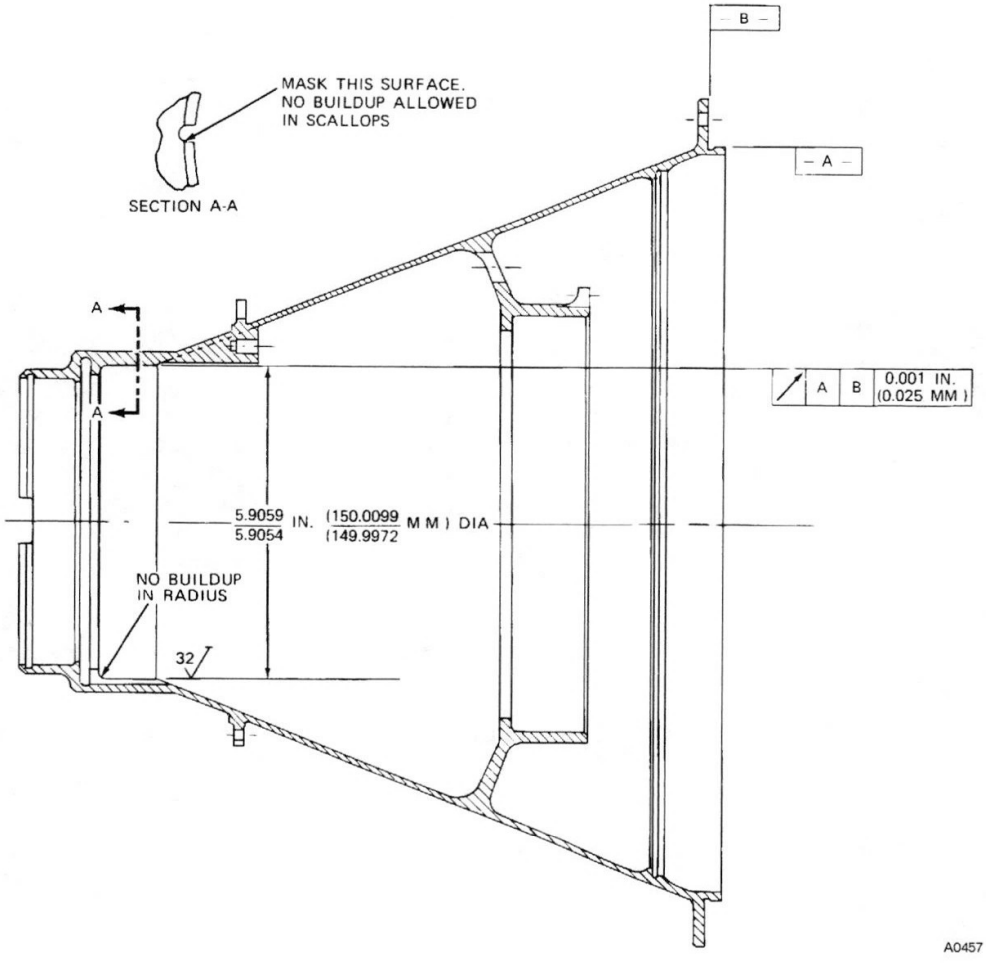
(3) Mask all areas not to be plasma-sprayed.

(4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

(5) Remove all silicon carbide particles.

(6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

(7) Machine to specified dimensions. (*See Figure 901.*)



Support Repair Area
Figure 901

FRONT BEARING SUPPORT – REPAIR-07

1. Repair Discrepant 13.340 to 13.350 Inch (338.84 to 339.09 Millimeter) Diameter *(See Figure 901)* – Repair-07

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-49
Plasma-Spray Powder	06-19
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine diameter, if necessary, to obtain a 0.003 to 0.010 inch (0.01 to 0.25 millimeter) buildup thickness after final machining.

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE SOLVENTS CONTAINING CHLORINATED HYDROCARBONS.

      (2) Clean repair areas using dry cleaning solvent.

      (3) Mask all areas not to be plasma-sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast repair area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma-spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. *(See Figure 901.)*

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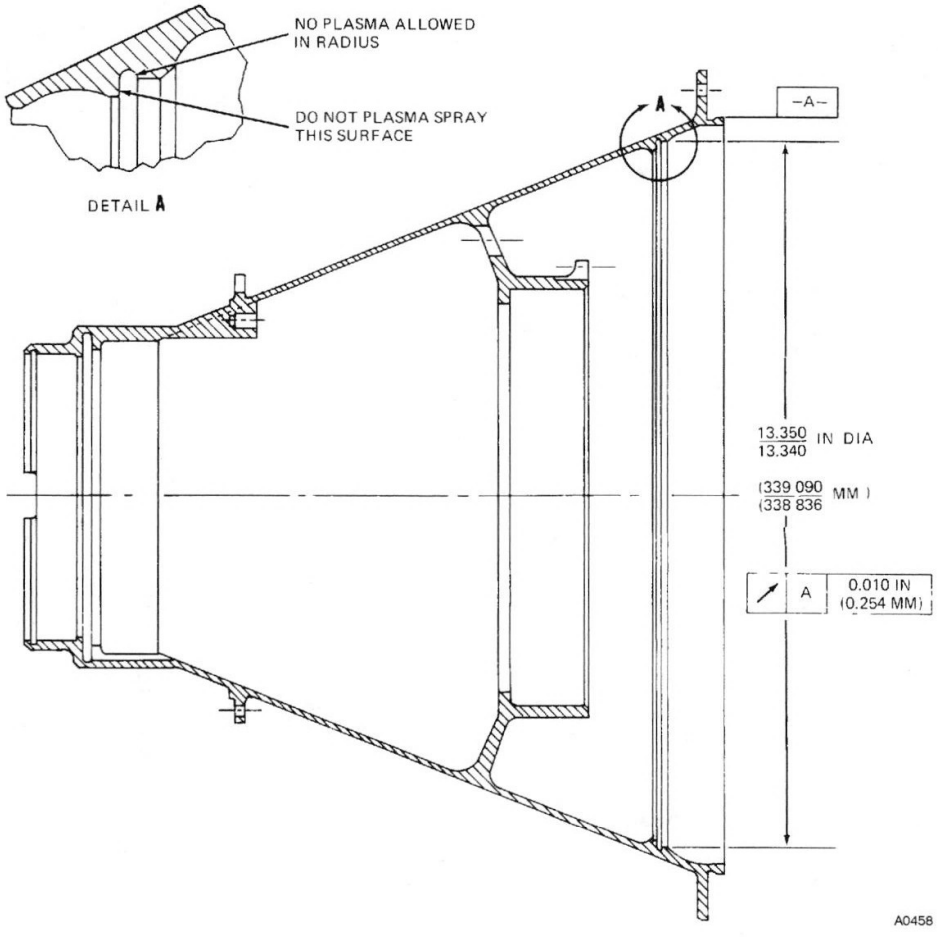

Support Repair Area
Figure 901

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FRONT BEARING SUPPORT – REPAIR-08

1. Repair Discrepant 0.988 to 0.992 Inch (25.10 to 25.20 Millimeter) Dimension of Support *(See Figure 901)* – Repair-08

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48 or -49
Plasma-Spray Powder	06-19
Silicon Carbide Grit (No. 24 to 26)	05-15

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Machine, if necessary, to obtain 0.020 inch (0.51 millimeter) maximum plasma spray buildup. (See *Figure 901*, Step 1.)

      WARNING: PERFORM CLEANING OPERATION IN A WELL-VENTILATED AREA. AVOID PROLONGED INHALING OF FUMES.

      CAUTION: DO NOT USE CHLORINATED SOLVENT.

      (2) Clean repair area using dry cleaning solvent or equivalent.

      (3) Suitably mask adjacent surfaces not to be plasma sprayed.

      (4) Using silicon carbide grit at 60 psi (414 kN/m^2), grit-blast machined area.

      (5) Remove all silicon carbide particles.

      (6) Using plasma spray powder, immediately plasma-spray. (Refer to 70-50-01, SPM.)

      (7) Machine to specified dimensions. (See *Figure 901*, Step 2.)

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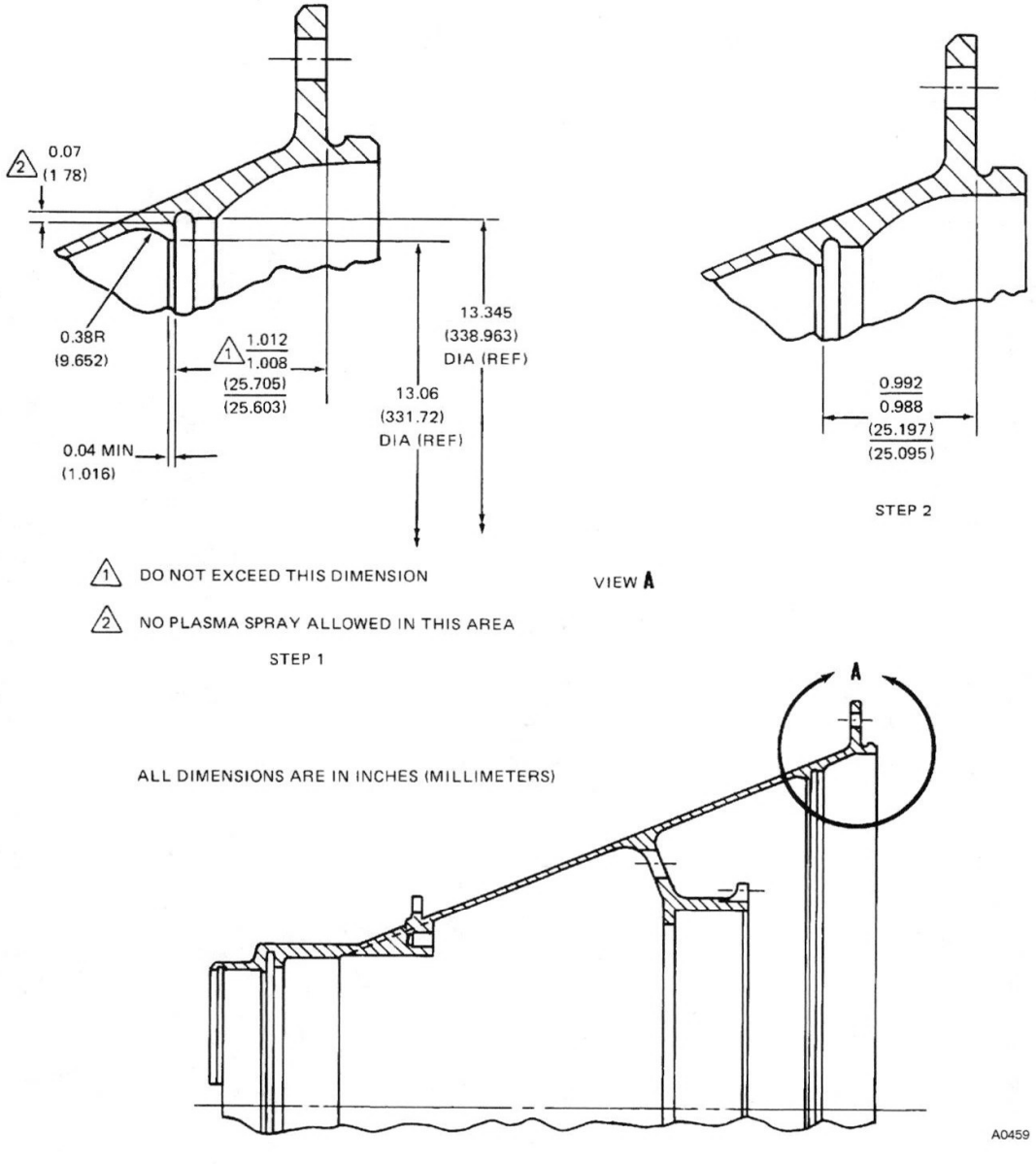

Support Repair Area
Figure 901

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FAN DRIVE SHAFT – CLEANING

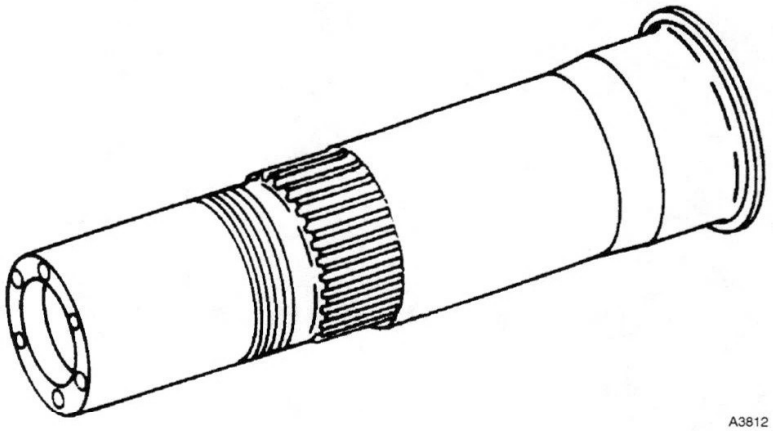
1. Fan Drive Shaft (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean in accordance with 70-15-12, SPM.



Fan Drive Shaft
Figure 601

FAN DRIVE SHAFT – INSPECTION/CHECK

1. Fan Drive Shaft – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks or distortion. Not acceptable. Replace.

      (2) Inspect splines in accordance with 70-20-08, SPM.

      (3) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.)

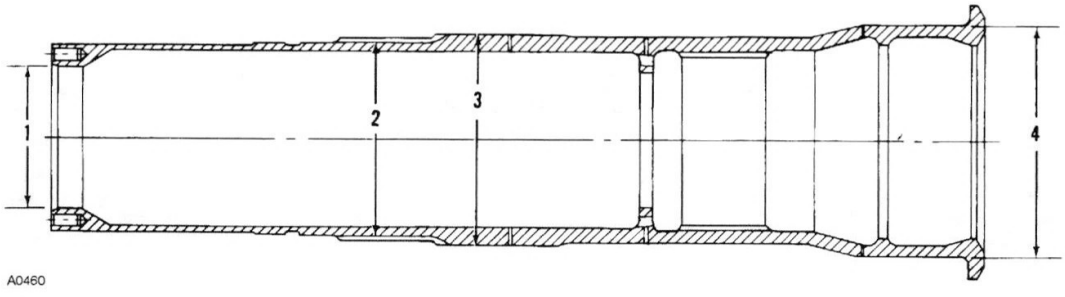
      (4) Dimensionally inspect. (*Refer to Table 802 and Figure 801.*) Repair (Refer to 72-33-03, Repair-01, -02, -03 or -04, and -05) or replace if limits cannot be met.

Table 801. Fan Drive Shaft Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
500/700		5000	X	

Table 802. Fan Drive Shaft Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
					801
ID	2.7090 (68.809)	2.7110 (68.859)	2.7089 (68.806)	2.7110 (68.859)	1
OD	3.6009 (91.463)	3.6013 (91.473)	3.6008 (91.460)	3.6013 (91.473)	2
OD	3.9369 (99.997)	3.9372 (100.005)	3.9368 (99.995)	3.9372 (100.005)	3
OD	4.3306 (109.997)	4.3309 (110.005)	4.3305 (109.995)	4.3309 (110.005)	4



Fan Drive Shaft Dimensional Inspection Locations
Figure 801

FAN DRIVE SHAFT – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-029-02/-06	-01 thru -05	None

FAN DRIVE SHAFT – REPAIR-01

1. Repair Discrepant 2.7090 to 2.7110 Inch (68.809 to 68.859 Millimeter) Diameter *(See Figure 901)* – Repair-01

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

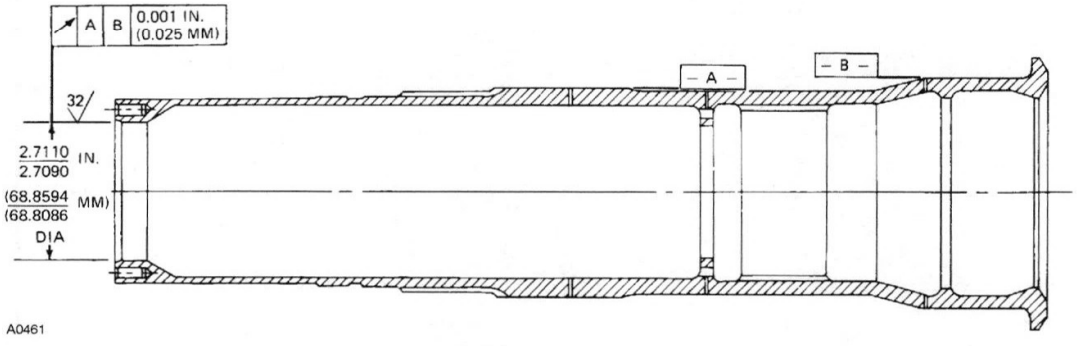
      (1) Machine diameter, if necessary, to obtain 0.002 to 0.005 inch (0.05 to 0.13 millimeter) plate thickness after final machining.

      (2) Chrome-plate. (Refer to 70-35-01, SPM.)

      (3) Bake at 690 to 710°F (366 to 377°C) for 2 hours.

      (4) Machine to specified dimension. *(See Figure 901.)*

      (5) Balance shaft. (Refer to 72-33-03, Repair-05.)



Shaft Plating Area
Figure 901

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FAN DRIVE SHAFT – REPAIR-02

1. Repair Discrepant 3.6009 to 3.6013 Inch (91.463 to 91.473 Millimeter) Diameter *(See Figure 901)* – Repair-02

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

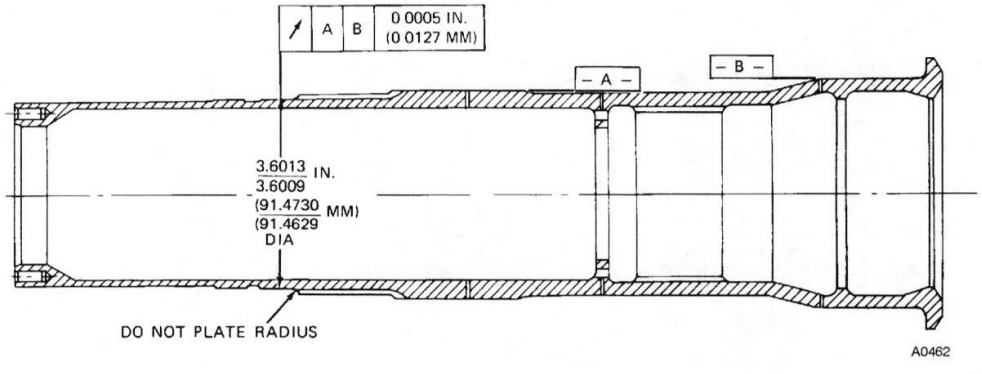
      (1) Machine diameter, if necessary, to obtain 0.002 to 0.005 inch (0.05 to 0.13 millimeter) plate thickness after final machining.

      (2) Chrome-plate. (Refer to 70-35-01, SPM.)

      (3) Bake at 690 to 710°F (366 to 377°C) for 2 hours.

      (4) Machine to specified dimension. *(See Figure 901.)*

      (5) Balance shaft. (Refer to 72-33-03, Repair-05.)



Shaft Plating Area
Figure 901

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FAN DRIVE SHAFT – REPAIR-03

1. Repair Discrepant 3.9369 to 3.9372 Inch (99.997 to 100.005 Millimeter) Diameter *(See Figure 901)* – Repair-03

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

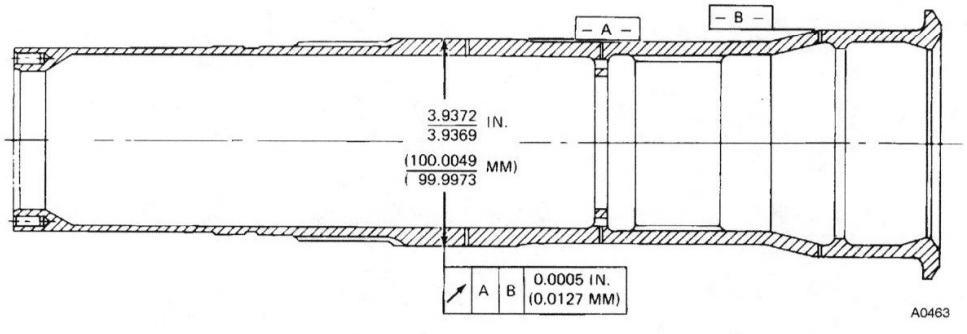
      (1) Machine diameter, if necessary, to obtain 0.002 to 0.005 inch (0.05 to 0.13 millimeter) plate thickness after final machining.

      (2) Chrome-plate. (Refer to 70-35-01, SPM.)

      (3) Bake at 690 to 710°F (366 to 377°C) for 2 hours.

      (4) Machine to specified dimension. *(See Figure 901.)*

      (5) Balance shaft. (Refer to 72-33-03, Repair-05.)



Shaft Plating Area
Figure 901

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FAN DRIVE SHAFT – REPAIR-04

1. Repair Discrepant 4.3306 to 4.3309 Inch (109.997 to 110.005 Millimeter) Diameter *(See Figure 901)* – Repair-04

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

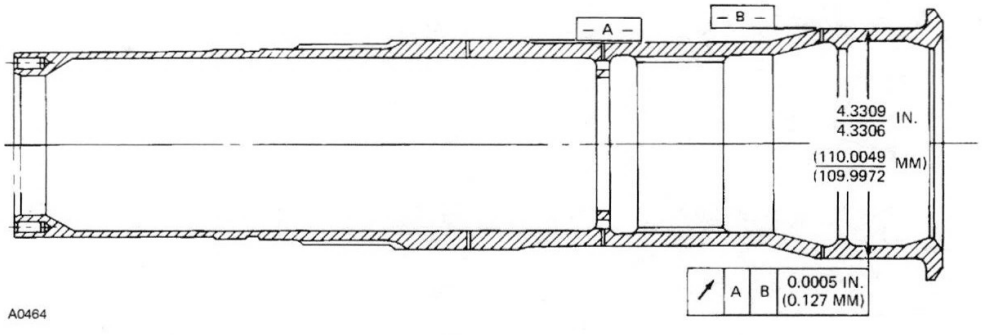
      (1) Machine diameter, if necessary, to obtain 0.002 to 0.005 inch (0.05 to 0.13 millimeter) plate thickness after final machining.

      (2) Chrome-plate. (Refer to 70-35-01, SPM.)

      (3) Bake at 690 to 710°F (366 to 377°C) for 2 hours.

      (4) Machine to specified dimension. *(See Figure 901.)*

      (5) Balance shaft. (Refer to 72-33-03, Repair-05.)



Shaft Plating Area
Figure 901

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FAN DRIVE SHAFT – REPAIR-05

1. Balance of Fan Drive Shaft – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
Model 3S	Gisholt Balancing Machine, Gillman Engineering, Jamesville, WI

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Support shaft in Gisholt Balancing Machine, Model 3S or equivalent. The shaft is to be supported as indicated in *Figure 901.*

(2) Check-balance shaft in accordance with balancing machine instructions.

(3) Correct unbalance by removing material from shaft at locations shown in *Figure 901.* Force unbalance shall not exceed 3.0 gram-inches in each plane.

(4) Repeat Step (2) and, if necessary, Step (3).

(5) Remove shaft from balancing machine.

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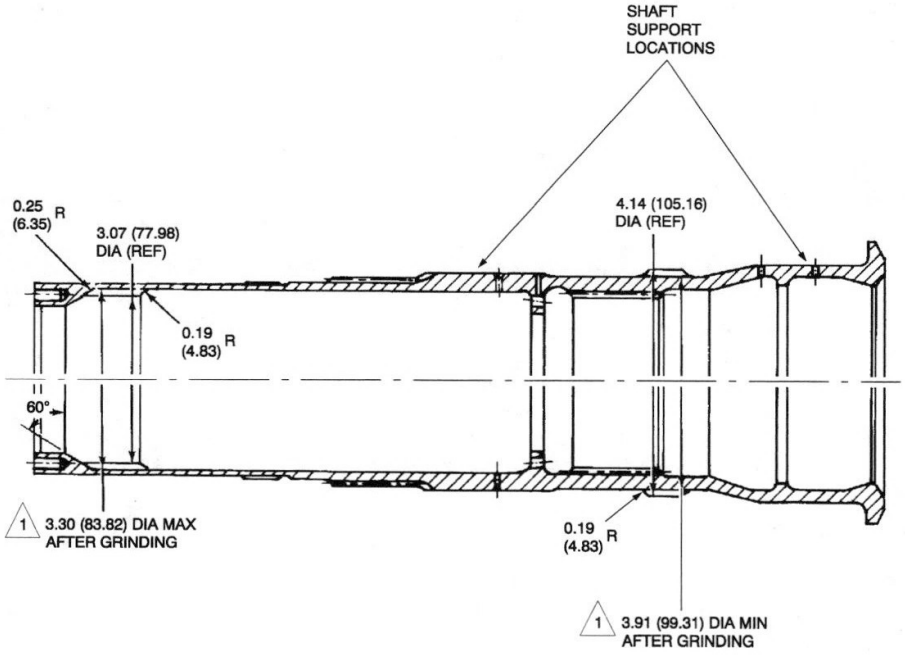

1 MATERIAL REMOVAL AREAS. DO NOT EXCEED MAXIMUM OR MINIMUM DIMENSIONS SHOWN.

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

I58322

Shaft Material Removal Areas for Balancing
Figure 901

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AFT RETAINER – CLEANING

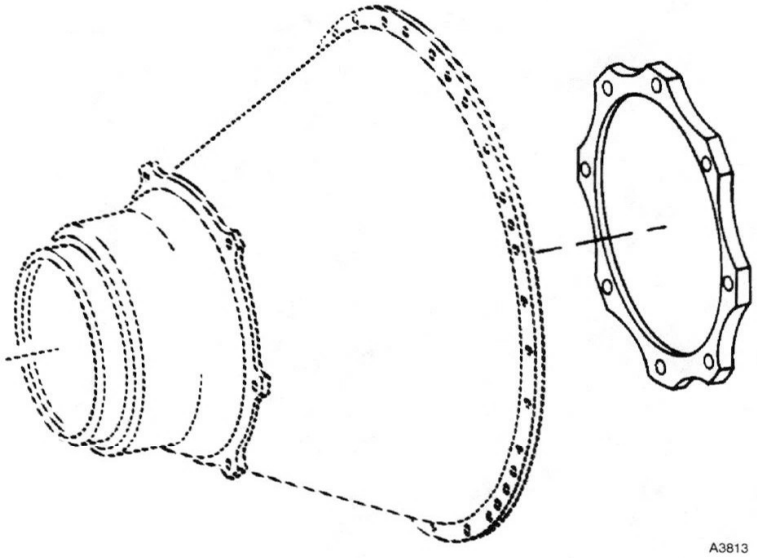
1. Aft Retainer (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Aft Retainer
Figure 601

AFT RETAINER – INSPECTION/CHECK

1. Aft Retainer – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      Visually inspect for the following:

      (1) Severe damage. Not acceptable. Replace.

      (2) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

      (3) Cracks or distortion. Not acceptable. Replace.

NO. 8 BALL BEARING – CLEANING

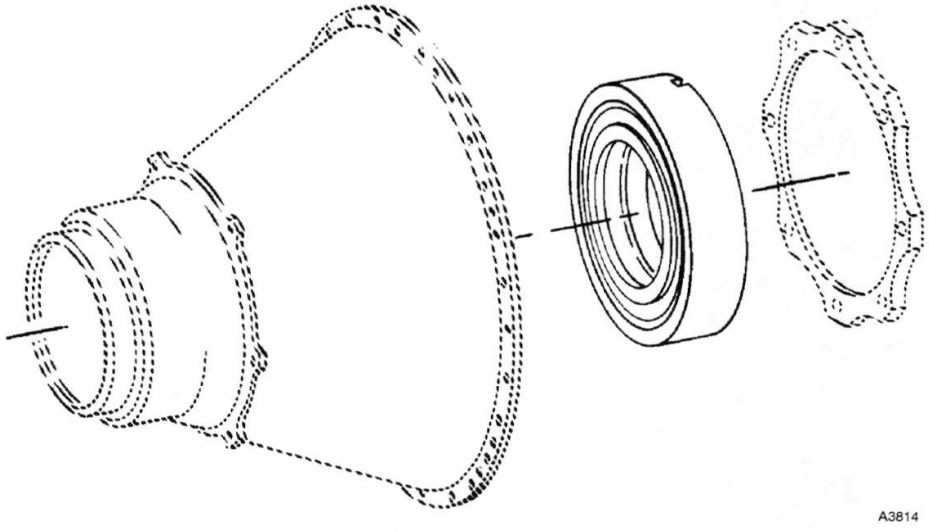
1. No. 8 Ball Bearing (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Procedure

      Clean in accordance with 70-15-13, SPM.



No. 8 Ball Bearing
Figure 601

NO. 8 BALL BEARING – INSPECTION/CHECK

1. No. 8 Ball Bearing – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      NOTE: If inspection procedures cannot be performed at your facility, send bearing to:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Inspect bearing. (Refer to 70-20-07, SPM and *Table 801* for hardness limits.)

      (2) Dimensionally inspect. *(Refer to Table 801.)* If limits cannot be met, replace.

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Table 801. No. 8 Ball Bearing Dimensional Inspection

+BEARING TYPE AND PART NO.	DIRECTION MEASURED	BLUEPRINT DIMENSIONS* INCH (MILLIMETER)	
		MINIMUM	MAXIMUM
Ball M222X1 (2-300-039-01)	ID	4.3304 (109.992)	4.3307 (110.000)
	OD	7.8735 (199.987)	7.8740 (200.000)
or	INTERNAL CLEARANCE	**0.0024 (0.061)	**0.0030 (0.076)
Ball AAV 222 K2M9RA 2574 (2-303-193-02)	ID	4.3304 (109.992)	4.3307 (110.000)
	OD	7.8735 (199.987)	7.8740 (200.000)
or	INTERNAL CLEARANCE	***0.0024 (0.061)	***0.0030 (0.076)
Ball M222X3 (2-303-193-01)	ID	4.3304 (109.992)	4.3307 (110.000)
	OD	7.8735 (199.987)	7.8740 (200.000)
	INTERNAL CLEARANCE	***0.0024 (0.061)	***0.0030 (0.076)

*Dimensional inspection not required unless visual inspection indicates obvious damage.

**Under 11.0 pound (5 kilogram) gage load.

***Under 33.0 pound (15 kilogram) gage load.

+Hardness for bearings inner and outer rings to be Rc60 minimum to Rc64 maximum. When there is any doubt as to bearing hardness condition, replace bearing.

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BEARING SPACER – CLEANING

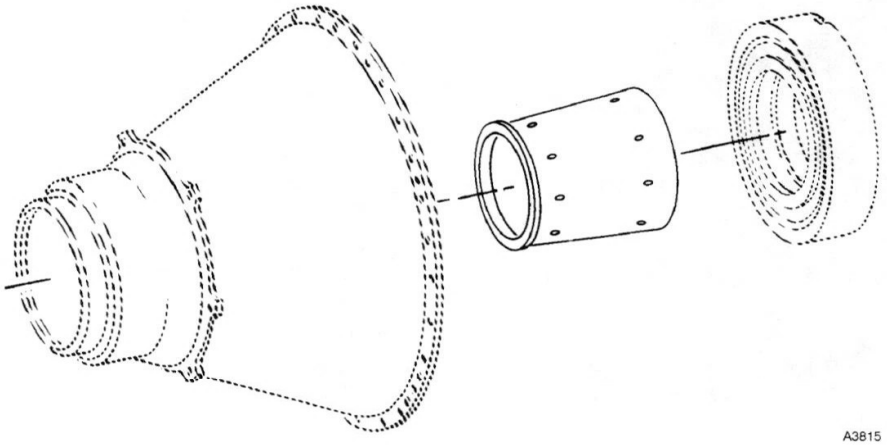
1. Bearing Spacer (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Bearing Spacer
Figure 601

BEARING SPACER – INSPECTION/CHECK

1. Bearing Spacer – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are noted.

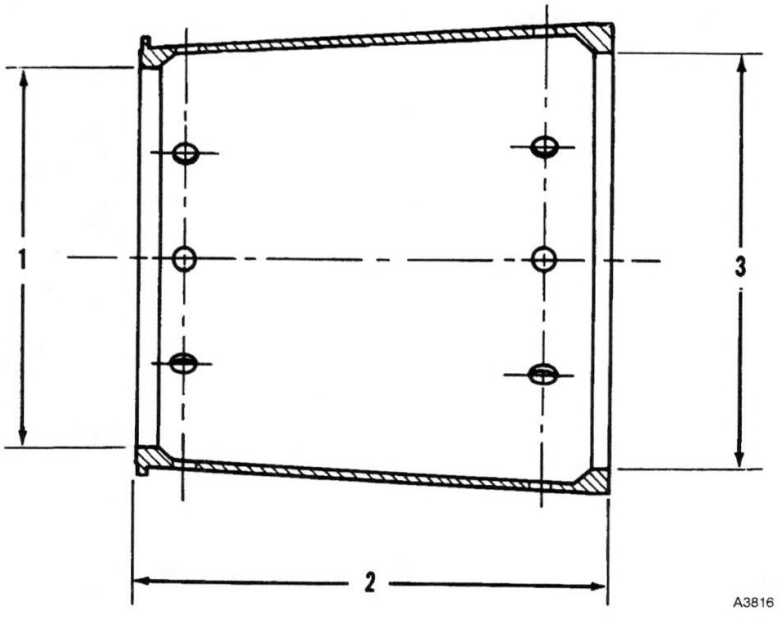
      (3) Dimensionally inspect. (*Refer to Table 802 and Figure 801.*) If limits cannot be met, replace.

Table 801. Bearing Spacer Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
300/500		5000	X	

Table 802. Bearing Spacer Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
					801
ID	3.9390 (100.051)	3.9400 (100.076)	3.9390 (100.051)	3.9401 (100.071)	1
AXIAL	4.8880 (124.155)	4.8910 (124.231)	4.8880 (124.155)	3.9401 (100.071)	2
ID	4.3330 (110.058)	4.3340 (110.084)	4.3330 (110.058)	4.3340 (110.084)	3



Bearing Spacer Dimensional Inspection Locations
Figure 801

FRONT BEARING RETAINER – CLEANING

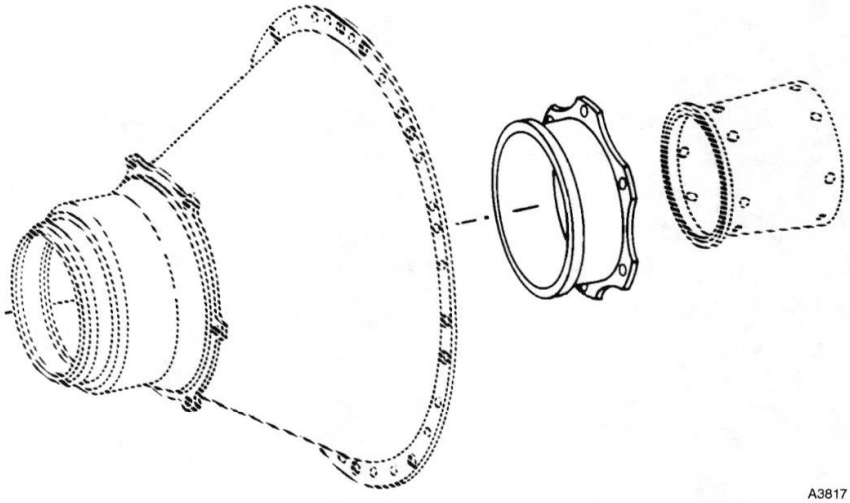
1. Front Bearing Retainer (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Front Bearing Retainer
Figure 601

FRONT BEARING RETAINER – INSPECTION/CHECK

1. Front Bearing Retainer – Inspection/Check

   A. Equipment and materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

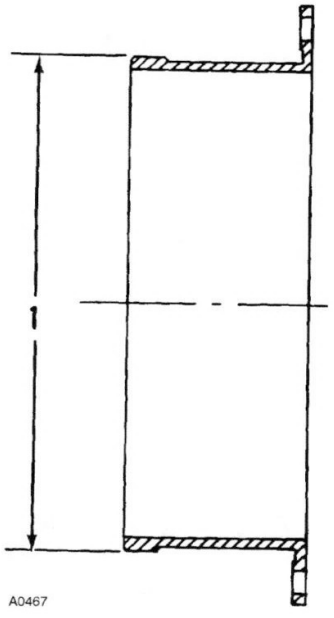
         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

      (2) Dimensionally inspect. (*Refer to Table 801 and Figure 801.*) Replace if limits cannot be met.

Table 801. Front Bearing Retainer Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
OD	5.9030 (149.936)	5.9040 (149.962)	5.9029 (149.934)	5.9040 (149.962)	**801** 1



Front Bearing Retainer Dimensional inspection Location
Figure 801

NO. 9 ROLLER BEARING – CLEANING

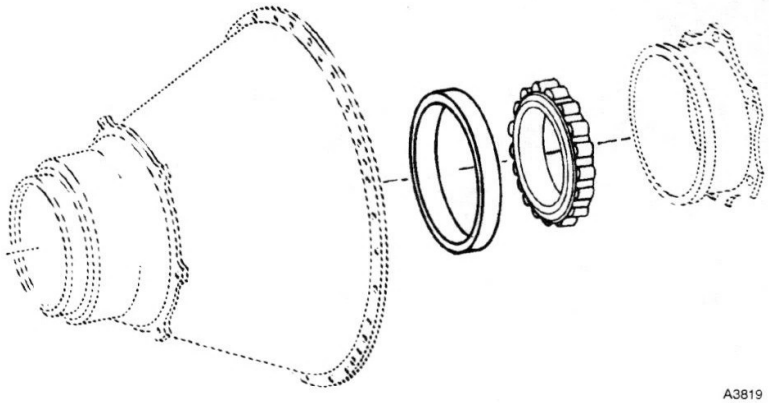
1. No. 9 Roller Bearing (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean in accordance with 70-15-13, SPM.



No. 9 Roller Bearing
Figure 601

NO. 9 ROLLER BEARING – INSPECTION/CHECK

1. No. 9 Roller Bearing – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      NOTE: If inspection procedures cannot be performed at your facility, send bearing to:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Visually inspect for cracks or distortion. Not acceptable. Replace.

      (2) Inspect bearing. (Refer to 70-20-07, SPM and *Table 801* for hardness limits.)

      (3) Dimensionally inspect. *(Refer to Table 801.)* Replace if limits cannot be met.

Table 801. No. 9 Roller Bearing Dimensional Inspection

BEARING TYPE** AND PART NO.	DIRECTION MEASURED	BLUEPRINT DIMENSIONS* INCH (MILLIMETER)	
		MINIMUM	MAXIMUM
5RNH-120-9 (2-303-289-01)	ID	3.9367 (99.992)	3.9370 (100.000)
	OD	5.9051 (149.990)	5.9055 (150.000)

*Dimensional inspection not required unless visual inspection indicates obvious damage.

**Hardness for all bearing inner and outer races to be Rc60 minimum to Rc64 maximum. When there is any doubt as to bearing hardness condition, replace bearing.

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FACEPLATE – CLEANING

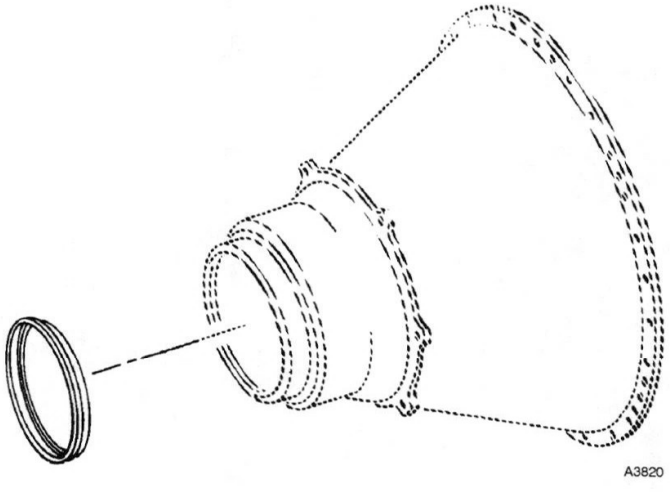
1. Faceplate (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Faceplate
Figure 601

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Honeywell

ENGINE MANUAL
ALF502R

TEMPORARY REVISION NO. 72-967

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 801/802, 72-33-09, INSPECTION/CHECK. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add inspection/check procedure for Pre and Post SB ALF/LF 72-1090.

Use the following revised inspection/check procedure in lieu of the existing inspection/check procedure.

FACEPLATE - INSPECTION/CHECK

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18 OCT 2006

TEMPORARY REVISION NO. 72-967

1. **(Pre SB ALF/LF 72-1090)** Faceplate - Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

         (d) A warped or mutilated condition. Not acceptable. Replace.

         (e) Raised carbon on seal runner surface. Remove. (Refer to 72-33-09, Cleaning.)

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are noted.

      (3) Inspect faceplate seal runner surface for scratches, grooves, or surface deformation. Repair coated surface without violating Service Center level thickness dimension. (Refer to 72-33-09, Repair-01.) Severely damaged faceplate must be replated at a Union Carbide facility and finish machined. (Refer to 72-33-09, Repair-01.)

Table 801. Faceplate Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
300/500		5000	X	

2. **(Post SB ALF/LF 72-1090)** Faceplate - Inspection/Check

   No inspection available. Replace faceplate.

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FACEPLATE – INSPECTION/CHECK

1. Faceplate – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

         (d) A warped or mutilated condition. Not acceptable. Replace.

         (e) Raised carbon on seal runner surface. Remove. (Refer to 72-33-09, Cleaning.)

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are noted.

      (3) Inspect faceplate seal runner surface for scratches, grooves, or surface deformation. Repair coated surface without violating Service Center level thickness dimension. (Refer to 72-33-09, Repair-01.) Severely damaged faceplate must be replated at a Union Carbide facility and finish machined. (Refer to 72-33-09, Repair-01.)

Table 801. Faceplate Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	WC
300/500		5000	X	

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ENGINE MANUAL
ALF502R

TEMPORARY REVISION NO. 72-968

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 901/902, 72-33-09, REPAIR-00. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add part number to Repair/Part Number Index.

Use the following revised Repair/Part Number Index in lieu of the existing Repair/Part Number Index.

Part Number	Repair	Service Bulletin
2-303-055-01/-02	-01	None
2-313-075-01	None	ALF/LF 72-1090

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FACEPLATE – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-303-055-01/-02	-01	None

FACEPLATE – REPAIR-01

1. Repair of Seal Runner Surface – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

37C80-HVK Truing Wheel

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Abrasive Diamond	05-04
Synthetic Diamond Bond Grit (No. 220)	05-10

B. Procedure

NOTE: Coated surface may be repaired by finish lapping (Refer to following Step (2)) provided overall thickness dimension can be maintained. If replating of surface is necessary for repair, seal runners must be returned to a Union Carbide facility due to proprietary nature of LC-IC Linde plating.

(1) Using truing wheel 37C80-HVK, with maximum runout of 0.002 inch (0.01 millimeter) and a natural or synthetic diamond wheel (bond L or N, grit size 200, 100 percent concentration), grind coating at a speed of 5000 to 6500 SFPM. For each pass, maximum infeed shall be 0.005 inch (0.01 millimeter) and maximum crossfeed shall be 0.025 inch (0.63 millimeter).

NOTE: Spray surface while grinding with flood coolant consisting of water and 1 to 2 percent soluble oil with a neutral pH.

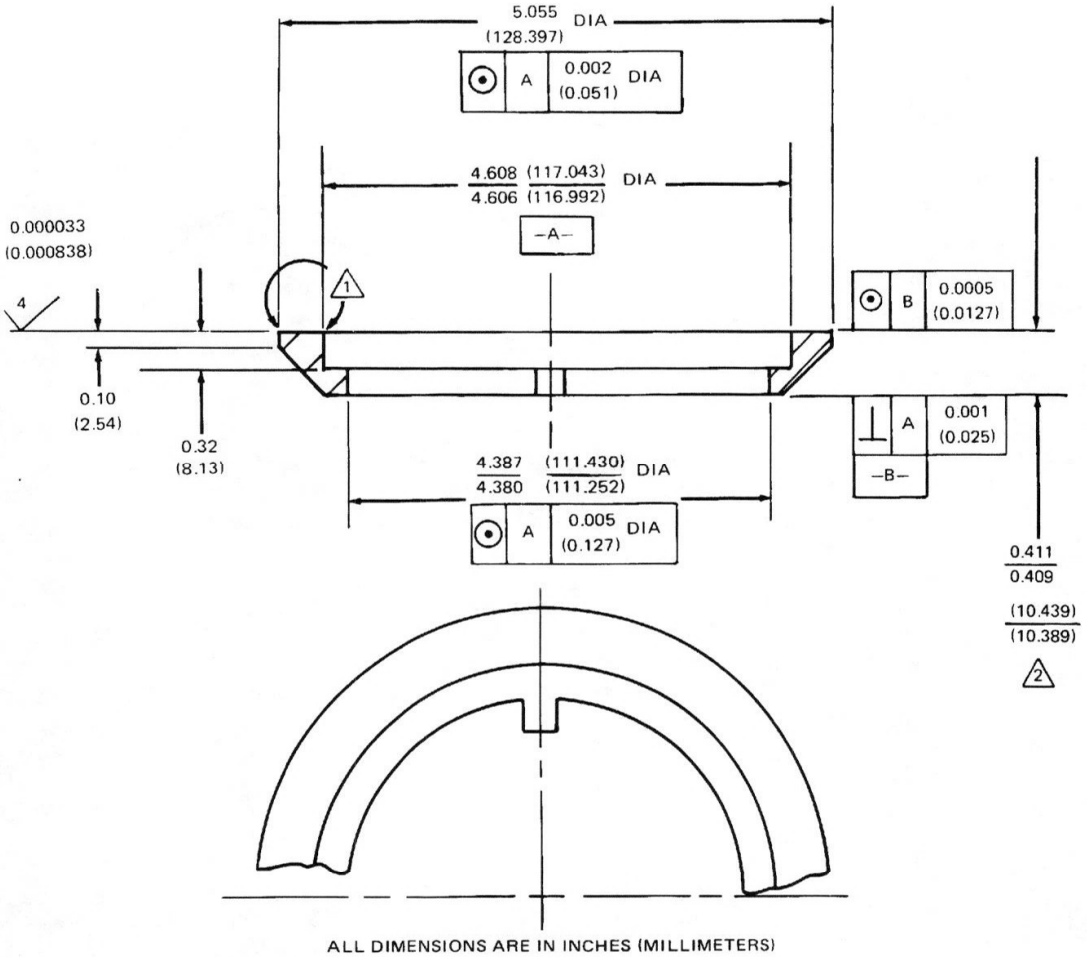
(2) Finish lap surface as follows:

(a) Using diamond abrasive and a lapping speed of 100 SFPM, finish lap at a pressure of 20 to 25 psi (138 to 172 kN/m^2). Obtain serrated lap surface dimensions shown in *Figure 901*.

NOTE: During lapping of surface, use suitable mineral spirits as a lubricant.

(b) Immerse faceplate in an ultrasonic bath to remove machining contaminations.

(c) Inspect lapped surface for proper dimensions. (*See Figure 901.*)



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

1 0.003-0.005 (0.076-0.127) FINISH THICK LC-1C LINDE FLAME PLATE.

2 DO NOT VIOLATE THIS DIMENSION

A0468

Grinding and Lapping Dimensions
Figure 901

FACEPLATE DRIVER – CLEANING

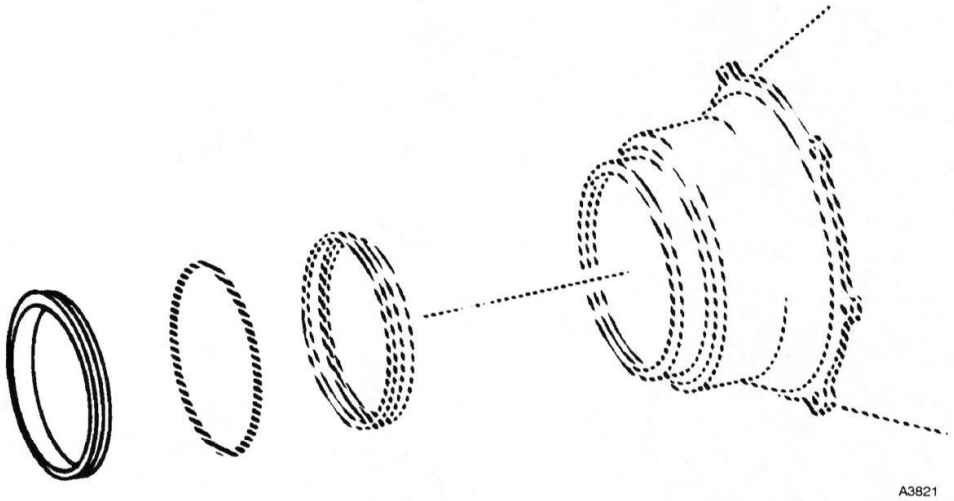
1. Faceplate Driver (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor-degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Faceplate Driver
Figure 601

FACEPLATE DRIVER – INSPECTION/CHECK

1. Faceplate Driver – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Pitting. Minor pitting is acceptable. If pitting is severe, replace.

         (c) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are noted.

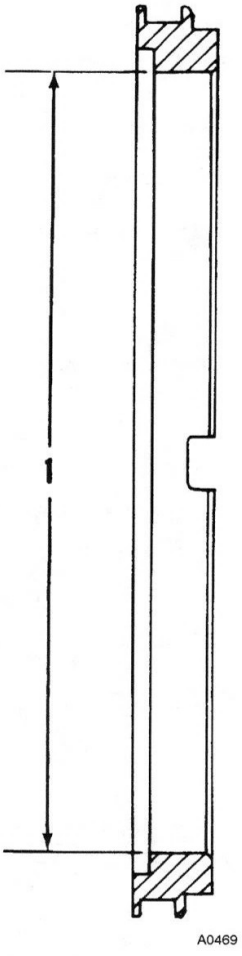
      (3) Dimensionally inspect. (*Refer to Table 802 and Figure 801.*) If limits cannot be met, replace driver.

Table 801. Faceplate Driver Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
300/500		5000	X	

Table 802. Faceplate Driver Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID	3.9400 (100.076)	3.9420 (100.127)	3.9400 (100.076)	3.9421 (100.129)	**801** 1



Faceplate Driver - Dimensional Inspection Location
Figure 801

NO. 9 BEARING FACE SEAL – CLEANING

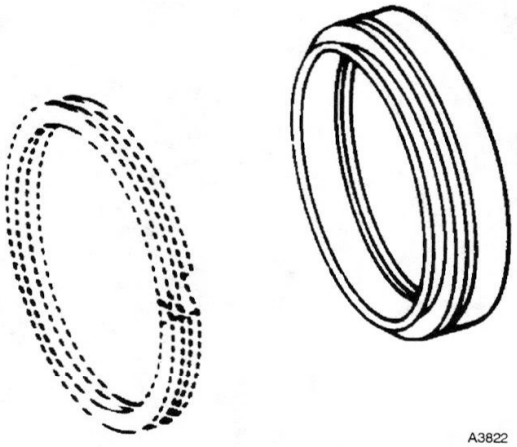
1. No. 9 Bearing Face Seal (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



No. 9 Bearing Face Seal
Figure 601

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TEMPORARY REVISION NO. 72-965

(Temporary Revision (TR) 72-965 is issued prior to TR 72-962 through TR 72-964. TR 72-962 through TR 72-964 will be distributed at a later date.)

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 801/802, 72-33-11, INSPECTION/CHECK. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add inspection/check procedure for Pre and Post SB ALF/LF 72-1090.

Use the following revised inspection/check procedure in lieu of the existing inspection/check procedure.

NO. 9 BEARING FACE SEAL - INSPECTION/CHECK

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TEMPORARY REVISION NO. 72-965

1. **(Pre SB ALF/LF 72-1090)** No. 9 Bearing Face Seal - Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

         (d) Severely damaged or mutilated housing. Not acceptable. Discard seal.

      (2) Inspect face seal. (Refer to 70-20-01, SPM.) Repair. (Refer to 72-33-11, Repair-01.)

2. **(Post SB ALF/LF 72-1090)** No. 9 Bearing Face Seal - Inspection/Check

   No inspection available. Replace seal.

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NO. 9 BEARING FACE SEAL – INSPECTION/CHECK

1. No. 9 Bearing Face Seal – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

         (d) Severely damaged or mutilated housing. Not acceptable. Discard seal.

      (2) Inspect face seal. (Refer to 70-20-01, SPM.) Repair. (Refer to 72-33-11, Repair-01.)

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TEMPORARY REVISION NO. 72-966

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 901/902, 72-33-11, REPAIR-00. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add part number to Repair/Part Number Index.

Use the following revised Repair/Part Number Index in lieu of the existing Repair/Part Number Index.

Part Number	Repair	Service Bulletin
2-303-054-01	-01	None
2-313-074-02	None	ALF/LF 72-1090

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NO. 9 BEARING FACE SEAL – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-303-054-01	-01	None

NO. 9 BEARING FACE SEAL – REPAIR-01

1. Repair of Seal Kit for Reuse of No. 9 Bearing Face Seal Housing – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Cleaning Solution	07-42
LIX Butyl II Cellosolve	07-54

B. Procedure

(1) Rotate seal nose assembly in housing. Seal nose will clear ears of antirotation lugs. (*See Figure 901.*)

(2) Remove seal nose assembly from housing. Discard packing that is located on ID of seal nose assembly.

(3) Remove and discard wave washer from housing.

WARNING: OVEREXPOSURE TO SOLVENT SOLUTION CAN CAUSE IRRITATION TO SKIN, EYES, NOSE, AND THROAT. USE IN WELL-VENTILATED AREAS. USE SUITABLE GLOVES WHEN WORKING WITH SOLVENT SOLUTION.

(4) Soak housing and seal nose assembly in solvent solution, consisting of 50 percent LIX 400 and 50 LIX Butyl II Cellosolve, until carbon deposits and other contaminants are removed. Heavy coke deposits may require 24 hour soak period. Light scraping or brushing with a non-metal soft bristle brush may be required.

(5) Rinse housing and seal nose assembly with hot water.

(6) Using seal data, inspect seal nose assembly. (Refer to 70-20-01, SPM.) If criteria is not met, discard seal nose assembly.

(7) Inspect housing for nicks, scratches, and dents. Dents are not allowed. Nicks on edges can be lightly stoned to remove raised metal. Scratches around perimeter of housing are permitted providing there is no raised metal to interfere with fit in bearing housing.

(8) Inspect packing groove in OD of housing. Damage in this area is not permitted. If damaged, reject housing.

1. B. (9) Inspect antirotation lugs for damage or looseness. Looseness is not allowed. Reject.

(10) Assemble seal as follows:

NOTE: Seal kit may be procured from the Rexnord Seal Division, Wheeling, IL, Kit No. 99-4734-1.

(a) Install wave washer into housing.

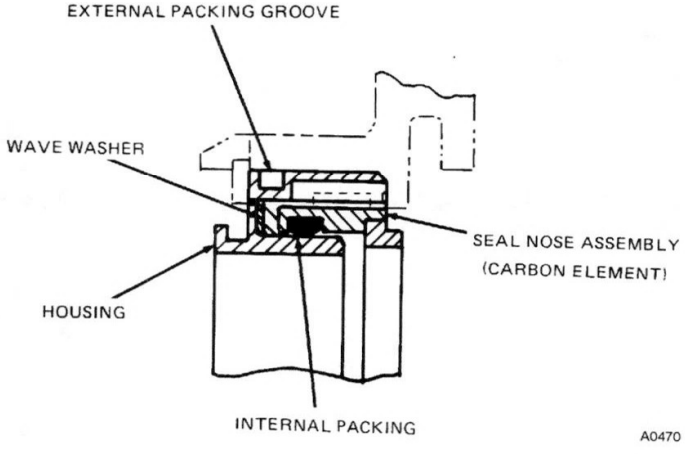
(b) Install packing in seal element

NOTE: Internal packing P/N 69-PA246VIT70, is included in seal repair kit No. 99-4734-1; however, packing may also be procured separately from the Rexnord Seal Division, Wheeling, IL.

(c) Install seal element into housing. Rotate seal element until positive contact and retention is made with housing antirotation lugs.

(11) Place a suitable piece of cloth over carbon element. Depress seal nose assembly into housing several times to insure there is no binding of seal or packing. Remove cloth.

NOTE: Ensure no damage to carbon element occurs during installation of seal nose assembly.



Seal Kit Repair
Figure 901

FAN DISC SHIM – CLEANING

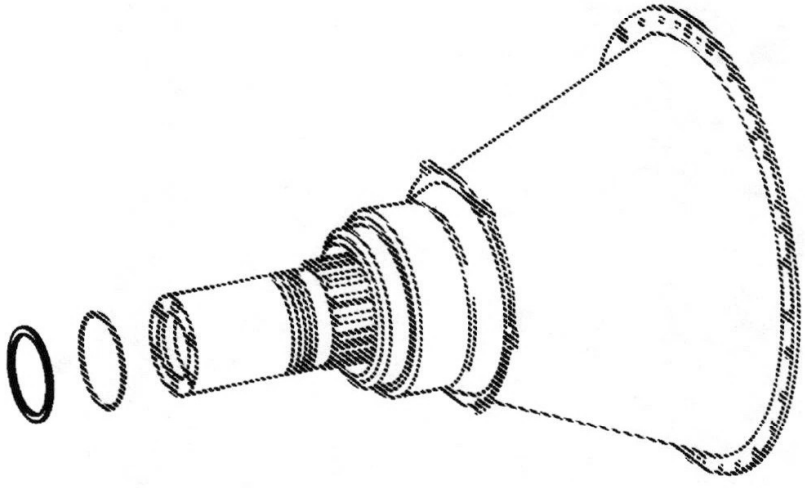
1. Fan Disc Shim (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean by vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



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Fan Disc Shim
Figure 601

FAN DISC SHIM – INSPECTION/CHECK

1. Fan Disc Shim – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Cracks. Not acceptable. Replace.

      (2) Magnetic-Particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are apparent.

Table 801. Fan Disc Shim Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	WC
500/700		3500	X	

RING GEAR ASSEMBLY – CLEANING

1. Ring Gear Assembly (*See Figure 601*) – Cleaning

A. Equipment and Materials

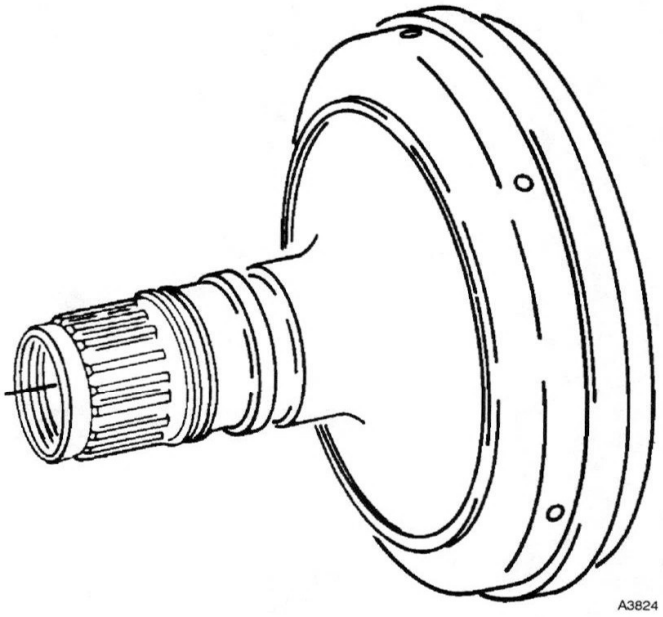
Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48 or -49

B. Cleaning

(1) Clean by flushing with dry cleaning solvent.

(2) Ring gear assembly may also be cleaned in accordance with 70-15-12, SPM.



Ring Gear Assembly
Figure 601

RING GEAR ASSEMBLY – INSPECTION/CHECK

1. Ring Gear Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Pitting. (Refer to 70-20-08, SPM.) Minor pitting on gear teeth is not acceptable. Replace ring gear assembly.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks and distortion. Not acceptable. Replace.

         (e) Fractured damping ring. If damping ring is fractured in two or more pieces, replace ring gear assembly and inspect planet gear and sun gear for unacceptable conditions. (Refer to 72-33-21 and 72-33-26, Inspection/Check.)

         (f) Damaged splines and/or gear teeth. (Refer to 70-20-08, SPM.)

         (g) Wear or fretting on ring gear under damping ring. Not acceptable. Repair. (Refer to Repair-02.)

      (2) On ring gears with bolted damping rings, visually check damping ring bolts for security and freedom of rotation and for broken nut/bolt welds. Replace damping ring with pinned configuration. (Refer to Repair-01.)

      (3) On ring gears with bolted damping rings, visually inspect ring gear assembly damping ring at six spot-faced locations for radial wear caused by retention bolt heads. (*See Figure 801.*) Replace damping ring with pinned configuration. Wear is unacceptable.

      (4) On ring gears with pinned damping rings:

         (a) Visually inspect brazed pins for looseness. Loose pins are not allowed. Replace ring.

         (b) Fluorescent-penetrant inspect exposed section of pin shanks for cracks. (Refer to 70-20-05, SPM.) Cracks are not allowed. Replace ring.

1. B. (5) If lubrication system was contaminated with metallic chips caused by reduction carrier distress, or a spun planet gear is noted, inspect ring gear as follows:

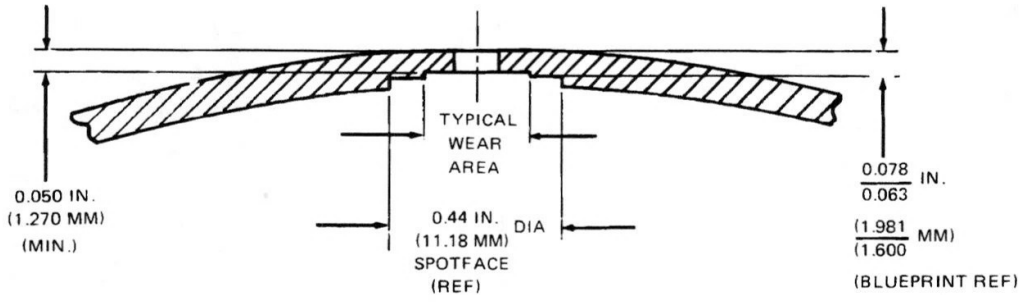
(a) Visually inspect for cracks. Cracks are not allowed. Replace gear.

(b) Magnetic-particle inspect (MPI) using fluorescent particle materials. Pay particular attention to the tooth fillet radii. Cracks are not allowed. Replace gear.

(c) Ring gears exposed to one or more incidents of heavy (Condition 3) reduction carrier metal generation shall be retired from service.

C. Non-Destructive Test (NDT)

Magnetic particle inspect using fluorescent materials. Closely examine the gear tooth root fillet radius (*Figure 802*). (Refer to 70-20-03, SPM.) Cracks are not allowed. Replace ring gear.



Inspection of Ring Gear Assembly
Figure 801

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TEMPORARY REVISION NO. 72-940

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 802, 72-33-13, INSPECTION/CHECK. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add ring gear reject criteria after 6/7 bearing failure.

Use the following revised Step 1.B.(5) in lieu of the existing Step 1.B.(5).

1. B. (5) If lubrication system was contaminated with metallic chips caused by reduction gearing distress, position 6/7 bearing distress, or a spun planet gear is noted, inspect ring gear as follows:

   (a) Visually inspect for cracks. Cracks are not allowed. Replace gear.

   (b) Magnetic-particle inspect (MPI) using fluorescent-particle materials. Pay particular attention to the tooth fillet radii. Cracks are not allowed. Replace gear.

   (c) Ring gears exposed to one or more incidents of heavy (Condition 3) reduction carrier metal generation shall be retired from service.

   (d) Ring gears exposed to carrier assemblies with failed position No. 6 or No. 7 bearings shall be retired from service.

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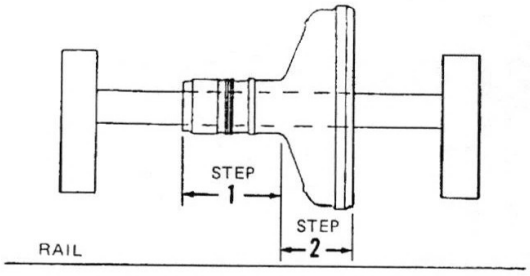

CIRCULAR

LONGITUDINAL

STEP 1. MAGNETIZE AND INSPECT USING 1100/1300 AMPS
STEP 2. MAGNETIZE 4 TIMES 90° FROM EACH OTHER AND INSPECT USING 3400/3900 AMPS
STEP 3. PLACE GEAR IN COIL AS SHOWN, MAGNETIZE AND INSPECT USING 5000 AMP TURNS
STEP 4. PLACE GEAR IN COIL AS SHOWN, MAGNETIZE AND INSPECT USING 20000 AMP TURNS

NOTE:
Central conductor shall be 2 x 18 inch (50.8 x 457.2 millimeters) and will be positioned so that the Ring Gear does not come in contact with the rail.

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Ring Gear Assembly Magnetic-Particle Inspection
Figure 802

RING GEAR ASSEMBLY –REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-090-25/-26/-31	-01 thru -02	None

RING GEAR ASSEMBLY – REPAIR-01

1. Replacement of Discrepant Parts – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

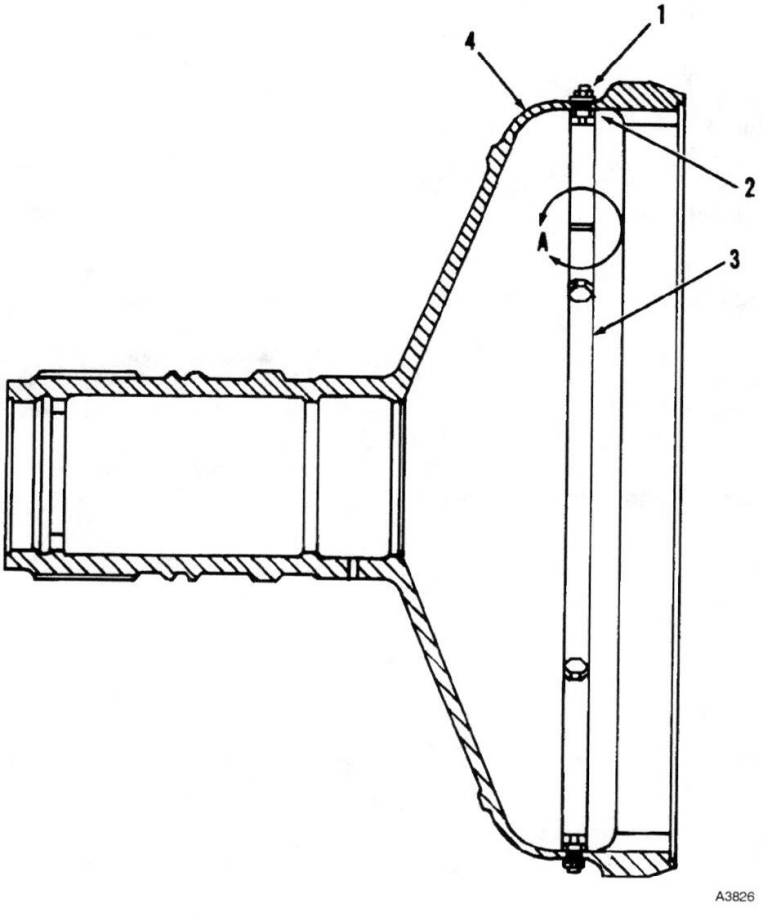
None.

B. Procedure

(1) If damping ring (3, *Figure 901*) is of bolted configuration, remove and discard six nuts (1) and six bolts (2).

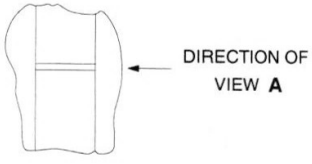
(2) Index ring and gear for proper reinstallation of new ring and remove and discard damping ring.

(3) Align index marks and install pinned configuration damping ring (3) by snapping ring into place. Ensure gap at slot is within limits. If gap slot is not within limits, machine damping ring as required. Load ring radially outward in two locations approximately 90 degrees from ring splitline. Ring end (long and short) must seat against ring gear with no gap greater than 0.040 inch (1.02 millimeter) measured radially from surface of ring gear assembly. (*See Figure 901.*)

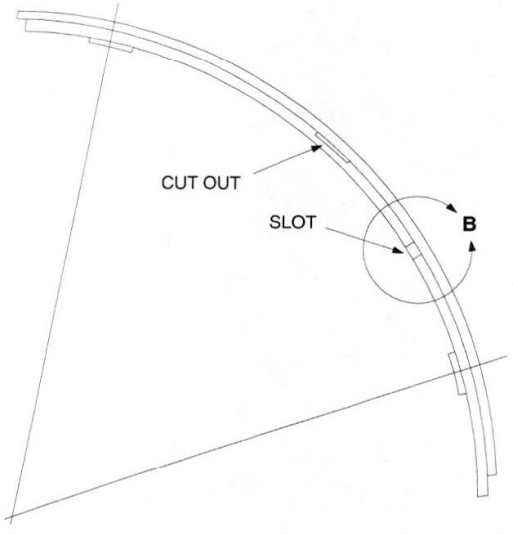


1. NUT
2. BOLT
3. RING
4. GEAR

Ring Gear Assembly
Figure 901 (Sheet 1 of 2)



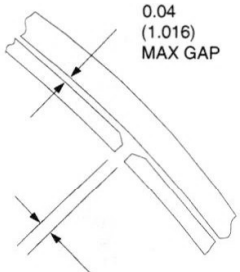
DETAIL **A**



VIEW **A**

WHEN ASSEMBLING DAMPING RING
TO GEAR, LOCATE RING SLOT ADJACENT
TO PIN AS SHOWN

ALL DIMENSIONS ARE IN
INCHES (MILLIMETERS)



DETAIL **B**

0.120
0.030
(3.05)
(0.76)

I–58G–101

Ring Gear Assembly
Figure 901 (Sheet 2)

RING GEAR ASSEMBLY – REPAIR-02

1. Repair of Ring Gear Due to Damping Ring Wear – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Bead, Glass	05-01
Surface Treatment, Hoppe's Gun Blue	06-44

B. Procedure

(1) Remove ring gear damping ring. (Refer to Repair-01.)

(2) Clean area. (Refer to Cleaning.)

(3) Fluorescent-penetrant inspect ring gear (Refer to 70-20-05, SPM, Level III), paying close attention to damping ring pin holes and gear tooth root radius.

(4) Mask gear teeth, spline, and oil drain hole areas.

(5) Paint the damping ring contact area on the ID of the ring gear with Gun Blue.

(6) Glass bead peen the entire damping ring contact area using No.6 (AMS2431) glass beads and a pressure of 50 to 60 psi (345 to 414 kPa). Holding the nozzle distance 4 to 5 inches (102 to 127 millimeters) from the surface, move the peening stream back and forth until all bluing is removed. Scatter peening of adjacent areas is permissible.

(7) Repeat Steps (5) and (6) one time.

(8) Remove masking and clean ring gear. (Refer to Cleaning.)

(9) Apply corrosion protection. (Refer to 70-15-11, SPM.)

(10) Install damping ring. (Refer to Repair-01.)

(11) Inspect ring gear. (Refer to Inspection/Check.)

RING GEAR NUT – CLEANING

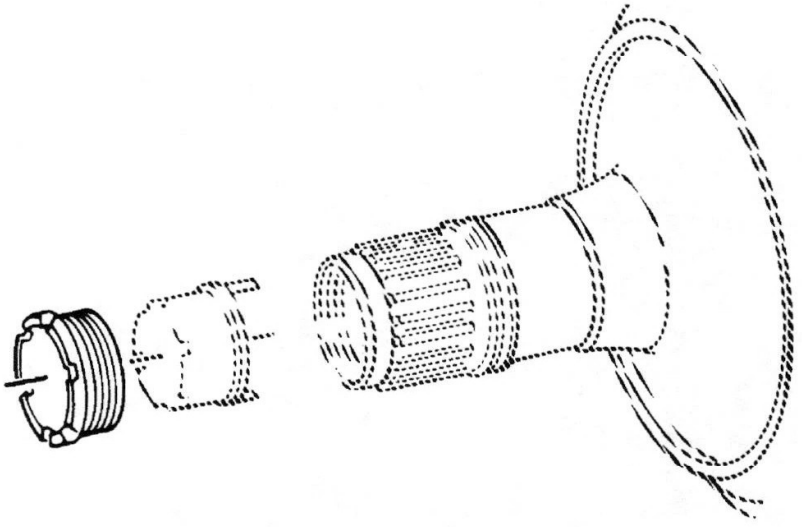
1. Ring Gear Nut (*See Figure 601*) – Cleaning

   A. Equipment and materials

      None.

   B. Cleaning

      Clean by vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Ring Gear Nut
Figure 601

RING GEAR NUT – INSPECTION/CHECK

1. Ring Gear Nut – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks or distortion. Not acceptable. Replace.

CARRIER RETAINING SPRING – CLEANING

1. Carrier Retaining Spring (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using dry cleaning solvent method. (Refer to 70-15-03, SPM.)

Carrier Retaining Spring
Figure 601

CARRIER RETAINING SPRING – INSPECTION/CHECK

1. Carrier Retaining Spring – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace spring if cracks are present.

Table 801. Carrier Retaining Spring Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
700/900		6000	X	

SUN GEAR AND RETAINER ASSEMBLY – DISASSEMBLY

1. Sun Gear and Retainer Assembly – Disassembly

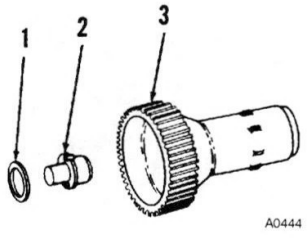
   A. Equipment and Materials

      None.

   B. Disassembly

      (1) Remove retaining ring (1, *Figure 501*).

      (2) Remove retainer assembly (2) from sun gear (3).



1. RETAINING RING
2. RETAINER ASSEMBLY
3. SUN GEAR

Sun Gear and Retainer Assembly
Figure 501

SUN GEAR AND RETAINER ASSEMBLY – ASSEMBLY

1. Sun Gear and Retainer Assembly – Assembly

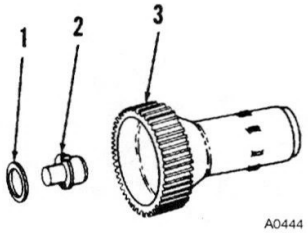
   A. Equipment and Materials

      None.

   B. Assembly

      (1) Position retainer assembly (2, *Figure 1001*) into sun gear (3).

      (2) Install retaining ring (1).



1. RETAINING RING
2. RETAINER ASSEMBLY
3. SUN GEAR

Sun Gear and Retainer Assembly
Figure 1001

SUN GEAR – CLEANING

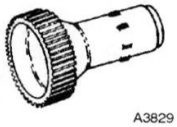
1. Sun Gear (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean in accordance with 70-15-12, SPM.



A3829

Sun Gear
Figure 601

SUN GEAR – INSPECTION/CHECK

1. Sun Gear – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      NOTE: The sun gear and reduction gear carrier assembly must be kept as a gear set for life if the sun gear or any planet gear in the reduction gear carrier assembly has accumulated more than 50 hours of total engine operation. Replacement of either part must include replacement of the other. If the sun gear and all planet gears in the reduction gear carrier assembly have accumulated less than 50 hours of total engine operation the sun gear and any planet gear or gears may be individually replaced in combination with any gear having less than 50 hours of engine operation.

      (1) Visually inspect for the following:

         (a) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (b) Wear on side faces of dampening ring. (*See Figure 801.*) Acceptable provided wear step does not exceed 0.005 inch (0.13 millimeter). Inspect for wear by moving the ring radially in retaining groove. If parent metal of ring shows excessive fretting, replace sun gear and planet gears or replace dampening ring. (Refer to Repair-01.)

            NOTE: Dampening ring is coated with a solid lubricant that will smear from operation.

         (c) Cracks and distortion. Not acceptable. Replace.

         (d) On those sun gear assemblies whose gear teeth are coated with solid lubricant (silver plate), smearing and wear of lubricant from normal operation is acceptable. Lubricant may turn black from oxidation, which is also acceptable.

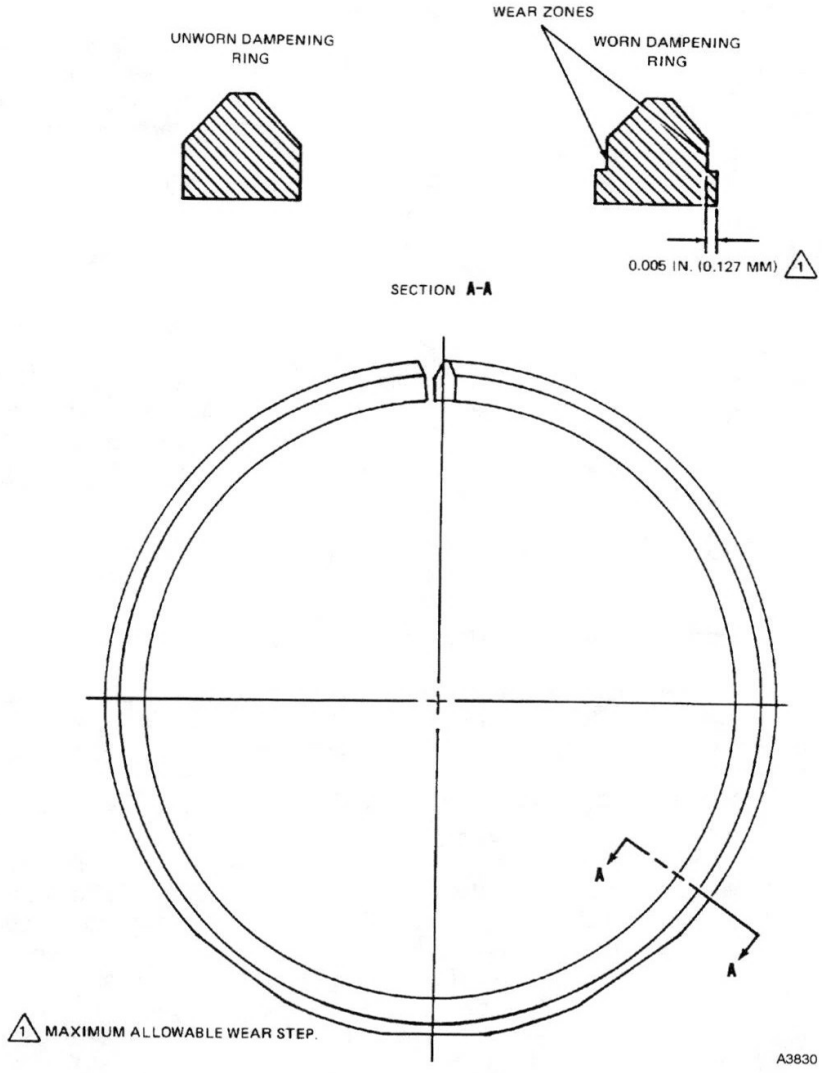
         (e) The absence of silver plate in the contact zone in whole or part on sun gear teeth with greater than 25 hours of operation is acceptable. Discoloration, nicks, scratches, scoring, and smearing of this silver plate on sun gear teeth is acceptable providing the defect is not present in the base metal. The base material can be inspected after local removal of the silver plating on the drive side of one tooth exhibiting worst condition by lightly polishing with crocus cloth and inspecting the tooth surface. (Refer to 70-20-08, SPM.)

         (f) Damage to gear tooth edges. If damage is within limits specified in *Figure 802*, repair edge damage. (Refer to Repair-02.)

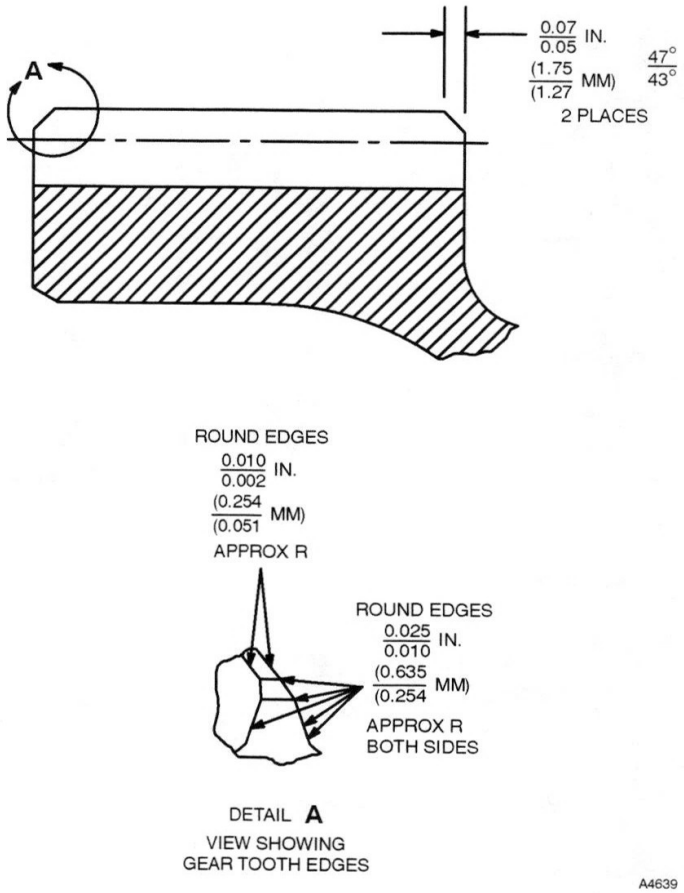
1. B. (2) Magnetic-particle inspect for cracks. (See *Figure 803* and 70-20-03, SPM.) If cracks are noted, replace.

NOTE: Application of particles to be wet continuous fluorescent.

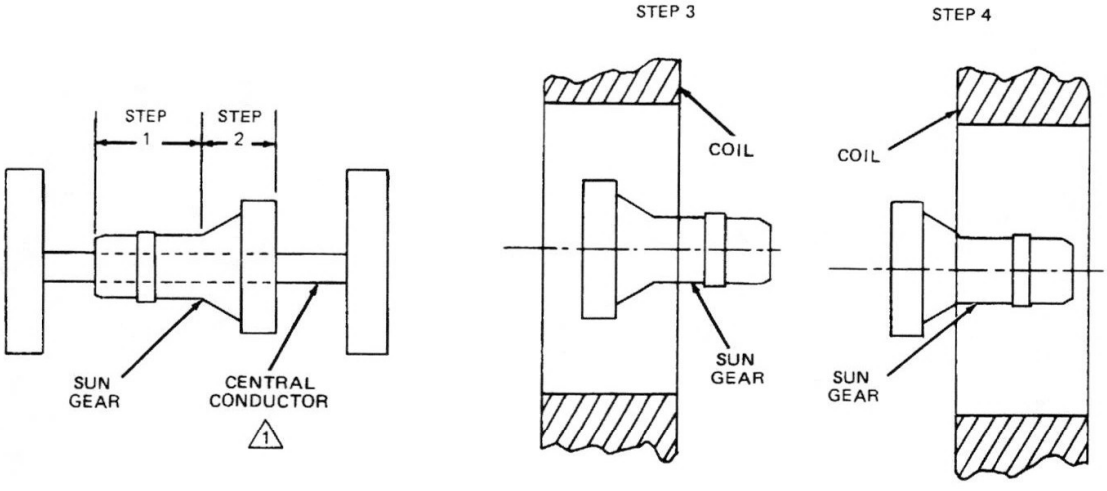
(3) Inspect sun gear. (Refer to 70-20-08 SPM.) If sun gear is replaced due to tooth damage, replace planet gears. (Refer to 72-33-25, Assembly.)



Inspection of Dampening Ring
Figure 801



Sun Gear Tooth Edge Damage Limits
Figure 802



CIRCULAR MAGNETIZATION

LONGITUDINAL MAGNETIZATION

NOTES:

1. DIAMETER – 1 INCH (25.4 MILLIMETERS)
2. CURRENT – FULL WAVE DIRECT

STEP 1. PLACE DISC AS SHOWN; THEN MAGNETIZE USING 1800/2000 AMPS AND INSPECT.

STEP 2. MAGNETIZE USING 4500/4800 AMPS AND INSPECT.

STEP 3. WITH SUN GEAR PLACED IN COIL AS SHOWN, MAGNETIZE USING 12,000 AMP TURNS AND INSPECT.

STEP 4. WITH SUN GEAR PLACED IN COIL AS SHOWN, MAGNETIZE USING 13,000 AMP TURNS AND INSPECT.

A0474

Sun Gear Magnetic-Particle Inspection
Figure 803

SUN GEAR – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-120-08	-01 and -02	None
2-023-120-11	-01 thru -03	None

SUN GEAR – REPAIR-01

1. Replacement of Discrepant Dampening Ring – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48 or -49
Lint-Free Cloth	10-08

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Dampening Ring	2-023-055-03	72-33-21	9	120

B. Procedure

(1) Using a small deburring tool, notch the dampening ring in two places and bend the ring inward; then remove and scrap the discrepant ring.

(2) Using a clean lint-free cloth dampened with dry cleaning solvent, clean the dampening ring groove in the sun gear.

(3) Install the new dampening ring by hand and work until completely seated.

NOTE: Plastic drifts may be used to manipulate the ring into the groove. No special tools are required.

(4) Inspect the dampening ring for looseness. If ring can be rotated by hand it is unacceptable. Movement of the ring from side to side is acceptable.

SUN GEAR – REPAIR-02

1. Repair of Damaged Tooth Edges – Repair-02

   NOTE: Refer to Repair-00 for part number application.

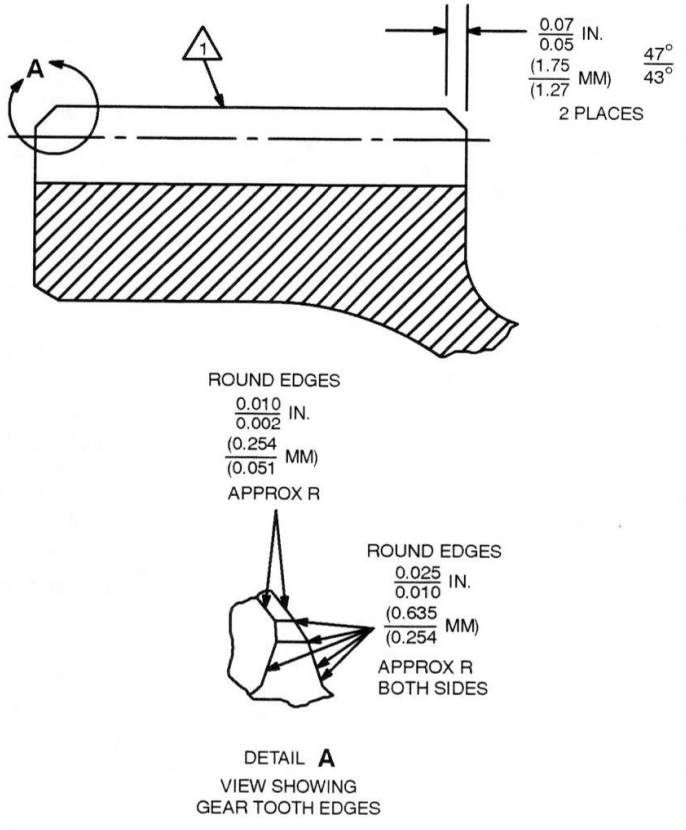
   A. Equipment and Materials

      None.

   B. Procedure

      CAUTION: USE OF POWER TOOLS IS NOT PERMITTED.

      (1) Blend edge damage. (Refer to 70-25-01, SPM.) Do not exceed limits specified in *Figure 901*.



DETAIL **A**
VIEW SHOWING
GEAR TOOTH EDGES

1 SILVER PLATE GEAR TOOTH PROFILES AND BOTH END FACES OF GEAR TEETH 0.0001 - 0.0002 INCH (0.0254 - 0.0308 MILLIMETER) THICK PER 70-35-05, SPM. IMMEDIATELY AFTER PLATING BAKE FOR 5 HOURS AT 265°F 10°F (129°C 5.5°C).

A4640

Sun Gear Tooth Edge Damage Limits
Figure 901

SUN GEAR – REPAIR-03

1. Refurbish Gears Showing Unacceptable Tooth Wear – Repair-03

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      A repair is available to refurbish gears showing unacceptable tooth wear patterns, or to refurbish gears that are serviceable but would have to be scrapped due to the requirement that used planetary and sun gears remain a matched set after 50 hours of engine operation. This repair may not be used to refurbish gears that exhibit pitting on the working surfaces of the gear teeth.

      This is a controlled-source repair. For information on suppliers authorized to perform this repair, contact the following:

      Honeywell Engines, Systems & Services
      Customer Support Center
      P.O. Box 29003
      M/S 26-06/2102-323
      Phoenix, AZ 85038-9003
      Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
      FAX: 1-602-365-3343

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SUN GEAR RETAINER ASSEMBLY – CLEANING

1. Sun Gear Retainer Assembly (*See Figure 601*) – Cleaning

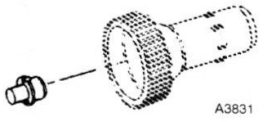
   A. Equipment and Materials

      None.

   B. Cleaning

      (1) Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)

      (2) Degrease insert hole.



Sun Gear Retainer Assembly
Figure 601

SUN GEAR RETAINER ASSEMBLY – INSPECTION/CHECK

1. Sun Gear Retainer Assembly – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

      (2) Magnetic-particle inspect for cracks. (Refer to *Table 801* and 70-20-03, SPM.) Replace if cracks are noted. Cracked tack welds may be repaired. (Refer to Repair-03.)

      (3) Inspect to determine if retaining insert has a self-locking feature by threading the retention bolt into retainer and observing the torque required to rotate the bolt into the sun gear before it reaches the bottom of the retainer. If a minimum of 25 pound-inches (2.8 Nm) resistance is achieved, self-locking feature exists. If the torque is less than 25 pound inches (2.8 Nm), insert must be replaced. (Refer to Repair-01 or -02.)

Table 801. Sun Gear Retainer Assembly Magnetic-Particle Inspection

AMPERAGE AND MAGNETIZATION				
CENTRAL CONDUCTOR AMPS	END-TO-END AMPS	LONGITUDINAL AMP TURNS	METHOD WR	METHOD WC
700/900		6000	X	

SUN GEAR RETAINER ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-070-01	-01 and -03	None
2-023-070-06	-02	None

SUN GEAR RETAINER ASSEMBLY– REPAIR-01

1. Replacement of Worn Swage Lock Type Insert – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Primer	01-09
Thread Locking Compound	01-05

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Insert	SR430L			
Pin	MS9105-78			

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Remove insert from retainer. (Refer to 70-25-03, SPM.)

(2) Using dry cleaning solvent method, clean to remove all debris and oil deposits. (Refer to 70-15-03, SPM.)

(3) Following manufacturer's instructions, apply primer (Loctite Primer T) and thread locking compound (Loctite 272) to the external insert threads and internal retainer threads.

(4) Within 4 minutes following primer (Loctite Primer T) application, install insert and pin into retainer. (Refer to 70-25-03, SPM.)

(5) Using primer (Loctite Primer T), clean to remove excess thread locking compound (Loctite 272).

(6) Install sun gear bolt into insert and inspect self-locking feature. (Refer to 72-33-22, Inspection/Check.)

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SUN GEAR RETAINER ASSEMBLY – REPAIR-02

1. Replacement of Worn Lock Ring Type Insert – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Primer	01-09
Thread Locking Compound	01-05

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Insert	R2A12956			
Pin	MS9105-78			

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Remove insert from retainer. (Refer to 70-25-03, SPM.)

(2) Using dry cleaning solvent method, clean to remove all debris and oil deposits. (Refer to 70-15-03, SPM.)

(3) Following manufacturer's instructions, apply primer (Loctite Primer T) and thread locking compound (Loctite 272) to the external insert threads and internal retainer threads.

(4) Within 4 minutes following retaining compound application, install insert and pin into retainer. (Refer to 70-25-03, SPM.)

(5) Using primer (Loctite Primer T), clean to remove excess thread locking compound (Loctite 272).

(6) Install sun gear bolt into insert and inspect self-locking feature. (Refer to 72-33-22, Inspection/Check.)

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SUN GEAR RETAINER ASSEMBLY – REPAIR-03

1. Repair of Cracked Tack Welds – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22
Welding Wire (MIL-E-23765/1, Type 70S-2)	

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Remove existing tack weld(s) using a hand grinder. Do not remove parent material.

(2) Clean area to be welded with acetone or equivalent.

(3) Tack weld using weld filler (MIL-3-23765/1, Type 70S-2). (Refer to 70-45-01, SPM.)

(4) Fluorescent-penetrant inspect. (Refer to 70-20-05, SPM.) No cracks allowed.

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OIL TUBE ADAPTER ASSEMBLY – CLEANING

1. Anti-Icing or Oil Tube Adapter Assembly – Cleaning

   A. Equipment and Materials

   None.

   B. Procedure

   Using vapor-degreasing method or dry cleaning solvent method, clean as required. (Refer to 70-15-01 or 70-15-03, SPM.)

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – INSPECTION/CHECK-01

1. Anti-Icing or Oil Tube Adapter Assembly – Inspection/Check-01

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT7539-01	Target Fixture
LTCT13971-01	Oil Flow Fixture
LTCT23960-01	Oil Flow and Pressure Test Stand

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Lubricating Oil	02-18

B. Inspection

(1) Visually inspect for nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

(2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) If cracks are present, replace adapter.

NOTE: Fillet porosity in braze joints is acceptable, provided fillet is complete.

(3) Inspect oil tube for kinks. If oil tube is kinked, replace adapter.

(4) Inspect surface finish for wear or corrosion. Repair surface finish. (Refer to 72-33-23, Repair-01.)

(5) Inspect oil jet tubes using suitable diameter drill blank or equivalent. Repair discrepant oil jets. (Refer to 72-33-23, Repair-02.)

(6) Inspect fiberglass wrapping for the following:

(a) Delamination and cracking. None allowed.

(b) Surface chipping. Minor surface chipping is allowed provided underlying fiberglass cloth is not damaged.

(c) Discoloration. Light brown tint is permissible.

1. B. (7) Oil flow check oil tube adapter assembly as follows:

NOTE: Ensure that a pressure gage is installed in oil supply line of oil flow and pressure test stand LTCT23960-01 or equivalent, at oil discharge side.

(a) Determine pressure drop between pressure gage in oil supply line of test stand LTCT23960-01 or equivalent, and assembly to be tested as follows:

NOTE: This procedure is accomplished before connecting assembly to oil supply line of test stand.

1 Adjust test stand as required to obtain median flow of assembly to be tested. (Refer to following Step (c).)

2 Observe reading on pressure gage in oil supply line; reading obtained is pressure drop. Record pressure drop.

(b) Install oil tube adapter assembly on oil flow fixture LTCT13971-01; then connect fixture to oil supply line of test stand LTCT23960-01.

(c) Using lubricating oil heated to 95 to 100°F (35 to 38°C), at a pressure of 75 psig (517 kN/m^2) plus pressure drop (Refer to preceding Step (a)), check that oil flow is within proper limits. (*Refer to Table 801.*) If oil flow requirements cannot be obtained due to clogging, clean and inspect oil jet holes using suitable diameter drill blank or equivalent. Repair discrepant jets, or leaking plugs. (Refer to 72-33-23, Repair-02 or -04.)

(d) Alternately, apply an oil pressure of 160 psig (1103 kN/m^2) and release pressure to zero psig (0 kN/m^2), shocking lubricating passages to dislodge any contaminants. Repeat shock cycle five times.

(e) Repeat flow check in Step (c); any change in flow is a sign of contamination. If contamination is evident, clean all passages. (Refer to 72-33-23, Repair-03.)

(f) Disconnect oil tube adapter assembly from test stand and flow fixture.

(8) Perform oil flow target check as follows:

(a) Connect oil tube adapter assembly to target fixture LTCT7539-01 and to oil flow and pressure test stand LTCT23960-01 or equivalent.

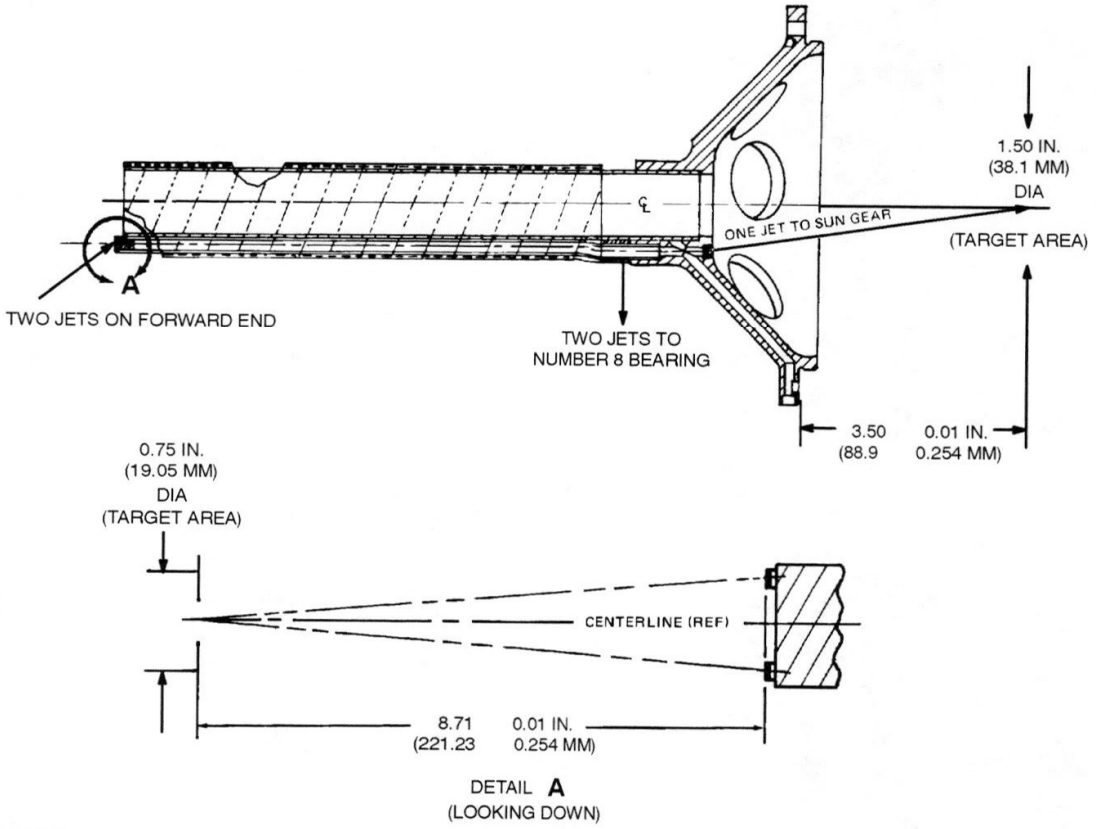
(b) Using lubricating oil at a pressure of 75 psig (517 kN/m^2), check that oil stream from oil jets falls within target areas and that oil stream is steady with no pulsing. (*See Figure 801.*)

(c) If adapter assembly does not target correctly, inspect oil jet holes using suitable diameter drill blank or equivalent. Repair discrepant oil jets. (Refer to 72-33-23, Repair-02.)

1. B. (9) Pressure test oil pressure tubes at a pressure of 150 psig (1034 kN/m^2). Leakage is not allowed. If leakage exists, replace discrepant plugs. (Refer to 72-33-23, Repair-04.)

Table 801. Anti-Icing Adapter Oil Flow Requirements

PART NO.	OIL FLOW PHR (kg/hr)
2-023-050-05/-09/R20	230 - 290 (104 - 132)
2-023-050-06-R10	165 - 285 (75 - 129)



NOTES:

1. OIL MUST FLOW IN STEADY STREAM WITH NO PULSING AT 100 2 F (38 1 C) AND 75 0.7 PSI (517.12 3.4 KN/m^2)
2. DO TARGETING WITH ANTI-ICE ADAPTER IN HORIZONTAL POSITION AND TWO FORWARD JETS LOCATED AT THE 3 AND 9 O'CLOCK POSITIONS

A3832A

Oil Flow and Targeting Requirements
Figure 801

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – INSPECTION/CHECK-02

1. Anti-Icing or Oil Tube Adapter Assembly – Inspection/Check-02

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT13971-01	Oil Flow Fixture
LTCT23960-01	Oil Flow and Pressure Test Stand

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Lubricating Oil	02-17 or -18

B. Inspection

(1) Visually inspect for the following:

(a) Cracks and distortion. Not acceptable. Replace.

(b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

(2) Inspect surface finish for wear or corrosion. Repair surface finish. (Refer to 70-30-07, SPM.)

(3) Using a suitable diameter drill blank or equivalent, inspect oil jets for blockage. If oil jets are blocked, repair adapter assembly. (Refer to Repair-05.)

(4) Oil flow check anti-icing adapter assembly as follows:

NOTE: Make sure that a pressure gage is installed in the oil supply line of the oil flow and pressure test stand LTCT23960-01, or equivalent, at the oil discharge side.

(a) Determine pressure drop between pressure gage in oil supply line of test stand LTCT23960-01, or equivalent, and assembly to be tested as follows:

NOTE: This procedure is done before connecting the assembly to the oil supply line of the test stand.

1 Adjust test stand as required to obtain median flow of assembly to be tested. (Refer to following Step (c).)

2 Observe reading on pressure gage in oil supply line; reading obtained is the pressure drop. Record the pressure drop.

1. B. (4) (b) Install adapter assembly on oil flow fixture LTCT13971-01; then connect fixture to oil supply line of test stand LTCT23960-01.

(c) Using lubricating oil heated to 98 to 102°F (36.7 to 39.0°C), at a pressure of 75 psig (517 kN/m^2) plus pressure drop (Refer to preceding Step (a)), check that oil flow is within proper limits (*Refer to Table 801*). If oil flow requirements cannot be obtained due to clogging, replace the adapter assembly.

(d) Alternately apply an oil pressure of 160 psig (1103 kN/m^2) and release pressure to zero psig (0 kN/m^2) shocking lubricating passages to dislodge any contaminants. Repeat shock cycle five times.

(e) Repeat flow check in Step (c); any change in flow is a sign of contamination. If contamination is evident, replace adapter assembly.

(f) Inspect to make sure that all jets are seated.

(g) Disconnect adapter assembly from test stand and flow fixture.

(5) Perform oil flow target check as follows:

NOTE: Oil flow target fixture shall be constructed in such a way that the adapter assembly is mounted horizontally on Surfaces -A- and -B- and with the oil feed as shown in *Figure 801*. Gage points and target diameters shall be as shown in *Figure 801*.

(a) Connect adapter assembly to the target fixture and to the oil flow and pressure test stand LTCT23960-01 or equivalent.

(b) Using lubricating oil at a pressure of 75 psig (517 kN/m^2), check that oil stream from oil jets falls within the target areas and that the oil stream is steady with no pulsing. (*See Figure 801.*)

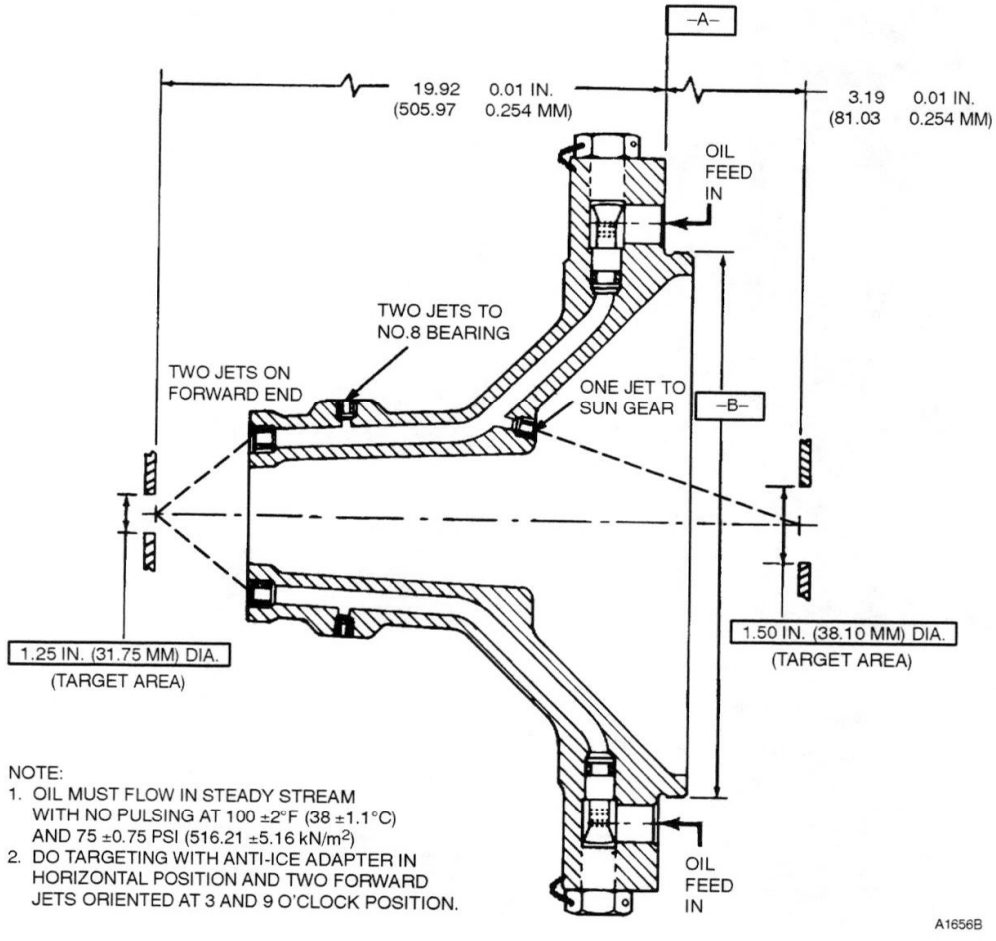
(c) If adapter assembly does not target correctly, replace the adapter assembly.

C. Non-Destructive Test (NDT)

Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) If cracks are present, replace adapter assembly.

Table 801. Anti-Icing Adapter Oil Flow Requirements

Part Number	Oil Flow, Lb/Hr (Kg/Hr)
2-023-240-03	280 to 345 (127 to 157)
2-023-240-06	260 to 345 (118 to 157)



NOTE:
1. OIL MUST FLOW IN STEADY STREAM WITH NO PULSING AT 100 ±2°F (38 ±1.1°C) AND 75 ±0.75 PSI (516.21 ±5.16 kN/m^2)
2. DO TARGETING WITH ANTI-ICE ADAPTER IN HORIZONTAL POSITION AND TWO FORWARD JETS ORIENTED AT 3 AND 9 O'CLOCK POSITION.

Oil Flow and Target Requirements
Figure 801

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-050-05/-06/-09/R10/R20	-01 thru -04	None
2-023-240-03	-05	ALF502R 72-315
2-023-240-06	-05	None

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-01

1. Repair of Worn or Corroded Surface Finish – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

Repair surface finish in accordance with 70-30-07, SPM.

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-02

1. Repair of Discrepant Oil Jet Holes – Repair-02

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Welding Wire	03-19

B. Procedure

(1) Using welding wire and fusion welding method, weld discrepant oil jet holes shut. (Refer to 70-45-01, SPM.)

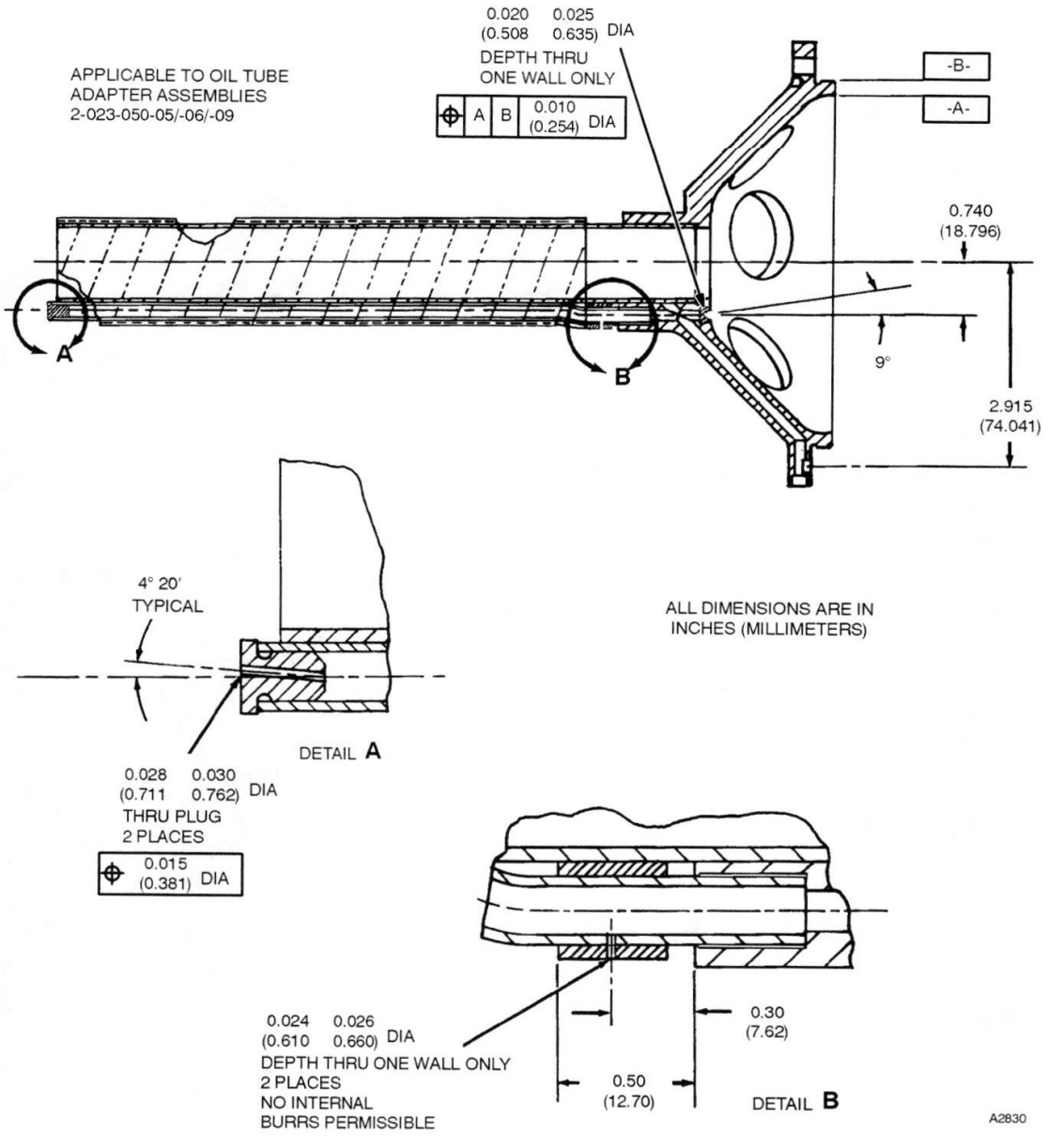
NOTE: Scorching of fiberglass wrap is to be kept to minimum and shall not exceed 0.100 inch (2.54 millimeter).

(2) Blend welds to original contour.

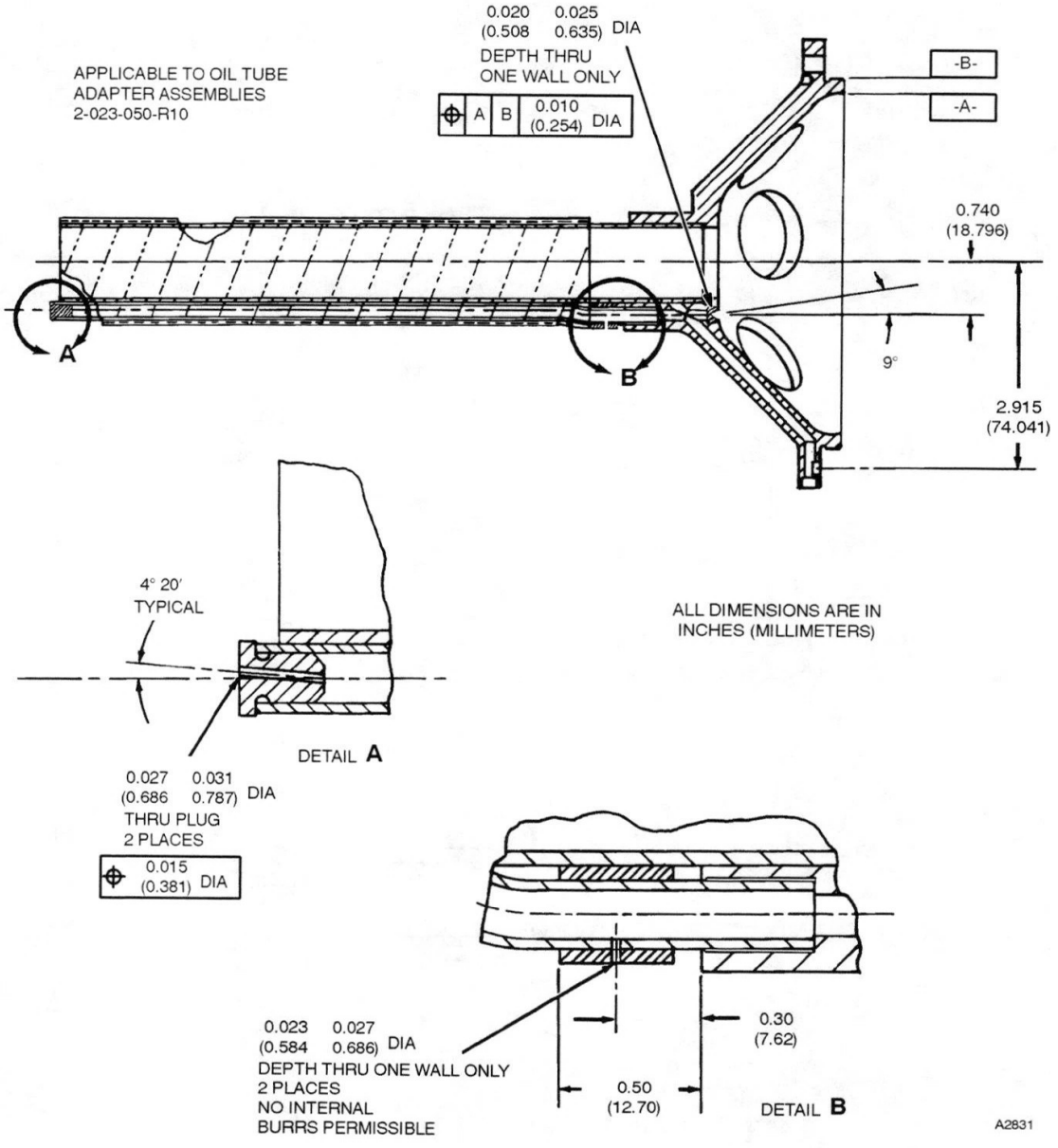
(3) Drill holes through repaired oil jets to dimensions shown in *Figure 901* by either electrical discharge machining (EDM) or drilling.

NOTE: If oil jet holes are drilled, access holes must be drilled at base of oil tube adapter assembly to flush out any chips in oil passages, and then plugged. (Refer to Repair-03.)

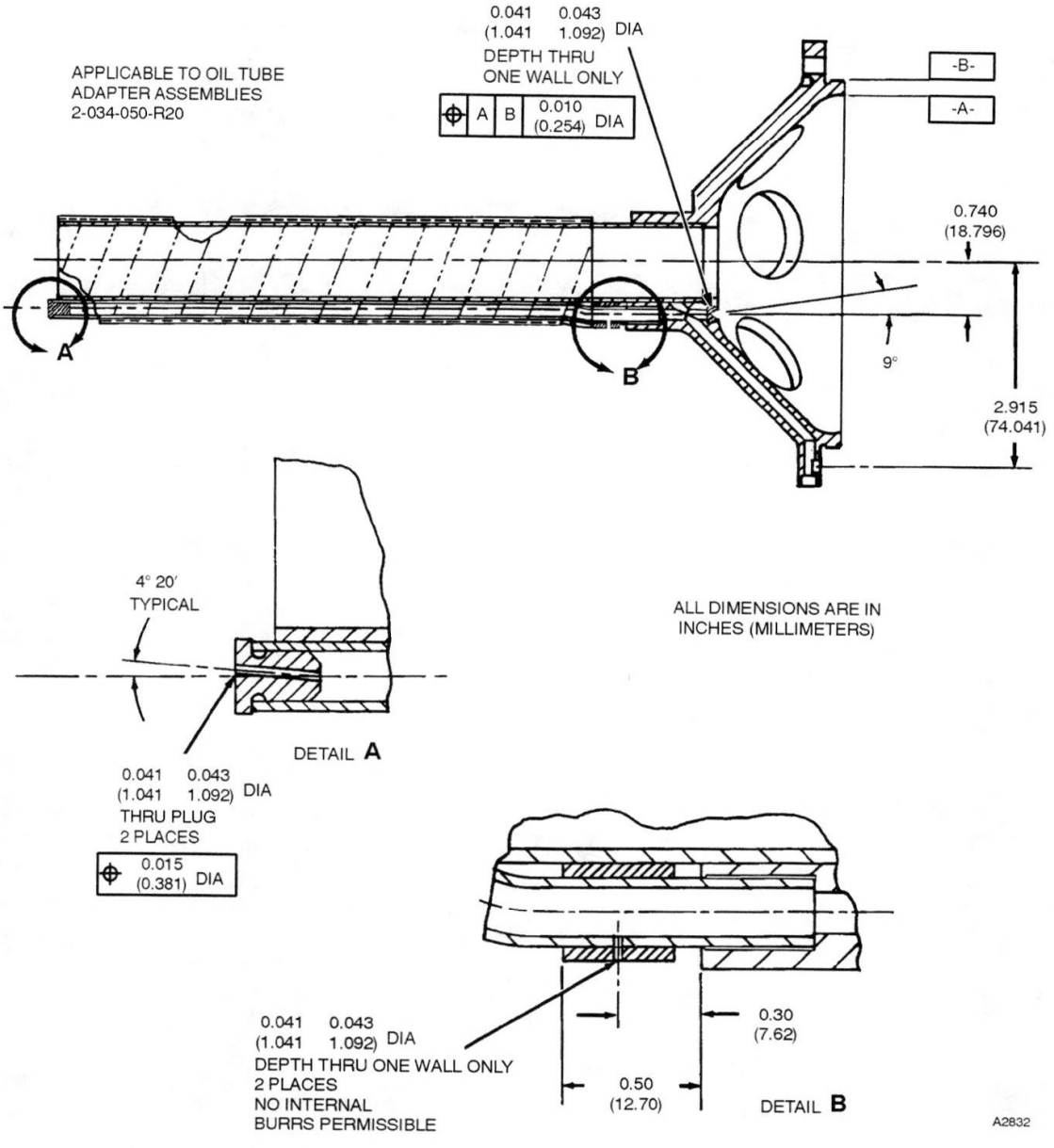
(4) Perform oil flow, target, and leak check. (Refer to Inspection/Check.)



Rework of Oil Jet Holes
Figure 901 (Sheet 1 of 3)



Rework of Oil Jet Holes
Figure 901 (Sheet 2)



Rework of Oil Jet Holes
Figure 901 (Sheet 3)

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-03

1. Repair of Clogged or Contaminated Oil Tubes – Repair-03

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22

B. Procedure

(1) Drill and ream two holes to proper dimensions at locations shown in *Figure 901* to provide access to tubes.

(2) Clean internal passageways using acetone or equivalent, by soaking and/or ultrasonically cleaning oil tube adapter assembly for a minimum of 1 hour. Using 0.020 inch (0.51 millimeter) maximum diameter probe, insure oil jet holes are free of any foreign material, taking care not to enlarge oil jet holes. Clean tube passages using small fiber brush or other suitable implement.

(3) Apply alodine touch-up to two reamed holes. (Refer to 70-30-07, SPM.)

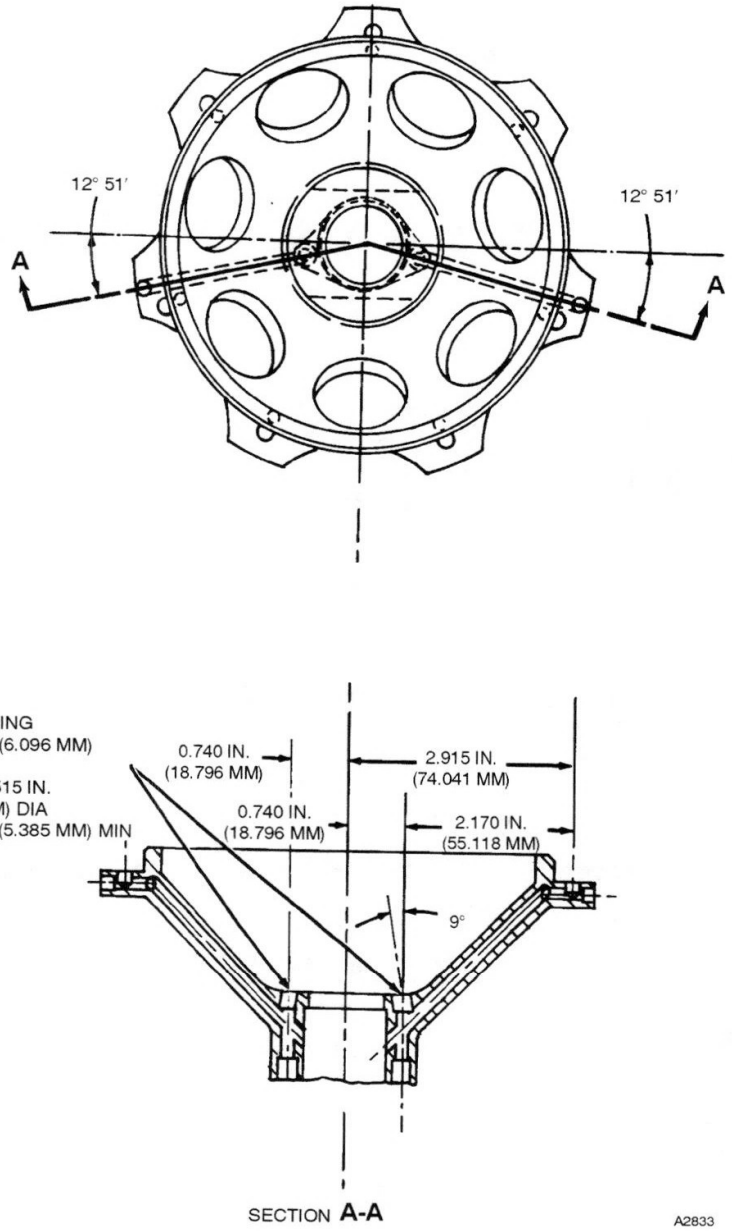
(4) Install Lee jet plug 2-303-562-XX (Lee part number JEPA2503022A) in reamed hole at location shown in *Figure 902*.

NOTE: Lee plugs may be purchased from Lee Company, Westbrook, Connecticut 06498.

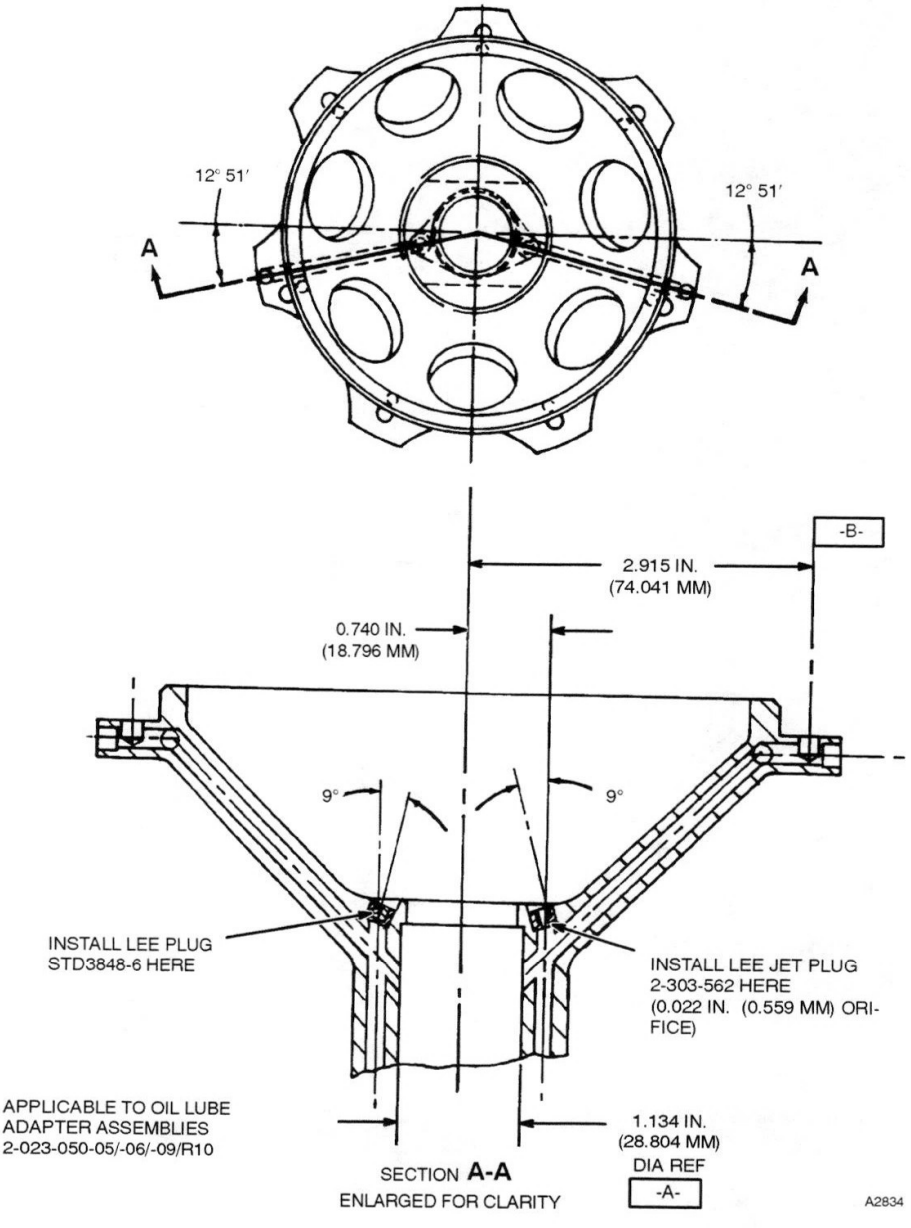
(5) Install Lee plug STD3848-6 (Lee part number 250001) in reamed hole at location shown in *Figure 902*.

NOTE: Lee plugs may be purchased from Lee Company, Westbrook, Connecticut 06498.

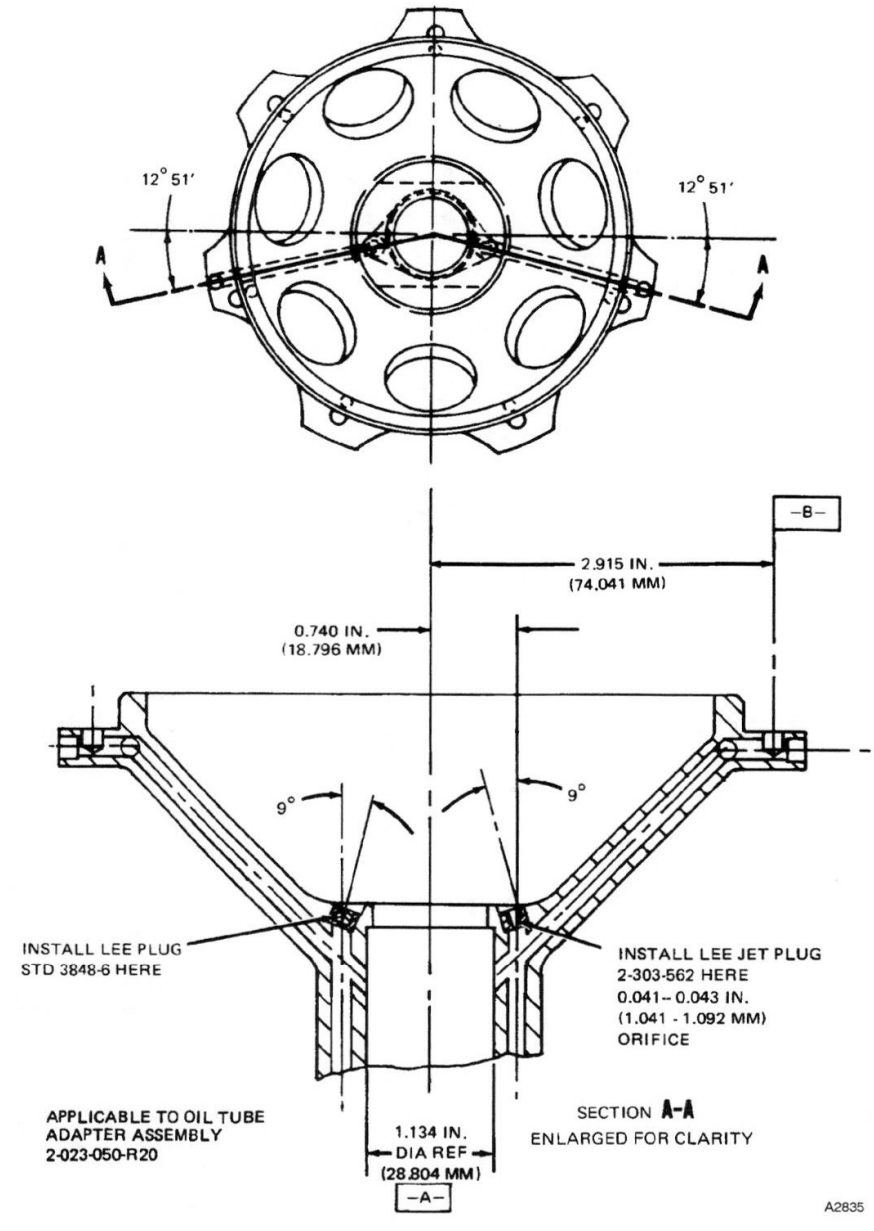
(6) Perform oil flow and pressure test. (Refer to 72-33-23, Inspection/Check.)



Location and Dimensions of Access Holes
Figure 901



Location of Lee Plugs
Figure 902 (Sheet 1 of 2)



Location of Lee Plugs
Figure 902 (Sheet 2)

ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-04

1. Repair of Leaking Plugs at Base of Oil Tube Adapter Assembly – Repair-04

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Acetone	07-22

B. Procedure

NOTE: This repair is available at:

Honeywell Engines, Systems & Services
Greer Repair and Overhaul
85 Beeco Road
Greer, SC 29650-1004
U.S.A.
Telephone: (864) 801-2200

(1) Drill and ream discrepant plugs to specified dimensions. *(See Figure 901.)*

NOTE: Ensure that all machining chips are removed after plugs are removed. A small amount of wax may be used provided it is also removed after machining.

(2) Using acetone or equivalent, remove any internal contaminants by soaking and/or ultrasonically cleaning oil tube adapter assembly for a minimum of 1 hour.

(3) Apply alodine touch-up to surfaces exposed during rework. (Refer to 70-30-07, SPM.)

(4) Install plugs STD3848-5 (Lee part number 218001) in reworked holes.

NOTE: Lee plugs may be purchased from Lee Co, Westbrook, CT 06498.

(5) Perform oil flow and pressure test. (Refer to 72-33-23, Inspection/Check.)

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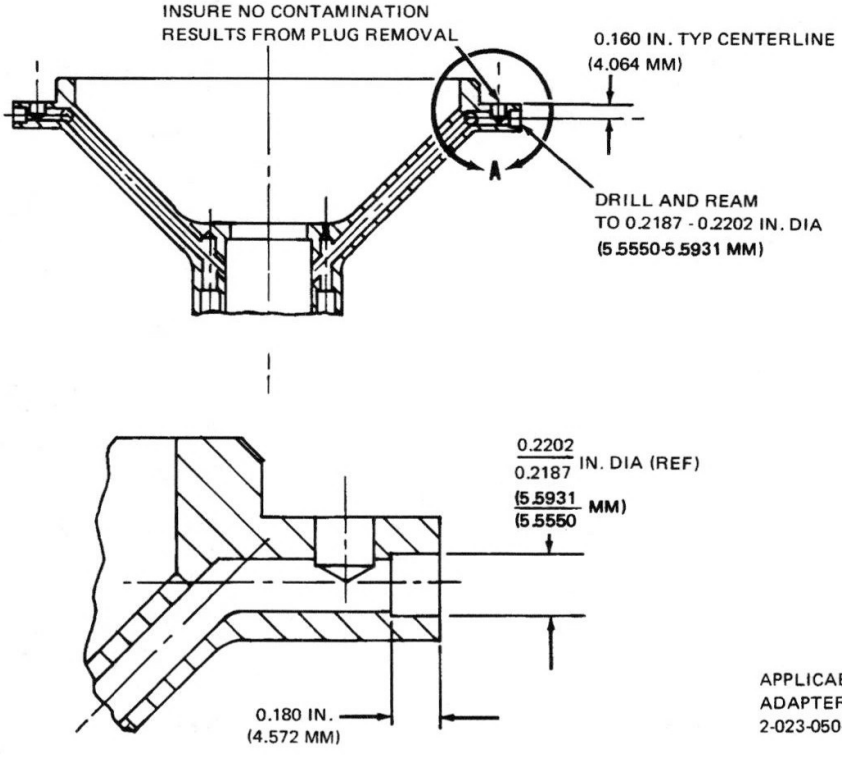

Plug Rework Locations and Dimensions
Figure 901 (Sheet 1 of 2)

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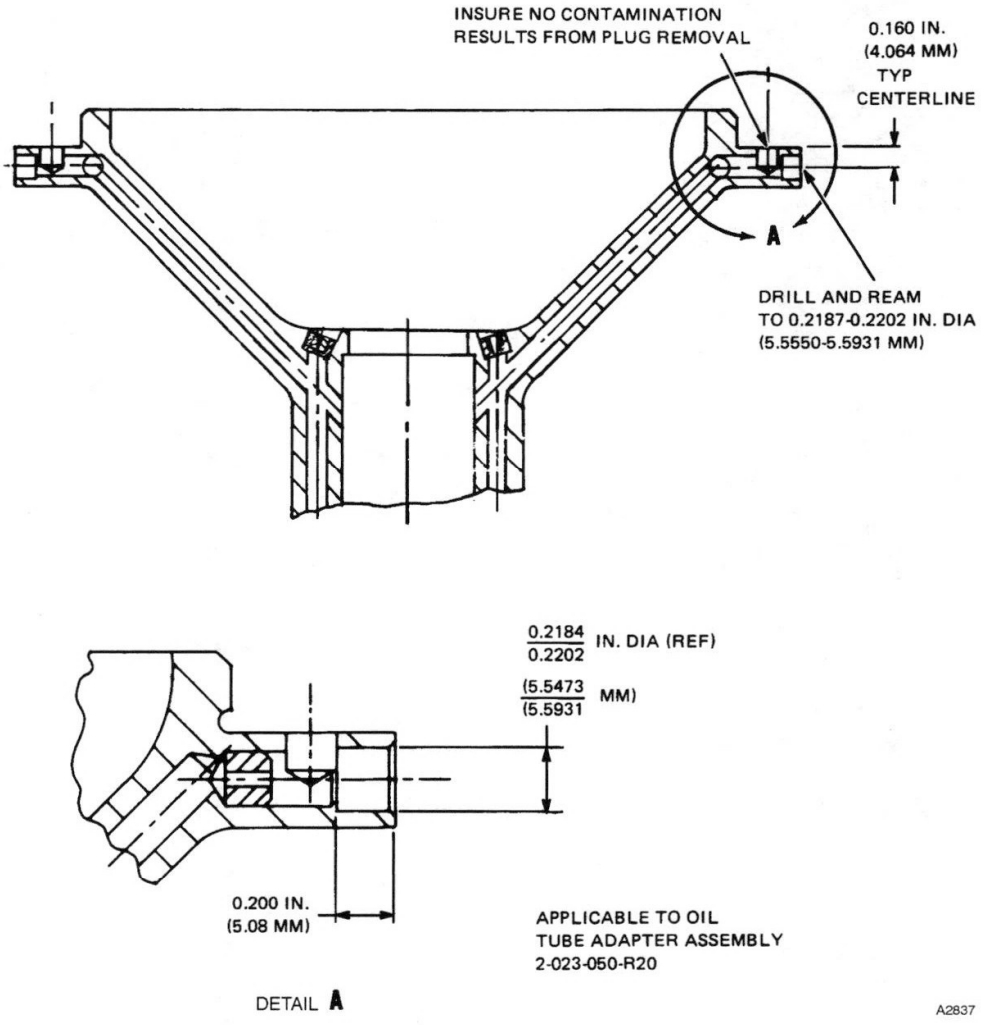

Plug Rework Locations and Dimensions
Figure 901 (Sheet 2)

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ANTI-ICING OR OIL TUBE ADAPTER ASSEMBLY – REPAIR-05

1. Repair of Blocked or Obstructed Oil Jets – Repair-05

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48 or -49

Expendable Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Packing	M83248-1-011	72-33-00	4	60
Packing	M83248-1-008	72-33-00	4	80

Repair Parts:

Name	Part Number	IPC Reference Chap-Sect-Subj	Figure	Item
Strainer Assembly	2-303-916-01	72-33-00	4	40

B. Procedure

(1) Remove lockwire (1, *Figure 901*) from each strainer assembly (2).

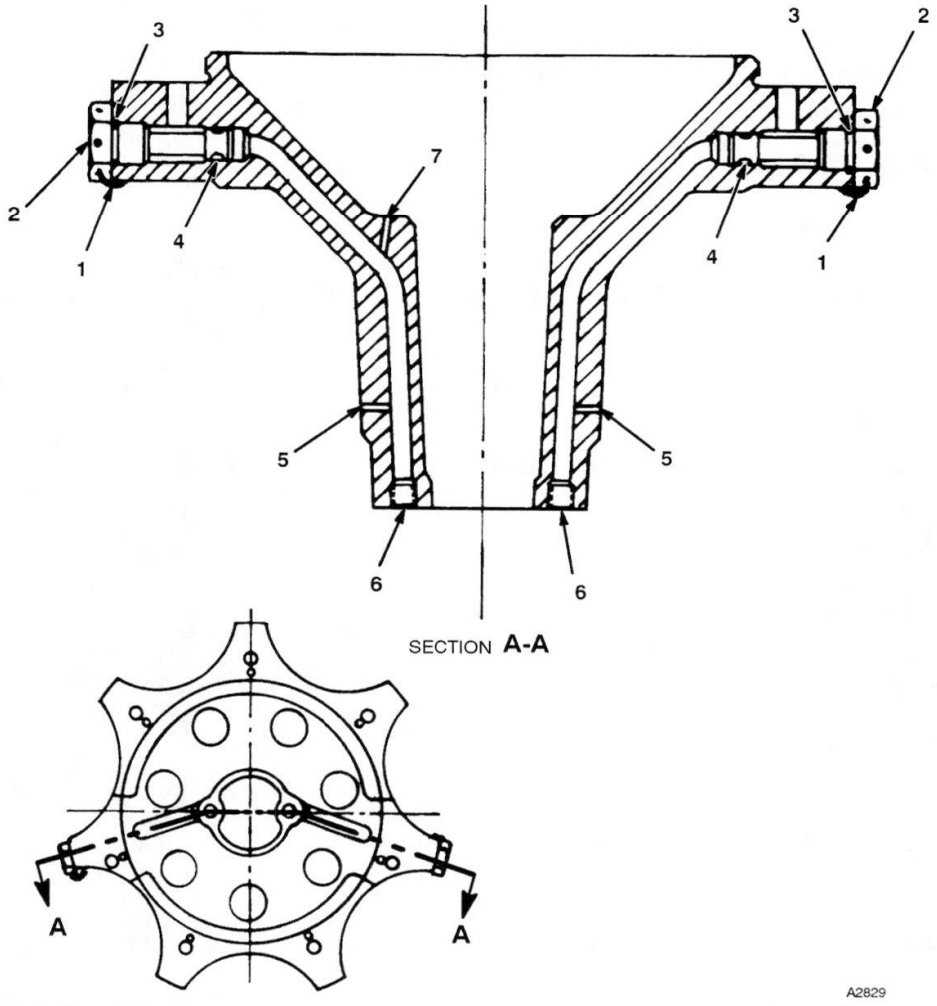
(2) Remove strainer assemblies (2).

(3) Remove and discard packings (3 and 4) from strainer assemblies (2).

(4) Check strainer assemblies (2) for blockage or obstruction. If blockage or obstruction is evident, clean or replace strainer assembly 2-303-916-01.

CAUTION: DO NOT USE POWER TOOLS OR EQUIVALENT TO CLEAN ORIFICES.

(5) If necessary, using suitable size drill blanks, manually clean jet assemblies.



1. LOCKWIRE
2. STRAINER ASSEMBLIES
3. PACKINGS
4. PACKINGS
5. OIL JET ASSEMBLIES; ORIFICE SIZE ON 2-023-240-03, 0.049 TO 0.052 INCH (1.25 TO 1.32 MILLIMETER) AND ON 2-023-240-06, 0.035 TO 0.037 INCH (0.89 TO 0.94 MILLIMETER)
6. OIL JET ASSEMBLIES; ORIFICE SIZE ON 2-023-240-03, 0.054 TO 0.056 INCH (1.37 TO 1.42 MILLIMETER) AND ON 2-023-240-06, 0.042 TO 0.044 INCH (1.07 TO 1.12 MILLIMETER)
7. OIL JET ASSEMBLY; ORIFICE SIZE ON 2-023-240-03, 0.049 TO 0.052 INCH (1.25 TO 1.32 MILLIMETER) AND ON 2-023-240-06, 0.031 TO 0.033 INCH (0.79 TO 0.84 MILLIMETER)

Anti-Icing Adapter Assembly
Figure 901

1. B. (6) Using dry cleaning solvent, reverse flush the adapter assembly through the jets. (Refer to 70-15-03, SPM.) Repeat Steps (5) and (6) a second time.

(7) Install new packing (4) M83248-1-008 on screen end of each strainer assembly (2) and packing (3) under head of each strainer assembly.

(8) Carefully install strainer assemblies (2) back into the adapter. Using lockwire MS20995C32, lockwire adapter assembly.

(9) Inspect anti-icing adapter assembly. (Refer to Inspection/Check-02.) All criteria must be met.

REDUCTION GEAR CARRIER ASSEMBLY – DESCRIPTION AND OPERATION

1. Reduction Gear Carrier Assembly – Description and Operation

The reduction gear carrier assembly is mounted in the fan module. It consists of the carrier, seven planet reduction gears and gearshafts, and fourteen roller bearings. The sun gear drives the seven planet reduction gears mounted in the carrier. The planet reduction gears drive the ring gear located in the front bearing support.

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TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 501, 72-33-25, DISASSEMBLY. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add ring gear reject criteria after 6/7 bearing failure.

Use the following revised NOTE following Paragraph 1.B in lieu of the existing NOTE.

NOTE: If carrier assembly is identified as having one or more spun planet gears, replace in accordance with the following criteria:

- If one spun gear is indicated, replace affected gear and adjacent planet gears (total: three gears).
- If two or more spun gears are indicated, replace all planet gears (total: seven gears). Any rejected planet gear must be physically mutilated to prevent its reuse.

If carrier assembly has been identified as having been in mesh with a sun gear having a worn or defective tooth surface, replace all planet gears; if one planet gear is rejected because of tooth deterioration or wear, replace all planet gears and sun gear.

If reduction gear assembly has been identified as having operated with a spun planet gear or bearings with excessive wear, conduct detailed inspections of the ring gear, sun gear, and carrier assembly. (Refer to applicable component Inspection/Check section.)

The sun gear and reduction gear carrier assembly must be kept as a gear set for life if the sun gear or any planet gear in the reduction gear carrier assembly has accumulated more than 50 hours of total engine operation. Replacement of either part must include replacement of the other. If the sun gear and all planet gears in the reduction gear carrier assembly have accumulated less than 50 hours of total engine operation, the sun gear and any planet gear or gears may be individually replaced in combination with any gear having less than 50 hours of engine operation.

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REDUCTION GEAR CARRIER ASSEMBLY – DISASSEMBLY

1. Reduction Gear Carrier Assembly – Disassembly

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT14491-01	Shaft Installing Assembly

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Marking Pencil	09-05

B. Disassembly

NOTE: If the carrier assembly is identified as having one or more spun planet gears, inspect the ring gear (Refer to 72-33-13, Inspection/Check) and replace planet gears in accordance with the following criteria: If one spun gear is indicated, replace affected gear and adjacent planet gears (total 3 gears). If two or more spun gears are indicated, replace all planet gears (total 7 gears).

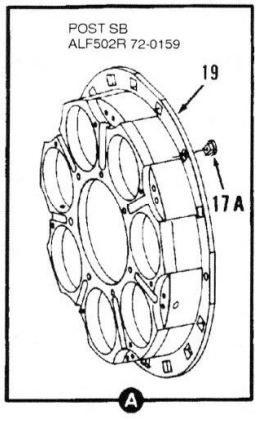
Any rejected planet gear must be physically mutilated to prevent its reuse.

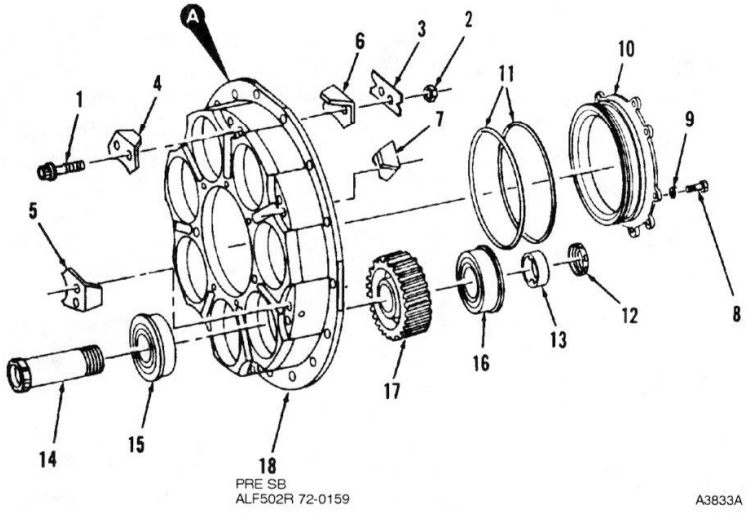
If the carrier assembly has been identified as having been in mesh with a sun gear having a worn or defective tooth surface, replace all planet gears; if one planet gear is rejected because of tooth deterioration or wear, replace all planet gears and sun gear.

The sun gear and reduction gear carrier assembly must be kept as a gear set for life if the sun gear or any planet gear in the reduction gear carrier assembly has accumulated more than 50 hours of total engine operation. Replacement of either part must include replacement of the other. If the sun gear and all planet gears in the reduction gear carrier assembly have accumulated less than 50 hours of total engine operation, the sun gear and any planet gear or gears may be individually replaced in combination with any gear having less than 50 hours of engine operation.

(1) Cut lockwire and remove 14 bolts (1, *Figure 501*), 14 nuts (2), 7 plates (3), 5 bearing clamps (4), 2 bearing clamps (5), 4 bearing clamps (6), and 3 bearing clamps (7).

(2) Place carrier assembly on shaft installing assembly LTCT14491-01, forward side up.





1. BOLT
2. NUT
3. PLATE
4. BEARING CLAMP
5. BEARING CLAMP
6. BEARING CLAMP
7. BEARING CLAMP
8. BOLT
9. TAB WASHER
10. OIL RING
11. PACKING
12. RETAINING NUT
13. LOCKING CUP
14. GEARSHAFT
15. BEARING
16. BEARING
17. PLANET GEAR
17A. ALIGNMENT SLEEVE
18. CARRIER
19. CARRIER

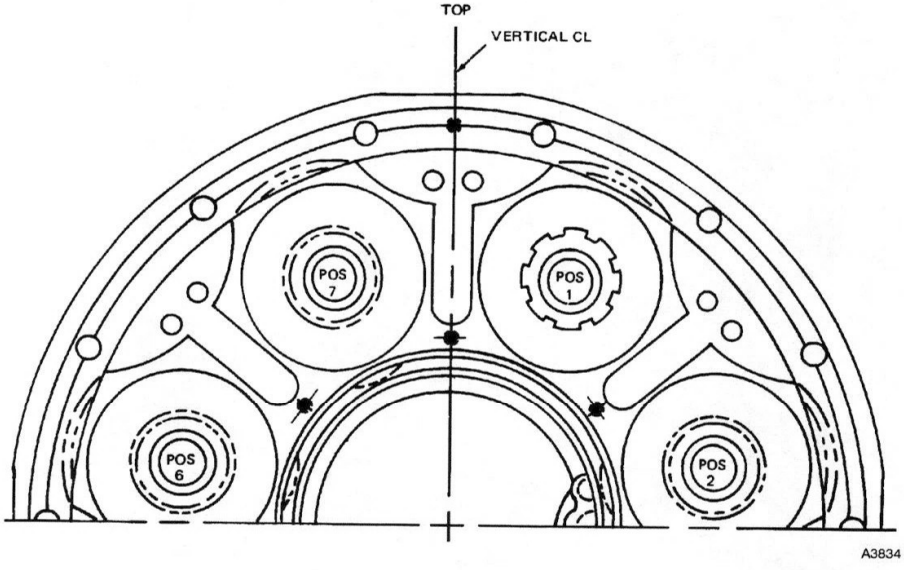
Reduction Gear Carrier Assembly
Figure 501

1. B. (3) Establish planet gear and bearing positions of carrier assembly and mark position of each bore and planet gear with marking pencil for reference during reassembly. Looking from forward to aft, number top bore to right of vertical centerline as position No. 1 Number remaining positions in a clockwise sequence. (*See Figure 502.*)

(4) Straighten five tab washers (9, *Figure 501*) and remove five bolts and five tab washers (9). Remove oil ring (10). Remove two packings (11) from oil ring grooves.

(5) Straighten seven locking cups (13). Using spanner LTCT14491-17, detail of LTCT14491-01, remove seven retaining nuts (12) and locking cups (13). Using shaft installing assembly LTCT14491-01, press gearshafts (14) from bearings (15 and 16) and planet gears (17).

(6) Remove seven bearings (15), seven bearings (16), and seven planet gears (17).



Marking Bore Positions and Positioning Oil Ring
Figure 502

REDUCTION GEAR CARRIER ASSEMBLY – ASSEMBLY

1. Reduction Gear Carrier Assembly – Assembly

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT14491-01	Shaft Installing Assembly
LTCT313 or LTCT23960-01	Pressure Test Stand

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Ethyl Alcohol	07-19
Loctite Primer	01-09
Loctite Retaining Compound	01-08
Lubricating Oil	02-18
Nitrogen, Refrigerated Liquid	10-15
Packing Assembly Aid	02-05, -06

B. Assembly

NOTE: For fits and clearance requirements, refer to Paragraph C.

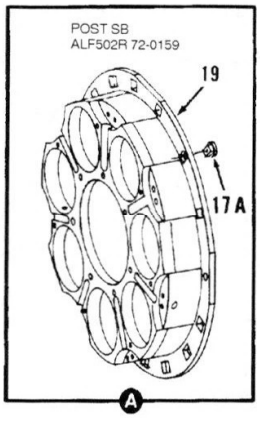
WARNING: CONTACT WITH LIQUID NITROGEN MAY CAUSE SERIOUS FREEZING/ FROSTBITE INJURY. DO NOT TOUCH LIQUID OR COLD SURFACES WITH BARE SKIN. ALWAYS WEAR A FACE SHIELD AND GLOVES WHEN HANDLING THESE LIQUIDS.

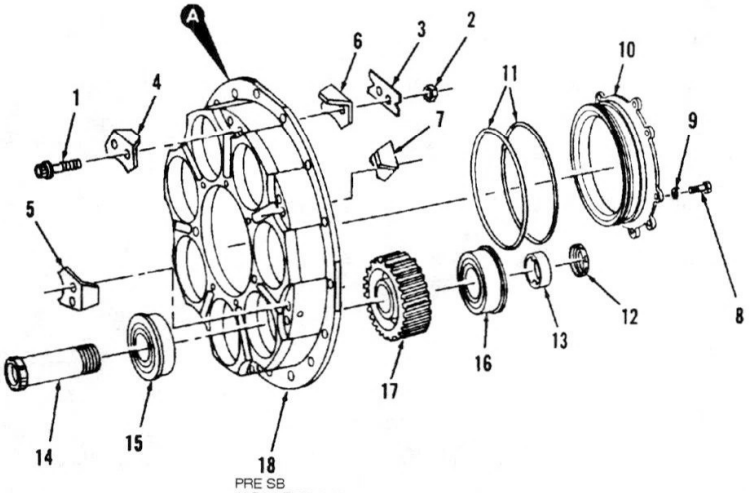
NITROGEN GAS CAN CAUSE SUFFOCATION WITHOUT WARNING. IN A CONFINED AREA, NITROGEN GAS MAY DISPLACE AIR REQUIRED FOR BREATHING. STORE AND USE THESE MATERIALS ONLY IN A WELL-VENTILATED AREA.

(1) Chill gearshafts (14, *Figure 1001*) to –125°F (–51°C) or lower temperature using an appropriate shaft-holding fixture and either liquid nitrogen or a refrigeration unit/freezer capable of –125°F (–51°C) or lower temperature. This task may be done at any time before installation of gearshafts into gears and bearings. Do one of the following:

(a) Allow gearshafts to remain submerged in liquid nitrogen for 8 to 10 minutes before installing in gear assembly.

(b) Allow shafts to remain submerged in a container with alcohol within the refrigeration unit/freezer for 1 hour (minimum) before installing in gear assembly.





1. BOLT
2. NUT
3. PLATE
4. BEARING CLAMP
5. BEARING CLAMP
6. BEARING CLAMP
7. BEARING CLAMP
8. BOLT
9. TAB WASHER
10. OIL RING
11. PACKING
12. RETAINING NUT
13. LOCKING CUP
14. GEARSHAFT
15. BEARING
16. BEARING
17. PLANET GEAR
17A. ALIGNMENT SLEEVE
18. CARRIER
19. CARRIER

Reduction Gear Carrier Assembly
Figure 1001

1. B. (2) Place carrier (18 or 19) on shaft installing assembly LTCT14491-01, forward side up.

(3) Lubricate each carrier bore with shortening or packing assembly aid.

(4) Using reference marks established during disassembly (*Figure 1002*), install outer races of seven bearings (15, *Figure 1001*) in their respective positions in carrier (18 or 19).

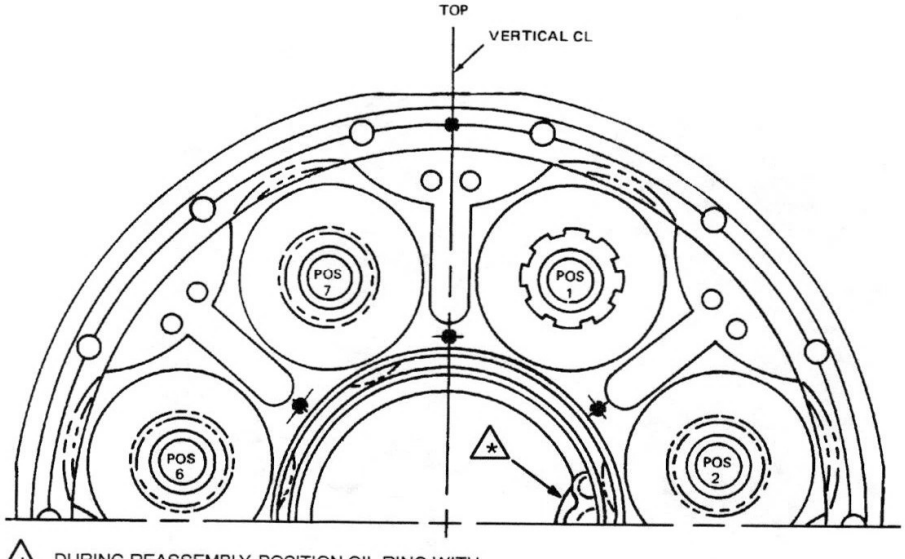
NOTE: All gears in any carrier assembly must have same part number and dash number. If the planet gears are not replaced, the gears must be installed in the same bores from which they were removed. (*See Figure 1002.*)

(5) Invert carrier (18 or 19, *Figure 1001*) on shaft installing assembly LTCT1449-01. Install outer races of seven bearings (16) into their respective positions in carrier (18 or 19). (*See Figure 1002.*)

(6) Install seven planet gears (17, *Figure 1001*) in their respective positions with identifying part numbers and serial numbers facing forward. Press outer races of seven aft bearings (16) down, until seated.

NOTE: Planet gears 2-023-013-23/24 must be used in reduction gear carrier assemblies 2-023-020-41/43.

Planet gears (17) must be installed in reverse order (No. 7 thru No. 1) so that No. 1 gear is last to be installed.



Positioning Oil Ring
Figure 1002

1. B. (7) Position No. 7 bore of carrier (18 or 19) on shaft installing assembly. Install inner races of position No. 7 bearings (15 and 16) into carrier (18 or 19).

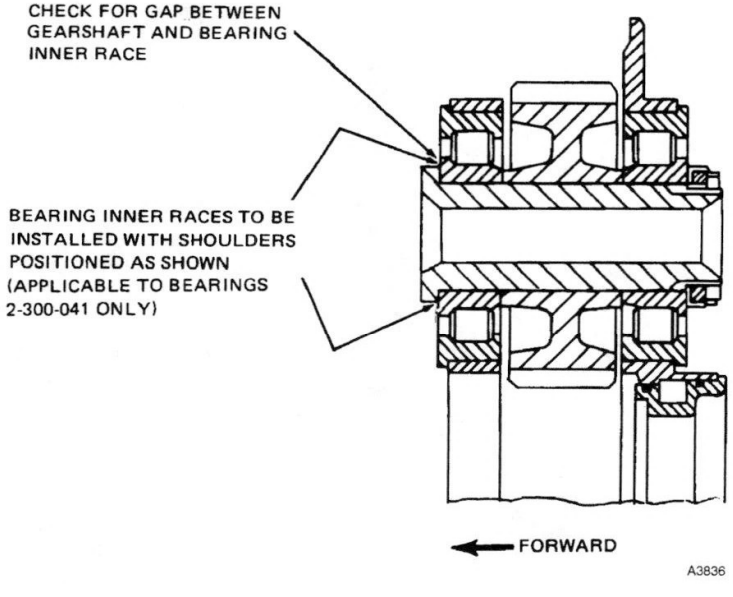
NOTE: If bearings 2-300-041 are installed, ensure shoulders of inner races are positioned as shown in *Figure 1003.*

(8) Remove only gearshaft No. 7, and using shaft installing assembly LTCT14491-01, immediately press gearshaft (14, *Figure 1001*) through bearings and planet gear.

NOTE: Gearshaft must be installed quickly and without noticeable resistance (it should slide smoothly). If it does not slide in smoothly, remove shaft from assembly, inspect all parts once ambient temperatures are maintained, and reassemble using the same procedures.

(9) Repeat Steps (7) and (8) for positions No. 6 thru No.1.

(10) Invert carrier (18 or 19) on shaft installing assembly, and allow all gearshafts (14) to return to room temperature.



Shoulder Positioning of Bearing Inner Races and Gap Check Location
Figure 1003

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TEMPORARY REVISION NO. 72-938

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 1005, 72-33-25, ASSEMBLY. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To correct torque value.

Use the following revised Step 1.B.(11) in lieu of the existing Step 1.B.(11).

1. B. (11) Align carrier assembly so that one gearshaft is in position for installation of retaining nut. Apply loctite primer and retaining compound to threads of retaining nut (12) following manufacturer's instructions. Install locking cup (13) and retaining nut (12). Using spanner LTCT14491-17, detail of LTCT14491-01, tighten retaining nut 240 to 250 pound-feet (325 to 339 newton-meters) torque. Release torque and retighten 225 to 230 pound-feet (305 to 312 newton-meters) torque.

NOTE: Gearshafts not returned to ambient temperature conditions may collect moisture, which can limit the performance of the loctite.

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1. B. (11) Align carrier assembly so that one gearshaft is in position for installation of retaining nut. Apply Loctite primer and retaining compound to threads of retaining nut (12) following manufacturer's instructions. Install locking cup (13) and retaining nut (12). Using spanner LTCT14491-17, detail of LTCT14491-01, tighten retaining nut 240 to 250 pound-feet (325 to 339 newton-meters) torque. Release torque and retighten 150 to 155 pound-feet (203 to 210 newton-meters) torque.

NOTE: Gearshafts not returned to ambient temperature conditions may collect moisture, which can limit the performance of the Loctite.

(12) Repeat Step (11) for remaining six positions.

(13) Check planet gears for freedom of rotation.

(14) Using 0.001 inch (0.03 millimeter) thick shim, check ability of shim to fit between head of gearshaft (14) and inner race of bearing (15). (*See Figure 1003.*) If shim fits between head of gearshaft and bearing, reject carrier (18 or 19, *Figure 1001*). Check for seating of bearing outer race against carrier (both sides).

(15) Install two packings (11) into grooves of oil ring (10). Lubricate oil ring (10) with shortening or packing assembly aid and install oil ring, with oil inlet at 9 o'clock position (*Figure 1002*), into carrier (18 or 19, *Figure 1001*). Secure with five bolts (8) and five tab washers (9). Tighten bolts (8) to standard torque.

(16) Deform wall of seven locking cups (13) into retaining nuts (12) in four places, equally spaced, in all seven positions. Bend four tab washers (9) into bolts (8) securely.

(17) Remove reduction gear carrier assembly from shaft installing assembly.

(18) Install 14 bolts (1), 5 bearing clamps (4), 2 bearing clamps (5), 4 bearing clamps (6), 3 bearing clamps (7), 7 plates (3), and 14 nuts (2). Tighten nuts (2), 55 to 75 pound-inches (6.2 to 8.5 newton-meters) torque.

(19) Check planet gears for freedom of rotation.

(20) Lockwire heads of bolts (1). Bend tabs of plates around nuts (2).

1. B. (21) Oil flow check reduction gear carrier assembly as follows:

NOTE: Ensure that a pressure gage is installed in oil supply line of oil flow and pressure test stand LTCT313 or LTCT23960-01 at oil discharge end.

(a) Determine pressure drop between pressure gage in oil supply line of test stand LTCT23960-01 and part or assembly to be tested as follows:

NOTE: This procedure is accomplished before connecting part or assembly to be oil flowed to oil supply line of test stand.

1 Adjust test stand as required to obtain median oil flow of assembly to be tested. (Refer to Step (21)(c).)

2 Observe reading on pressure gage in oil supply line; reading obtained is pressure drop. Record pressure drop.

(b) Install oil tube adapter assembly to carrier (18); then connect oil tube adapter assembly and reduction gear carrier assembly to oil supply line of test stand LTCT23960-01.

(c) Using lubricating oil heated to 95 to 100°F (35 to 38°C), at a pressure of 75 psig (517 kN/m^2) plus pressure drop (Refer to Step (21)(a)), check that oil flow is within specified limits. (*Refer to Table 1001.*) If oil flow is not within limits, disassemble carrier assembly and clean passage.

(d) Alternately apply an oil pressure of 160 psig (1103 kN/m^2) and release to zero psig (zero kN/m^2) to shock lubrication passages to dislodge any contaminants. Repeat shock cycle five times.

(e) Repeat flow check. (Refer to preceding Step (c).) Any change in flow rate is a sign of contamination. If contamination is evident, disassemble and clean passages.

(f) Remove carrier assembly from oil flow and pressure test stand.

Table 1001. Reduction Gear Carrier (Assembled) Oil Flow Rates

PART NUMBER	FLOW
Prior to 2-023-030-17	2270 to 2930 phr (1031 to 1330 kg/hr)
2-023-030-17 and subsequent	2500 to 2970 phr (1135 to 1349 kg/hr)

1. C. Fits and Clearances (*Refer to Table 1002*)

Table 1002. Fits and Clearances

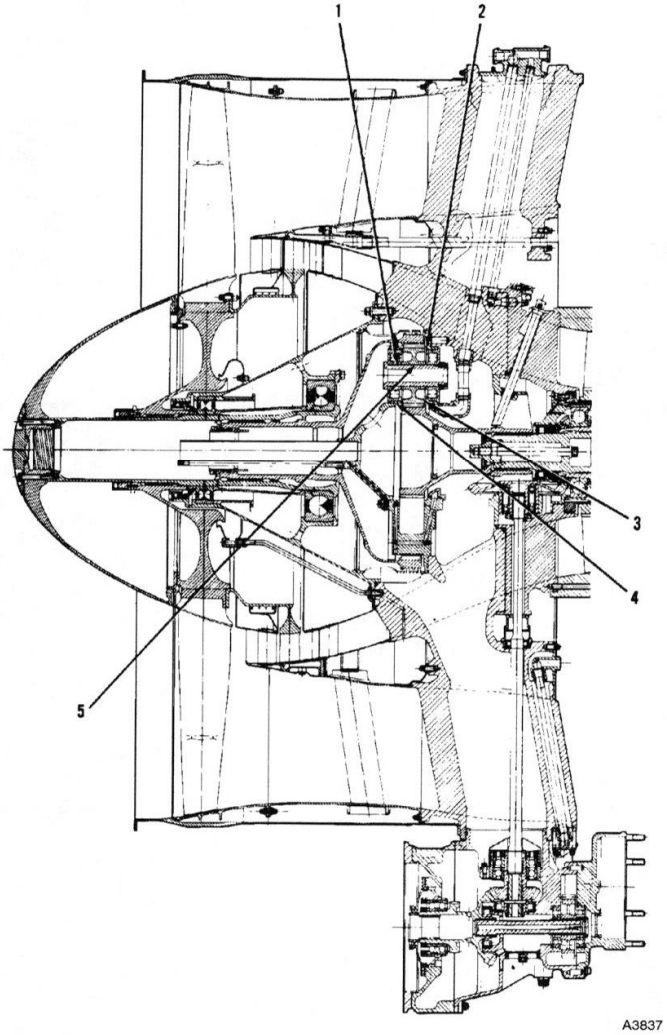
DESCRIPTION	SEE FIGURE AND ITEM NO.	DIRECTION MEASURED	USED PARTS: FIT OR CLEARANCE INCH (MILLIMETER)		SEE FIGURE AND INDEX NO.
			MINIMUM	MAXIMUM	
	1001				**1004**
Fit Between Gear Shaft and Bearing (Typical 14 Places)	14 15,16	OD ID	0.0007T (0.018T)	0.0002T (0.005T)	1
Clearance Between Planet Gear and Carrier (Typical 7 Places)	17 18 or 19	AXIAL	0.0710 (1.803)		2
Clearance Between Planet Gear and Carrier (Typical 7 Places)	17 18 or 19	AXIAL	0.0310 (0.787)		3
Fit Between Bearing and Carrier (Typical 14 Places)	15,16 18 or 19	OD ID	0.0006T (0.015T)	0.0000 (0.000)	4
**Fit between Gear Shaft and Gear	14,17	OD ID	0.0005T (0.013)	0.0012T (0.031)	5

*If limits cannot be met, dimensionally reinspect parts.

**When assembling combinations of used/serviceable gear shafts and gears, match combinations of parts that result in similar interference fits; and ensure that:

(1) Gear shafts with 1.1812 inch (30.003 millimeter) OD shall be matched to gears with a 1.1807 inch (29.990 millimeter) ID or less.

(2) Gears with 1.1809 inch (29.995 millimeter) ID shall be matched to gear shafts with a 1.1814 inch (30.008 millimeter) OD or larger.



Fits and Clearances
Figure 1004

REDUCTION GEAR CARRIER – CLEANING

1. Reduction Gear Carrier (*See Figure 601*) – Cleaning

   A. Equipment and Materials

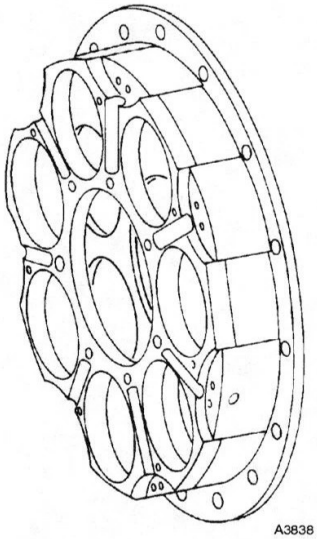
      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48, -48A, -48B, -49

   B. Cleaning

      (1) Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)

      (2) Clean oil ring by pressure flushing with dry cleaning solvent.



Reduction Gear Carrier
Figure 601

REDUCTION GEAR CARRIER – INSPECTION/CHECK

1. Reduction Gear Carrier – Inspection/Check

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
LTCT313 or LTCT23960-01	Pressure Test Stand
LTCT7632-01	Target Fixture

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Lubricating Oil	02-18

B. Inspection

(1) Visually inspect for the following:

(a) Severe damage. Not acceptable. Replace.

(b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

(c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

(d) Cracks or distortion. Not acceptable. Replace.

(e) Corrosion as follows:

CAUTION: ALL ASSEMBLY CLEARANCES MUST BE MAINTAINED AFTER BLEND-REPAIR.

1 Local areas of corrosion not exceeding 10 percent of surface area of any bore is acceptable provided that after blend-repair, parent material removal does not exceed a depth of 0.010 inch (0.25 millimeter). (Refer to 70-25-01, SPM.)

2 Local areas of corrosion are acceptable in all other areas provided that after blend-repair, parent material removal does not exceed a depth of 0.015 inch (0.38 millimeter). (Refer to 70-25-01, SPM.)

3 Corrosion on any surface under bearing retention clamps is not allowed.

1. B. (1) (f) Fretting, scoring, or other damaged chrome plating in bearing bores. Limits are as follows:

1 Fretting is not acceptable if it exceeds 10 percent of each bore circumference.

2 Fretting must be well distributed and in no case concentrated in one particular area.

3 If fretting is within limits, blend-repair. (Refer to 70-25-01, SPM.) If limits are exceeded, or if bores are scored or damaged, repair by chrome-plating. (Refer to Repair-01.)

(2) Magnetic-particle inspect for cracks. (See *Figure 801* and 70-20-03, SPM.) Replace cracked parts.

NOTE: Application of particles shall be wet continuous, fluorescent.

(3) If installed, inspect carrier assembly for spun planet gears. If spun planet gears are indicated, identify spun planet gear and rout carrier assembly, sun gear, and ring gear for detail inspection. (Refer to 72-33-13.) Spun planet gears are indicated by the following:

NOTE: If engine is known to generate metallic chips and source of metallic chips cannot be identified, return sun gear and carrier assembly for disassembly and detail inspection.

(a) Loose or uncrimped lock rings.

(b) Loose planet gear retaining nuts.

(c) Ability to rotate planet gears on gearshafts.

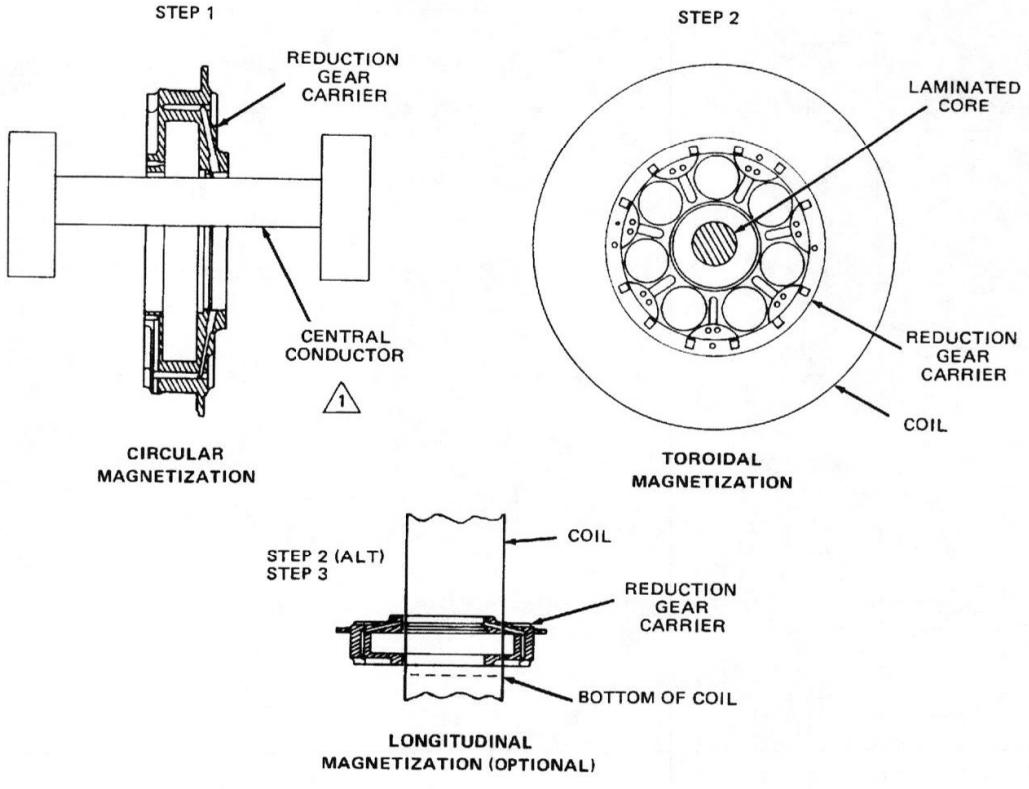
(d) Gap between gearshaft shoulder and bearing inner race or between bearing inner race and lock nut exceeding 0.001 inch (0.03 millimeter).

(e) Gap between planet gear and either bearing inner race that exceeds 0.001 inch (0.03 millimeter).

(4) Dimensionally inspect. (*Refer to Table 801 and Figure 802.*) Repair (Refer to Repair-01 or -02) or replace as required.

(5) Dimensionally inspect alignment sleeve slots for wear. Wear that exceeds 0.474 inch (12.04 millimeter) overall width is not acceptable. Repair alignment sleeve slots that exceed limits. (Refer to Repair-07.)

(6) Inspect oil passage plugs for leaks (Refer to Step (10)). Replace defective plugs. (Refer to Repair-03.)



NOTES:

1. DIAMETER – 4 INCHES (102 MILLIMETERS)
2. CURRENT – FULL WAVE DIRECT

STEP 1. PLACE CARRIER AS SHOWN. APPLY SUSPENSION; THEN MAGNETIZE USING 3800/4000 AMPS. ROTATE CARRIER 180 DEGREES; THEN MAGNETIZE USING 3800/4000 AMPS AND INSPECT.

STEP 2. PLACE CARRIER IN TOROIDAL SETUP AS SHOWN. APPLY SUSPENSION; THEN MAGNETIZE USING 2500 AMP TURNS AND INSPECT.

STEP 2. (ALT) PLACE CARRIER IN COIL AS SHOWN. APPLY SUSPENSION; THEN MAGNETIZE USING 14,000 AMP TURNS AND INSPECT.

STEP 3. IF STEP 2 (ALT) IS USED, ROTATE CARRIER 90 DEGREES. APPLY SUSPENSION; THEN MAGNETIZE USING 14,000 AMP TURNS AND INSPECT.

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Reduction Gear Carrier Magnetic-Particle Inspection
Figure 801

Table 801. Reduction Gear Carrier Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		REFER TO FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID*	2.8340 (71.984)	2.8343 (71.991)	Fit line-to-line to 0.0006 (0.0152) tight		802 1
OD*/**	13.3365 (338.747)	13.3375 (338.773)	13.3365 (338.747)	13.3375 (338.773)	2 (REF)
OD*/***	13.314 (338.18)	13.318 (338.28)	13.2860 (337.464)	13.3375 (338.773)	2 (REF)
OD*/++	13.282 (337.37)	13.286 (337.46)	13.2820 (337.363)	13.3375 (338.773)	2 (REF)
OD*	11.3780 (289.001)	11.3840 (289.154)	Fit at Assembly		3
Symmetrical to Surface*		0.0010 TIR (0.025)		0.0020 TIR (0.051)	4
Radial (Slot Width)+	0.472 (11.989)	0.473 (12.014)	0.472 (11.989)	0.474 (12.040)	5

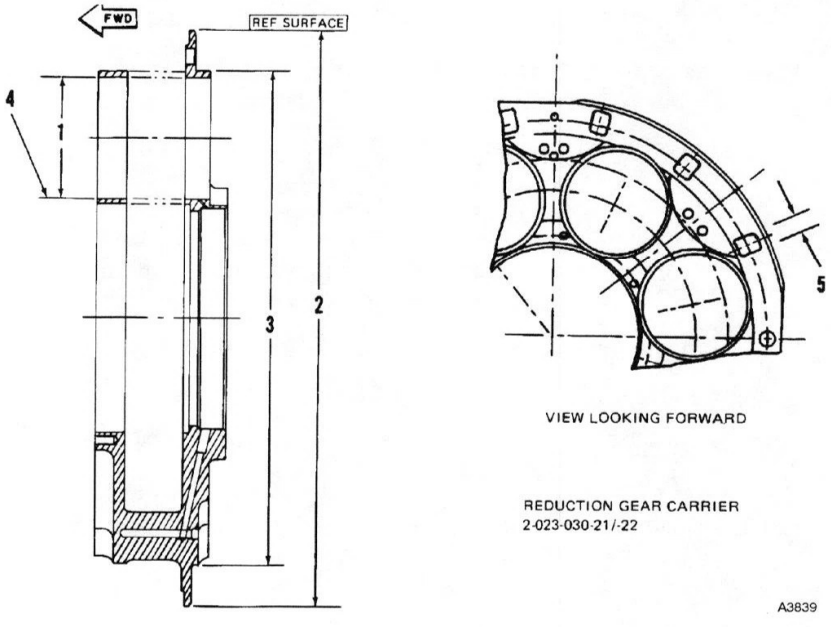
*Required only if damaged.

**Applicable to reduction gear carrier prior to 2-023-030-17

***Applicable to reduction gear carrier 2-023-030-17/-22

+Applicable to reduction gear carriers 2-023-030-21/-22

++Applicable to reduction gear carrier 2-023-030-21



Reduction Gear Carrier Dimensional Inspection Locations
Figure 802

1. B. (7) Inspect oil passage plugs (location A, *Figure 803*) for leaks and/or damage or carrier for missing plug (Refer to Step (10).) Replace defective plug with oversize plug. (Refer to Repair-04.)

(8) Inspect oil passage plugs (location B and C, *Figure 803*) for leaks and/or damage or carrier for missing plug (Refer to Step (10).) Replace defective plugs with oversize plugs. (Refer to Repair-05.)

(9) Inspect oil passage plug bore (location D, *Figure 804*) for damage and/or oversized condition. Repair by installing oversized plug. (Refer to Repair-04, -05, or -06.)

(10) Oil flow check carrier as follows:

(a) Install two packings (1, *Figure 805*) into grooves of oil ring (2).

(b) Install oil ring (2) into carrier (5) with oil inlet at 9 o'clock position. Secure with five bolts (4) and tab washers (3). Tighten bolts (4) to standard torque.

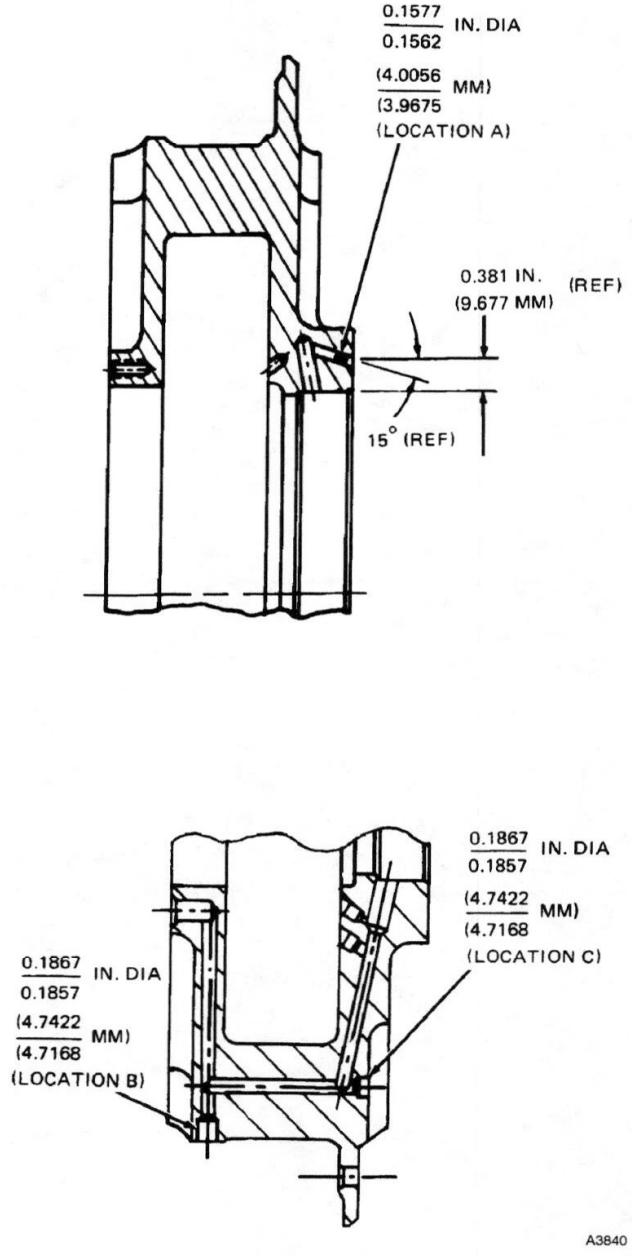
NOTE: Ensure that a pressure gage is installed in oil supply line of oil flow and pressure test stand LTCT313 or LTCT23960-01 at oil discharge side.

(c) Determine pressure drop between pressure gage in oil supply line of test stand LTCT313 or LTCT23960-01 and part to be tested as follows:

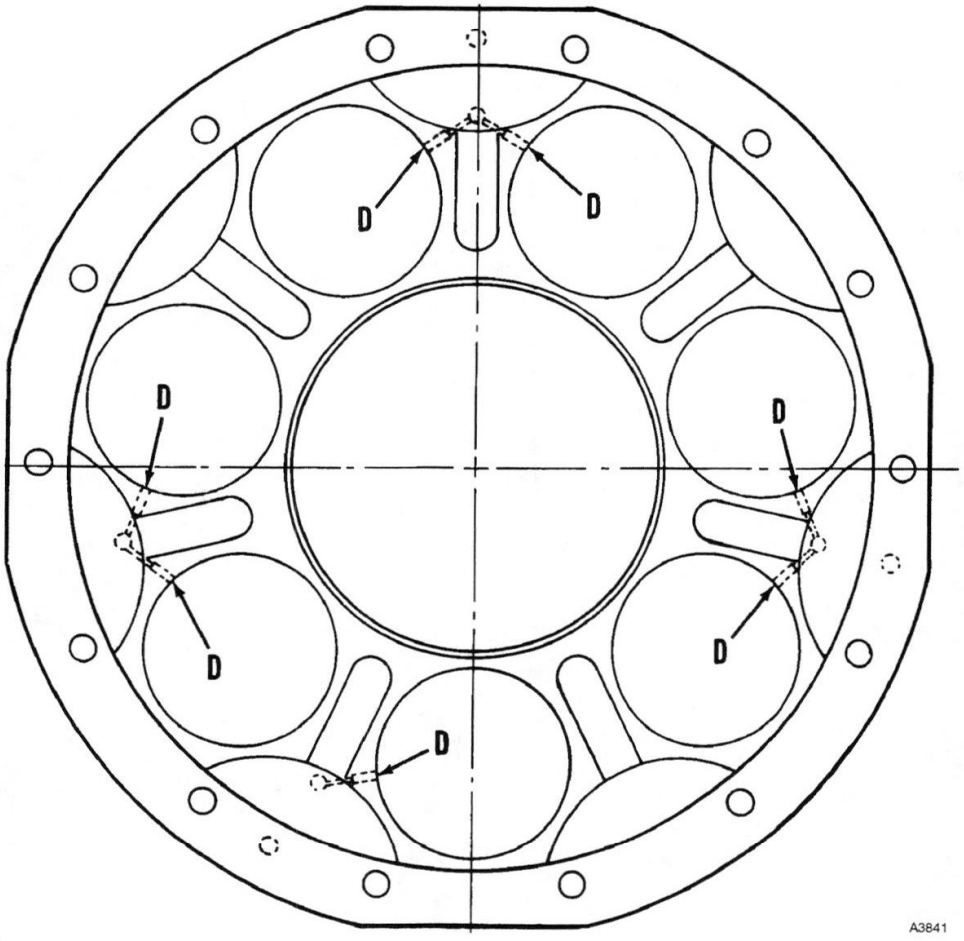
NOTE: This procedure is accomplished before connecting carrier to oil supply line of test stand.

1 Adjust test stand as required to obtain median oil flow of part to be tested. (Refer to following Steps (g) and (i).)

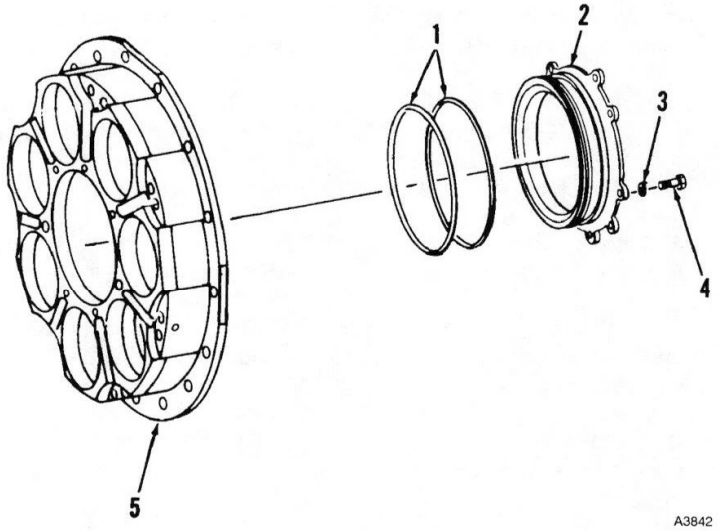
2 Observe reading on pressure gage in oil supply line; reading obtained is pressure drop. Record pressure drop.



Location of Oil Passage Plugs
Figure 803



Location of Plugs
Figure 804



1. PACKINGS
2. OIL RING
3. TAB WASHER
4. BOLT
5. CARRIER

Oil Flow Check Set Up – Reduction Gear Carrier
Figure 805

1. B. (10) (d) Install oil ring (2) on oil flow and target fixture LTCT7632-01.

(e) Using suitable caps, cap off two aft 0.187 to 0.193 inch (4.75 to 4.90 millimeter) diameter oil feed holes.

(f) Connect target fixture to oil supply line of test stand LTCT313 or LTCT23960.

(g) Ensure two aft feed holes are capped. Using lubricating oil, heated to 98 to 102°F (36.7 to 38.9°C), at a pressure of 75 psig (517 kN/m^2) plus pressure drop (Refer to preceding Step (c)), check oil flow rate. (*Refer to Table 802.*)

(h) Reduce oil pressure to 30 psig (207 kN/m^2) plus pressure drop. (Refer to preceding Step (c).) Check that all oil jets have a steady stream of oil projecting a minimum of 3.0 inches (76.2 millimeters).

(i) Plug seven 0.017 to 0.020 inch (0.43 to 0.51 millimeter) diameter and seven 0.020 to 0.025 inch (0.51 to 0.64 millimeter) diameter bearing jets. Apply an oil pressure of 75 psig (517 kN/m^2) plus pressure drop. (Refer to to preceding Step (c).) Check oil flow rate. (*Refer to Table 802.*)

(j) Subtract oil flow rate obtained in Step (h) from oil flow rate obtained in Step (g). Result is minimum bearing oil flow, which must be at least 340 phr (154 kg/hr).

(k) Alternately apply an oil pressure of 160 and zero psig (1103 and zero kN/m^2) shocking lubrication passages to dislodge any contaminants. Repeat shock cycle 5 times.

(l) Repeat flow check Steps (g) thru (j). Any change in flow rate in excess of 5 percent is a sign of contamination. If contamination is evident, clean carrier passages.

(m) Apply a pressure of 15 psig (103 kN/m^2) and check oil stream angle flow of jets. Oil stream from jets must pass freely through 0.250 inch (6.35 millimeter) diameters at target locations.

(n) Remove oil flow and target fixture LTCT7632 from oil ring (2). Remove oil ring (2) from carrier (5). Examine packings (1) on ring (2). If packings have been shaven, all pieces of packing must be accounted for before using carrier.

Table 802. Reduction Gear Carrier Oil Flow Rates

PART NUMBER	FLOW TWO AFT FEED HOLES CAPPED	FLOW BEARING JETS CAPPED
Prior to 2-023-030-17	2080 to 2650 phr (944 to 1203 kg/hr)	1740 to 2200 phr (290 to 999 kg/hr)
2-023-030-17	2310 to 2700 phr (1049 to 1226 kg/hr)	1970 to 2200 phr (894 to 999 kg/hr)

REDUCTION GEAR CARRIER – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-030-10/-13/-14/-15/ -17/-21/-22	-01, -03, -04, -05, and -06	None
2-023-030-10/-13/-14/-15/-17	-02	None
2-023-030-21/-22	-07	None

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TEMPORARY REVISION NO. 72-947

TO: HOLDERS OF TURBOFAN AIRCRAFT ENGINE MANUAL REPORT NO. 286.1, REVISION 27, DATED AUGUST 27, 2004. INSERT FACING PAGE 901, 72-33-26, REPAIR-01. THIS TR IS ALSO APPLICABLE TO THE CD-ROM ALF502R_L AND THE CD-ROM ALF502R_H.

Reason: To add incomplete or missing data.

Use the following revised Figure 901 in lieu of the existing Figure 901.

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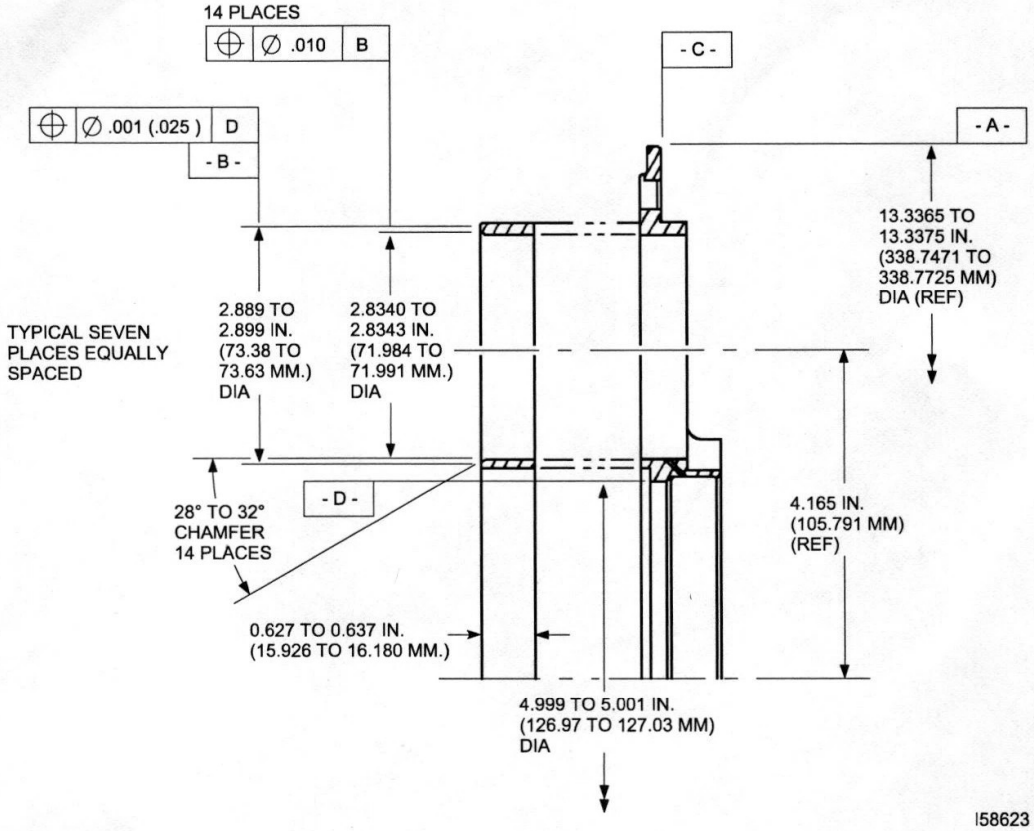

Carrier Machining After Repair
Figure 901

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REDUCTION GEAR CARRIER – REPAIR-01

1. Repair Discrepant 2.8340 to 2.8343 Inch (71.984 to 72.991 Millimeter) ID Where Up To 0.005 Inch (0.13 Millimeter) Plate Thickness is Required – Repair-01

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

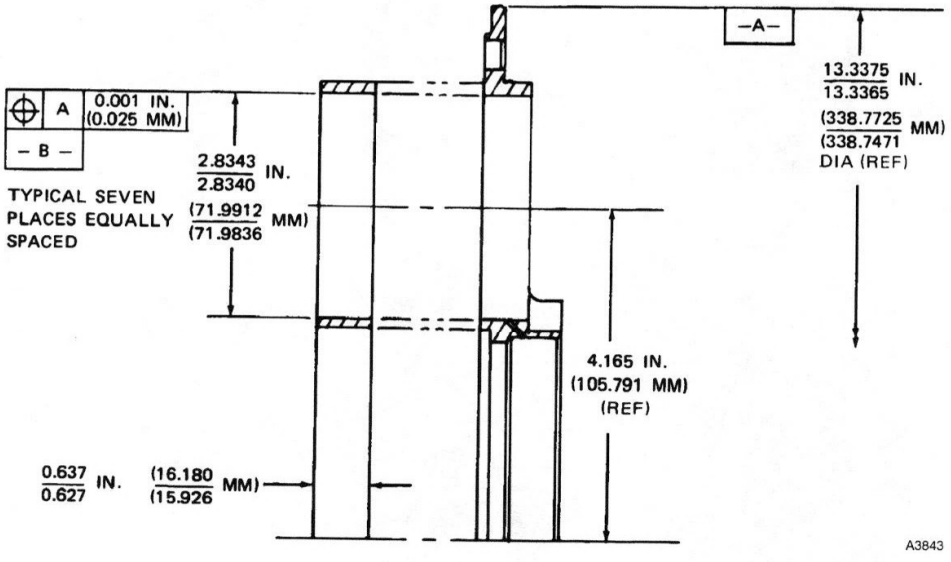
B. Procedure

(1) Machine area to obtain 0.002 inch (0.05 millimeter) minimum chrome-plate thickness after final machining.

(2) Chrome-plate diameter. (Refer to 70-35-01, SPM.)

(3) Bake carrier at 365 to 385°F (185 to 196°C) for 3 hours.

(4) Machine to specified dimensions. (*See Figure 901.*)



Carrier Machining After Repair
Figure 901

REDUCTION GEAR CARRIER – REPAIR-02

1. Repair Discrepant 13.3365 to 13.3375 Inch (338.747 to 338.773 Millimeter) OD Where Up To 0.005 Inch (0.13 Millimeter) Plate Thickness is Required – Repair-02

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

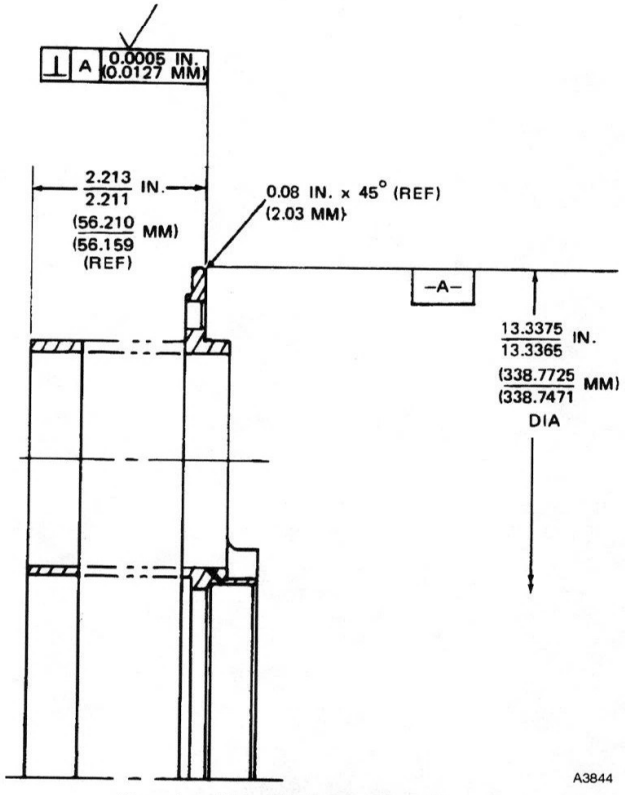
   B. Procedure

      (1) Machine area to obtain 0.002 inch (0.05 millimeter) minimum chrome-plate thickness after final machining.

      (2) Chrome-plate diameter. (Refer to 70-35-01, SPM.)

      (3) Bake carrier at 365 to 385°F (185 to 196°C) for 3 hours.

      (4) Machine to specified dimensions. (*See Figure 901.*)



Carrier Machining After Repair
Figure 901

REDUCTION GEAR CARRIER – REPAIR-03

1. Replace Leaking Oil Passage Plugs – Repair-03

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Drill and tap defective plug pin as required for 8-32 threads.

      (2) Using suitable 8-32 bolt, pull defective plug pin from oil passage.

      (3) Using 0.1875 to 0.1900 inch (4.763 to 4.826 millimeter) diameter reamer, ream plug bore as required to obtain original depth. (*See Figure 901.*)

      (4) Flush oil passages as necessary to remove all machining contamination.

      (5) Install replacement Lee plug in reworked oil passages plug bore. (*Refer to Table 901.*)

         NOTE: Short plugs may be used for both locations shown in *Figure 901.*

      (6) Oil flow check. (Refer to Inspection/Check.) If leakage still exists, repair as follows:

         (a) Remove Lee plug from oil passage.

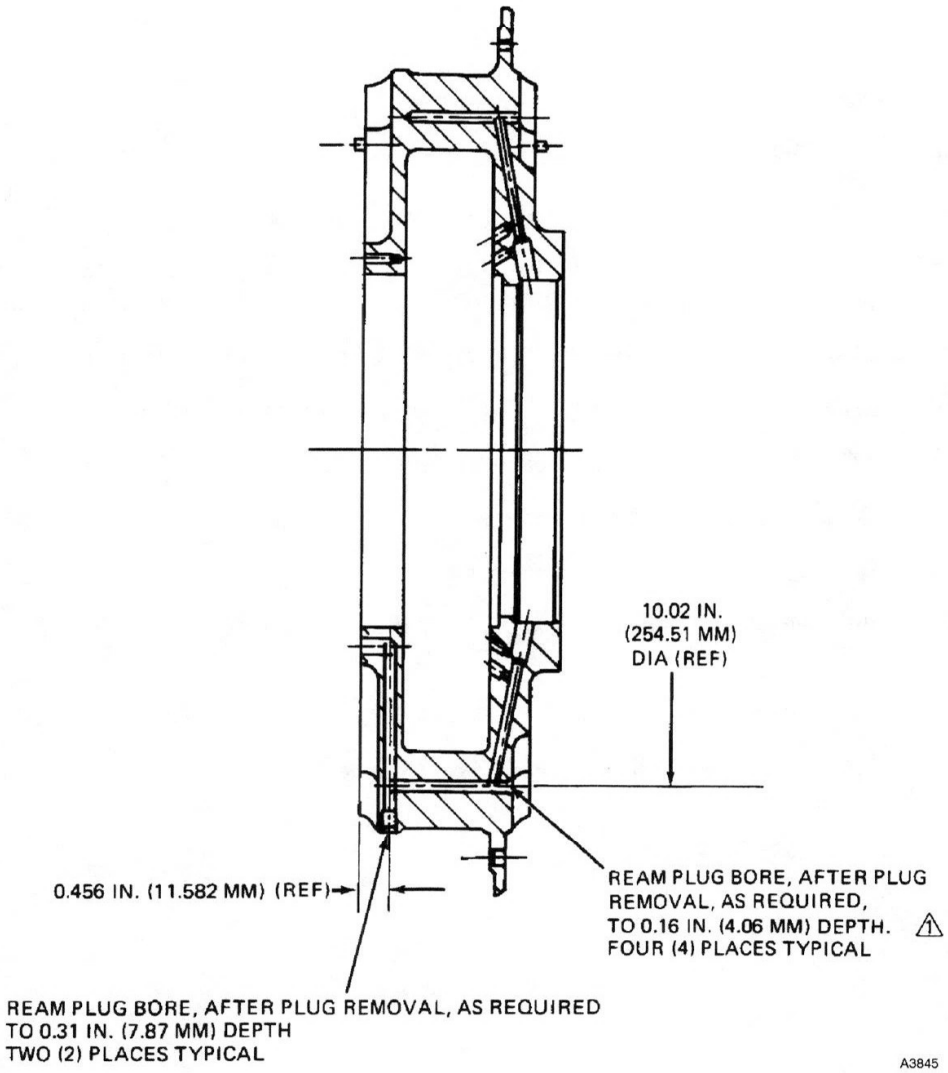
         (b) Using 0.1975 to 0.2000 inch (5.017 to 5.080 millimeter) diameter reducer, ream plug bore as required. (*See Figure 901.*)

         (c) Flush oil passages as necessary to remove all machining contamination.

         (d) Install oversized Lee plug. (*Refer to Table 901.*)

         (e) Repeat oil flow check. (Refer to Inspection/Check.)

⚠1 IF LONG PLUG IS TO BE USED, INCREASE PLUG BORE DEPTH TO 0.255 IN. (6.477 MM) MINIMUM.



Machining Requirements for Plug Replacement
Figure 901

Table 901. Plug Replacement Data

PLUG SIZE	MATERIAL	*SHORT PLUG	**LONG PLUG
Standard Diameter	416 Stainless	PLGA1870020	PLGA1871020
	303 Stainless	PLGA1870030	PLGA1871030
0.010 Inch (0.254 Millimeter) Diameter Oversize	416 Stainless	PLGA1970020	PLGA1971020
	303 Stainless	PLGA1970030	PLGA1971030

*Ream depth to be 0.152 inch (3.86 millimeters).

**Ream depth to be 0.253 inch (6.43 millimeters).

NOTE: Plugs may be obtained from The Lee Company, 2 Pettipaug Road, P.O. Box 0424, Westbrook, CT 06498.

REDUCTION GEAR CARRIER – REPAIR-04

1. Repair of Missing, Leaking, or Damaged Oil Gallery Plugs (Location A, *Figure 901)* – Repair-04

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Drill two-piece Lee plugs that are damaged and tap; then use suitable bolt to pull defective plug. (See *Figure 901* for dimensions.)

      (2) Drill existing hole oversize to 0.1875 to 0.1890 inch (4.763 to 4.801 millimeter) diameter and to a depth of 0.215 to 0.225 inch (5.46 to 5.72 millimeter) with an 89 to 91 degree included bottom angle.

      (3) Flush and back flush exposed and connecting oil galleries to remove all machining contamination.

      (4) Using filtered shop air, blow assembly dry.

      (5) Press in cupped detail of replacement plug STD3072-4 until closed end bottoms.

      (6) Insert tapered detail of plug STD3072-4, small end first, into cup and press or drive until exposed end and cup are flush.

      (7) Oil flow check. (Refer to 72-33-26, Inspection/Check.)

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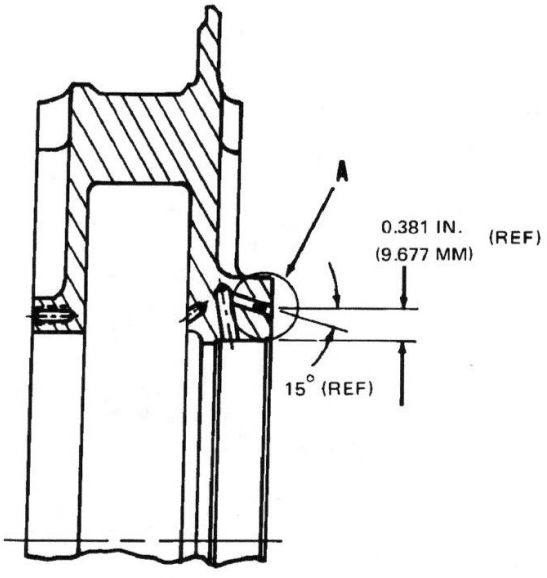

A

BLUEPRINT DATA	0.1562 TO 0.1577 IN. (3.9675 TO 4.0056 MM) DIAMETER 0.195 TO 0.205 IN. (4.953 TO 5.207 MM) DEPTH
REPAIR DATA	OVERSIZE 0.1875 TO 0.1890 IN. (4.7625 TO 4.8006 MM) DIAMETER 0.215 TO 0.225 IN. (5.461 TO 5.715 MM) DEPTH 89 TO 91 DEGREE INCLUDED ANGLE AT BOTTOM

A3846

Machining Requirement for Plug Replacement
Figure 901

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REDUCTION GEAR CARRIER – REPAIR-05

1. Repair of Missing, Leaking, or Damaged Air Gallery Plugs (Locations B and C, *Figure 901*) – Repair-05

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Wire	08-73

   B. Procedure

      NOTE: This repair is available at:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Drill plugs that are damaged, tap and use suitable bolt to pull defective plugs out. (See *Figure 901* for dimensions.)

      (2) Drill existing holes oversize to the following dimensions:

         (a) Hole(s) at Location B *(Figure 901)* shall not exceed 0.2117 inch (5.377 millimeter) diameter and 0.31 inch (7.87 millimeter) depth.

         (b) Hole(s) at Location C *(Figure 901)* shall not exceed 0.2467 inch (6.266 millimeter) diameter and 0.16 inch (4.1 millimeter) depth.

      (3) Using wire, manufacture replacement plug(s). *(Refer to Table 901 and Figure 901.)*

      (4) Flush and back flush exposed and connecting oil galleries to remove machining contamination. Using filtered shop air, blow dry.

      (5) Press plugs into holes until bottomed and stake to secure.

      (6) Oil flow check. (Refer to Inspection/Check.)

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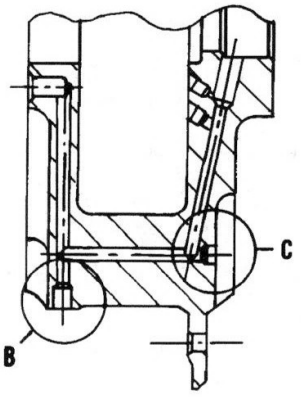
Table 901. Replacement Plug Dimensions

PLUG LOCATION	DIMENSION (REFER TO NOTES)
B	0.24 to 0.26 inch (6.1 to 6.6 millimeter) length
C	0.115 to 0.135 inch (2.92 to 3.43 millimeter) length

NOTE:
1. Surface roughness shall be AS291.
2. Break sharp edges to 0.002 to 0.015 inch (0.08 to 0.38 millimeter).
3. Interference fit at locations B and C shall be 0.0003 to 0.0013 inch (0.008 to 0.033 millimeter).



BLUEPRINT DATA	LOCATION B	0.1857 TO 0.1867 INCH (4.7168 TO 4.7422 MILLIMETERS) DIAMETER, 0.031 INCH (7.87 MILLIMETERS) DEPTH.
	LOCATION C	0.1857 TO 0.1867 INCH (4.7168 TO 4.7422 MILLIMETERS) DIAMETER, 0.16 INCH (4.06 MILLIMETERS) DEPTH.
REPAIR DATA	LOCATION B	OVERSIZE AS NECESSARY TO A MAXIMUM OF 0.2117 INCH (5.3772 MILLIMETERS) DIAMETER, 0.31 INCH (4.06 MILLIMETERS) DEPTH.
	LOCATION C	OVERSIZE AS NECESSARY TO A MAXIMUM OF 0.2467 INCH (6.2662 MILLIMETERS) DIAMETER, 0.16 INCH (4.06 MILLIMETERS) DEPTH.

A3847

Machining Requirements for Plug Replacement
Figure 901

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REDUCTION GEAR CARRIER – REPAIR-06

1. Repair of Damaged or Oversized Plug Bore – Repair-06

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

Special Tools:

Part No.	Nomenclature
CUTA 0930103B	Extraction Tooling Kit

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Primer	01-09
Retaining Compound	01-08
Wire	08-59

B. Procedure

(1) Using extraction tool kit CUTA 0930103B, remove plug from damaged or oversized bore, following manufacturer's instructions (Location D, *Figure 901*). Dimensionally inspect bore for 0.1250 to 0.1265 inch (3.18 to 3.21 millimeter) diameter.

(2) Drill and ream existing hole oversize to specified dimensions. (*See Figure 902.*) Chamfer bottom of hole as required.

(3) Ultrasonically clean and flush to ensure all jet holes are free of machining residue.

(4) Using wire, fabricate plug to specified dimensions. (*See Figure 903.*)

(5) Heat treat fabricated plugs as follows:

(a) Heat to 1625°F (885°C) and maintain heat for a period of 30 minutes.

(b) Cool in still air.

(c) Heat to 1550°F (843°C) and maintain heat for a period of 15 minutes.

(d) Quench in oil.

(e) Heat to 1025°F(557°C) and maintain heat for a period of 60 minutes.

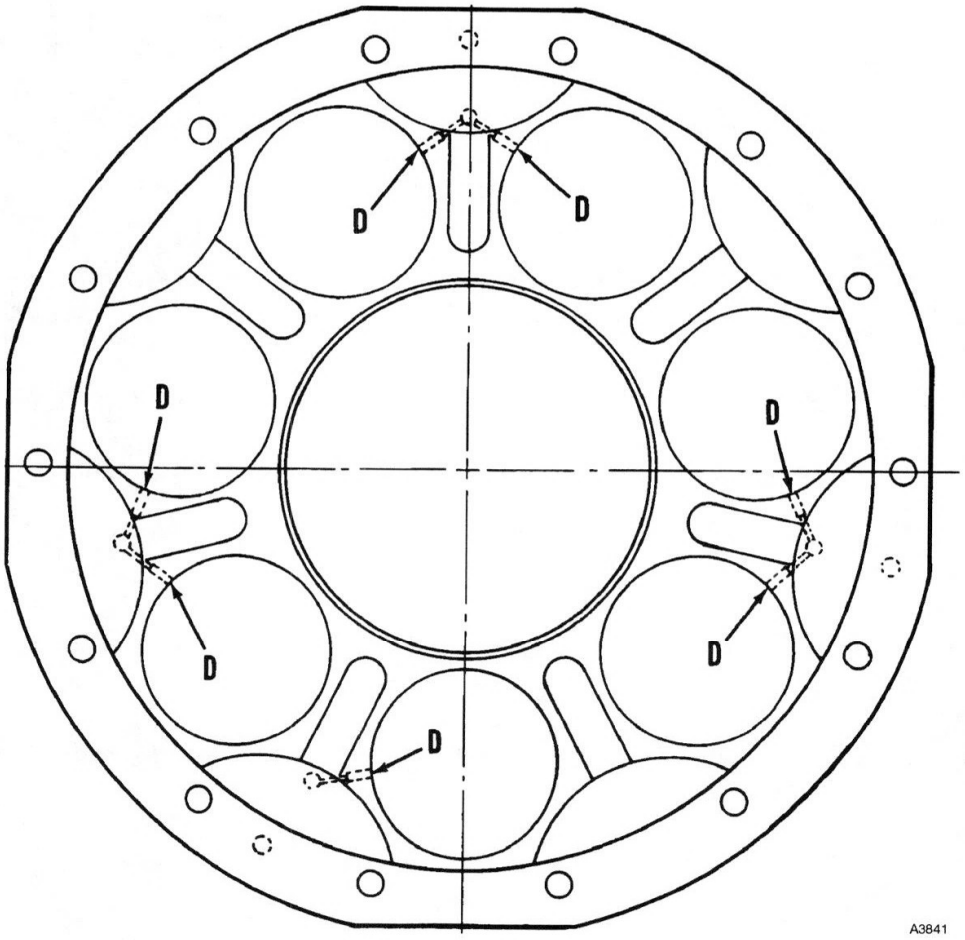
(f) Cool in still air.

CAUTION: AVOID USING TOO MUCH LOCTITE DUE TO POSSIBLE CONTAMINATION OF JOURNALS AND PASSAGEWAYS.

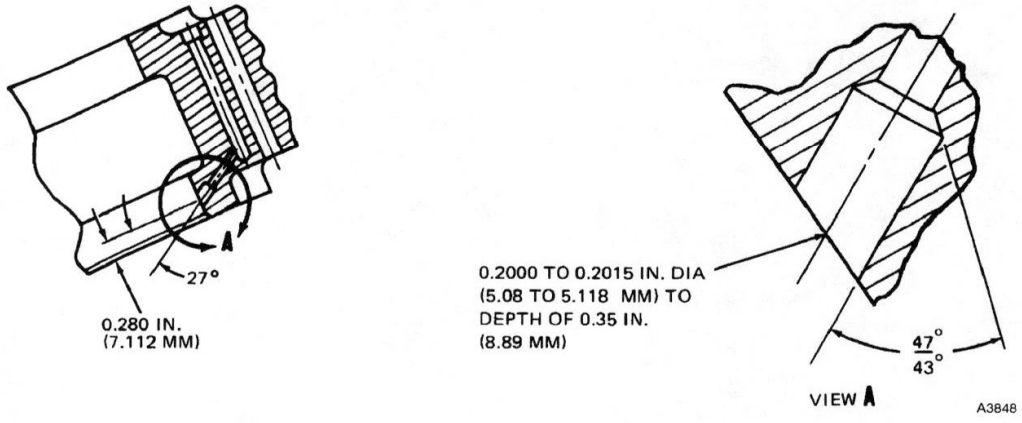
1. B. (6) Using Loctite primer, clean ID of bore. Apply Loctite compound; then insert fabricated plug until fully seated on shoulder of reamed hole. Stake plug. Ensure 0.010 inch (2.54 millimeter) minimum dimension is met. (*See Figure 904.*)

(7) Using electrical discharge machining method, obtain a 0.020 to 0.025 inch (0.51 to 0.64 millimeter) diameter hole through center of plug. (*See Figure 905.*)

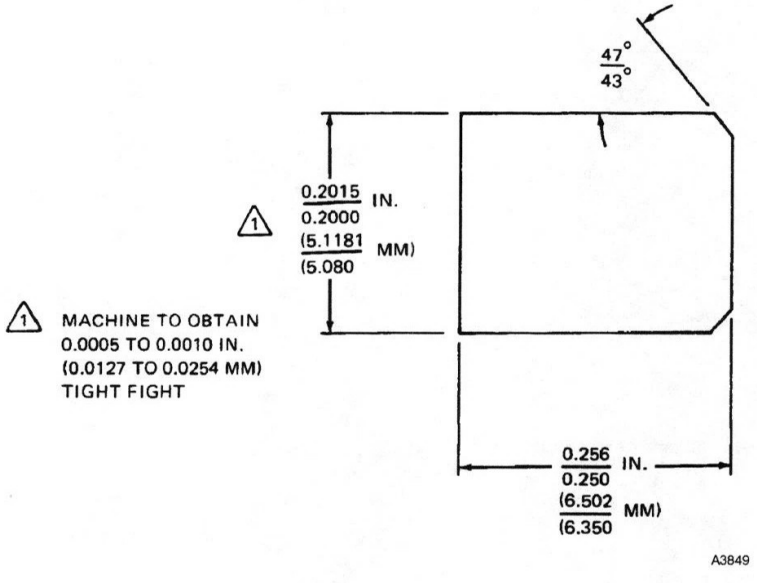
(8) Oil flow check. (Refer to Inspection/Check.)



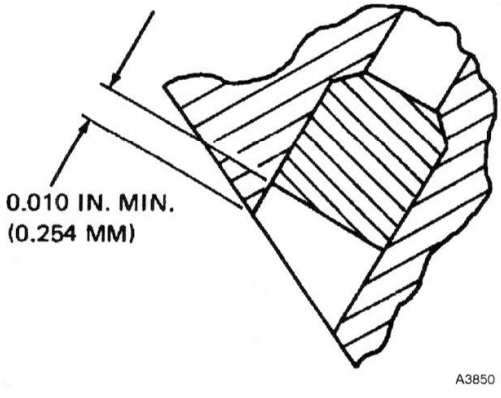
Location of Plugs
Figure 901



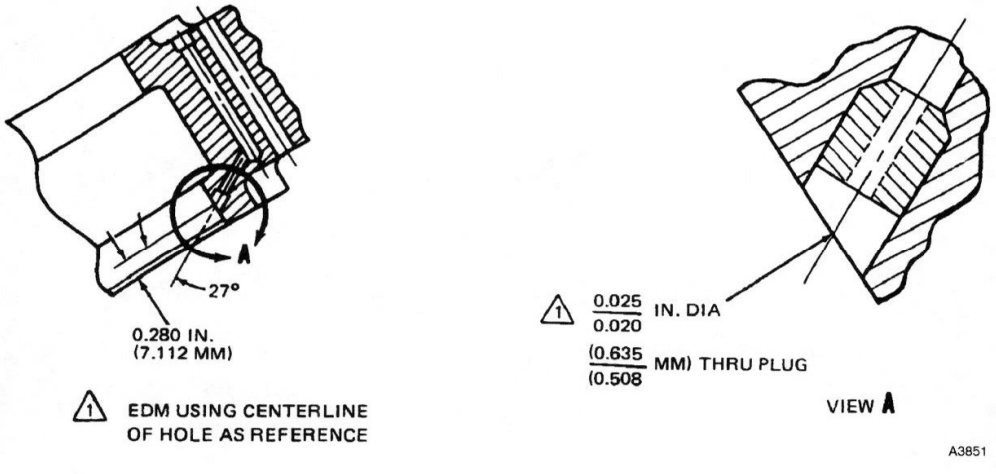
Machining Requirements for Oversize Hole
Figure 902



Fabrication of Plug
Figure 903



Installation of Plug
Figure 904



Machining Requirements for Plug Oil Hole
Figure 905

REDUCTION GEAR CARRIER – REPAIR-07

1. Repair of Oversized Alignment Sleeve Slots – Repair-07

NOTE: Refer to Repair-00 for part number application.

A. Equipment and Materials

None.

B. Procedure

CAUTION: DO NOT MACHINE OFF MORE MATERIAL THAN IS REQUIRED TO REPAIR EACH PARTICULAR PART OR SLOT. MACHINE ONLY TO OBTAIN EVEN BASE MATERIAL SURFACES AND/OR MINIMUM PLATING THICKNESS.

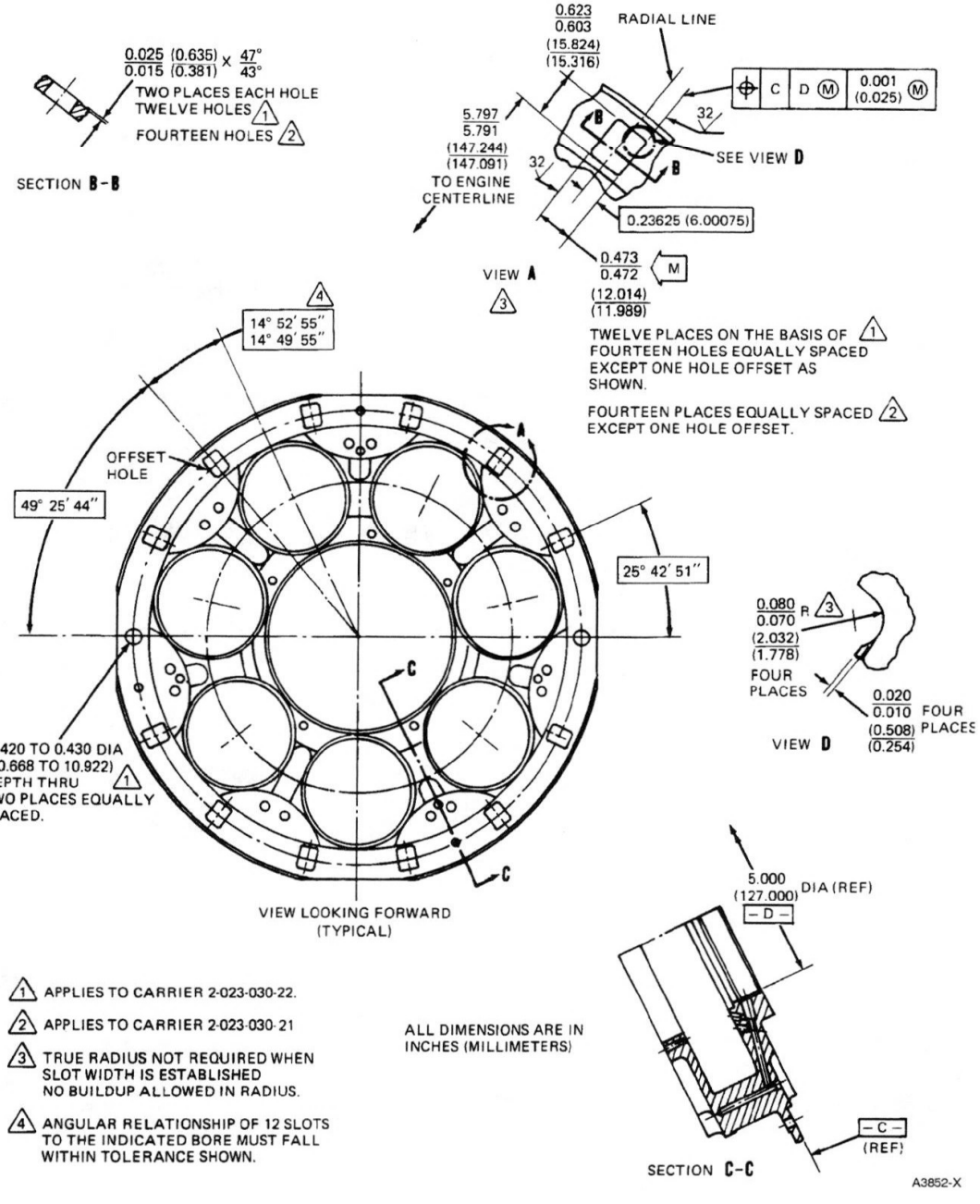
(1) Machine slot surfaces (*Figure 901*) to obtain 0.002 to 0.015 inch (0.05 to 0.38 millimeter) plate thickness.

(2) Mask surfaces not to be chrome plated.

(3) Chrome plate slots. (Refer to 70-30-01, SPM.)

(4) Bake carrier at 365 to 385°F (185 to 196°C) for 3 hours.

(5) Machine to specified dimensions. (*See Figure 901.*)



1 APPLIES TO CARRIER 2-023-030-22.

2 APPLIES TO CARRIER 2-023-030-21

3 TRUE RADIUS NOT REQUIRED WHEN SLOT WIDTH IS ESTABLISHED NO BUILDUP ALLOWED IN RADIUS.

4 ANGULAR RELATIONSHIP OF 12 SLOTS TO THE INDICATED BORE MUST FALL WITHIN TOLERANCE SHOWN.

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

Carrier Machining After Repair
Figure 901

PLANET GEAR SHAFT – CLEANING

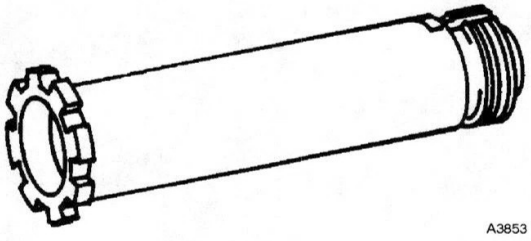
1. Planet Gear Shaft (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Planet Gear Shaft
Figure 601

PLANET GEAR SHAFT – INSPECTION/CHECK

1. Planet Gear Shaft – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks or distortion. Not acceptable. Replace.

         CAUTION: ALL ASSEMBLY CLEARANCES MUST BE MAINTAINED AFTER BLEND-REPAIR.

         (e) Corrosion. Local areas of corrosion are acceptable, provided that after blend-repair (Refer to 70-25-01, SPM), parent material removal does not exceed a depth of 0.015 inch (0.38 millimeter).

         (f) Chipped or worn chrome plating. Not acceptable. Repair. (Refer to Repair-01.)

         (g) Axial or radial scoring, fretting, or pitting. Not acceptable. Repair. (Refer to Repair-01.)

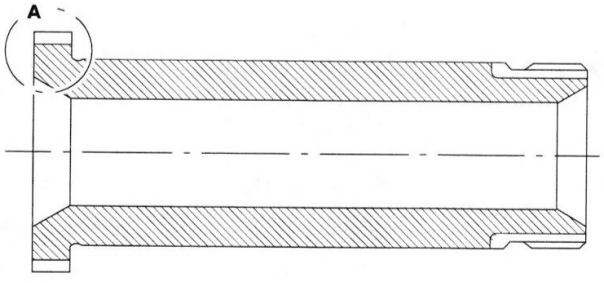
         (h) Circumferential scoring on planet gear journal. Not acceptable. Repair. (Refer to Repair-01.)

      (2) Visually inspect the radius between the shaft and shoulder. See *Figure 801* for acceptance criteria. If radius is unacceptable, replace shaft.

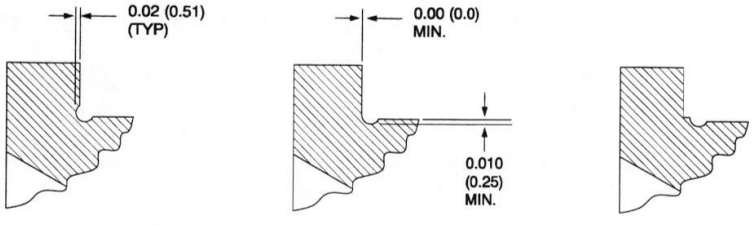
      (3) Dimensionally inspect. (*Refer to Table 801 and Figure 802.*) Using temporary marking, record resulting dimension on gear shaft or tag gear shaft with the resulting dimension for use during assembly. (Refer to 72-33-25, Assembly.) Repair or replace if limits cannot be met.

   C. Non-Destructive Test (NDT)

      Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Replace if cracks are noted.



ALL DIMENSIONS ARE
IN INCHES (MILLIMETERS)



ACCEPTABLE
(BLUEPRINT REQUIREMENT)

VIEW **A**

MINIMUM ACCEPTABLE
CORNER RELIEF

VIEW **A**

UNACCEPTABLE

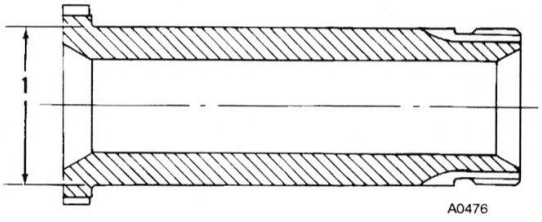
VIEW **A**

I58308

Acceptance Criteria For Radius Between Shaft and Shoulder
Figure 801

Table 801. Planet Gear Shaft Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
OD	1.1816 (30.013)	1.1819 (30.020)	1.1816 (30.013)	1.1819 (30.020)	802 1



Planet Gear Shaft Dimensional Inspection Location
Figure 802

PLANET GEAR SHAFT – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-016-05	-01	None
2-023-016-12	-01	ALF502R 72-271

PLANET GEAR SHAFT – REPAIR-01

1. Repair of Chipped or Worn Chrome Plating on the 1.1816 to 1.1819 Inch (30.013 to 30.020 Millimeter) Diameter – Repair-01

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      (1) Remove chrome plating by machining or using electrochemical method.

         NOTE: Ensure that all original chrome plate has been removed.

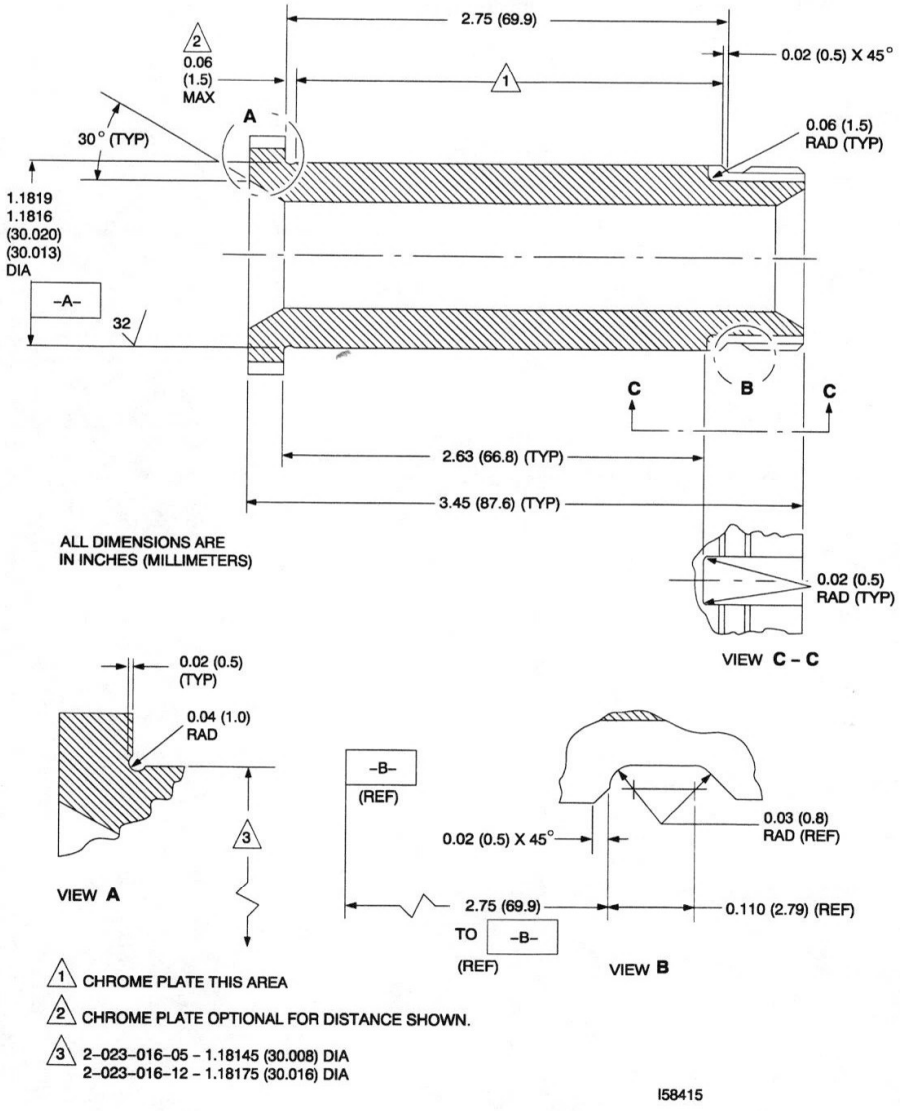
      (2) Visually inspect parent metal for evidence of scoring, pitting, or fretting damage. Parent metal damage is not acceptable.

      (3) Mask areas not to be plated.

      (4) Chrome-plate diameter to obtain a plating thickness of 0.002 to 0.010 inch (0.05 to 0.25 millimeter) after final machining. (See *Figure 901* and 70-35-01, SPM.)

      (5) Bake gear shaft at 685 to 715°F (363 to 379°C) for 2 hours.

      (6) Machine to specified dimensions. (*See Figure 901.*)



Planet Gear Shaft Repair Area
Figure 901

NO. 6 AND 7 ROLLER BEARINGS – CLEANING

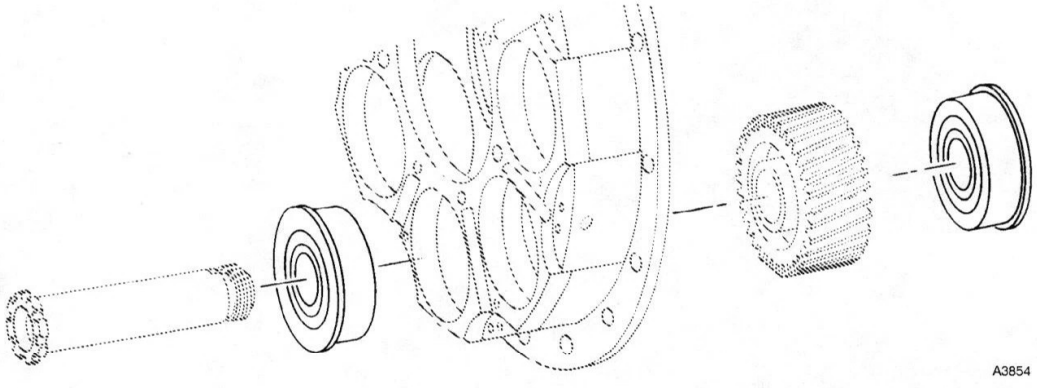
1. No. 6 and 7 Roller Bearings (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean in accordance with 70-15-13, SPM.



No. 6 and 7 Roller Bearing
Figure 601

NO. 6 AND 7 ROLLER BEARINGS – INSPECTION/CHECK

1. No. 6 and 7 Roller Bearings – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      NOTE: If inspection procedures cannot be performed at your facility, send bearings to:

      Honeywell Engines, Systems & Services
      Greer Repair and Overhaul
      85 Beeco Road
      Greer, SC 29650-1004
      U.S.A.
      Telephone: (864) 801-2200

      (1) Visually inspect for the following:

         (a) Cracks or distortion. Not acceptable. Replace.

         (b) Corrosion. Not allowed on surface under bearing clamps.

      (2) Inspect bearings (Refer to 70-20-07, SPM) and refer to *Table 801* for hardness limits.

      (3) Dimensionally inspect. *(Refer to Table 801.)* Replace if limits cannot be met.

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Table 801. No. 6 and 7 Roller Bearings Dimensional Inspection

+BEARING TYPE AND PART NO.	DIRECTION MEASURED	BLUEPRINT DIMENSIONS* INCH (MILLIMETER)	
		MINIMUM	MAXIMUM
5RJH306-031 (2-300-041-05)	ID	1.1809 (29.995)	1.1811 (30.000)
and			
AAVF306RWD3MSRA 1909 (2-300-041-04)	OD	2.8343 (21.991)	2.8346 (21.999)
	INTERNAL CLEARANCE	0.0017 (0.043)	**0.0023 (0.058)
or			
5RFH306-76 (2-303-536-01)	ID	1.1808 (29.992)	1.1811 (30.000)
	OD	2.8342 (71.989)	2.8346 (71.999)
and			
AAVF-306-RW1-102 (2-303-536-02)	INTERNAL CLEARANCE	0.0017 (0.043)	**0.0023 (0.058)

*Dimensional inspection not required unless visual inspection indicates obvious damage.

**Under 11.0 pound (5 kilogram) gage load.

***Hardness for all bearing inner and outer rings to be Rc60 minimum to Rc64 maximum. When there is any doubt as to bearing hardness condition, replace bearings.

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PLANET GEAR – CLEANING

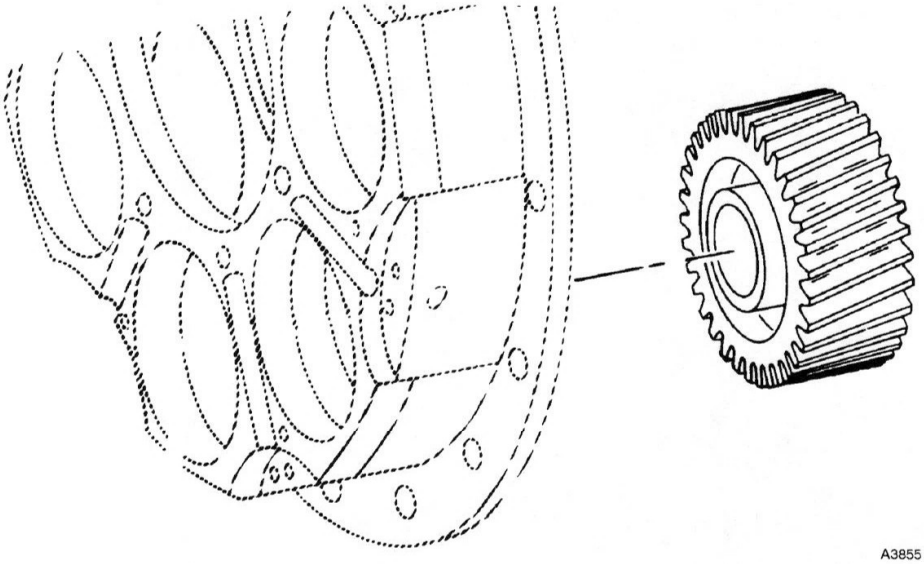
1. Planet Gear (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean in accordance with 70-15-12, SPM.



Planet Gear
Figure 601

PLANET GEAR – INSPECTION/CHECK

1. Planet Gear – Inspection/Check

   A. Equipment and Materials

   None.

   B. Inspection

      NOTE: The sun gear and reduction gear carrier assembly must be kept as a gear set for life, if the sun gear or any planet gear in the reduction gear carrier assembly has accumulated more than 50 hours of total engine operation. Replacement of either part must include replacement of the other. If the sun gear and all planet gears in the reduction gear carrier assembly have accumulated less than 50 hours of total engine operation the sun gear and any planet gear or gears may be individually replaced in combination with any gear having less than 50 hours of engine operation.

      (1) Refer to 70-20-08, SPM for inspection requirements.

      (2) Dimensionally inspect. (*Refer to Table 801 and Figure 801.*) Using temporary marking, record resulting dimension on gear or tag gear with the resulting dimension for use during assembly. (Refer to 72-33-25, Assembly.) Repair (Refer to Repair-01) or replace discrepant gear.

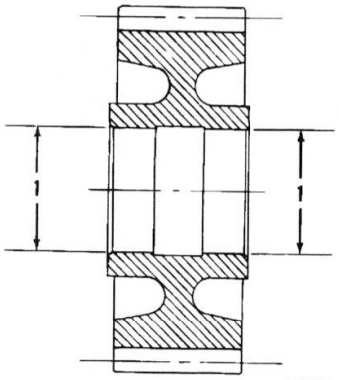
      (3) Magnetic-particle inspect for cracks. (See *Figure 802* and 70-20-03, SPM.) Replace if cracks are noted.

         NOTE: Application of particles shall be wet continuous, fluorescent.

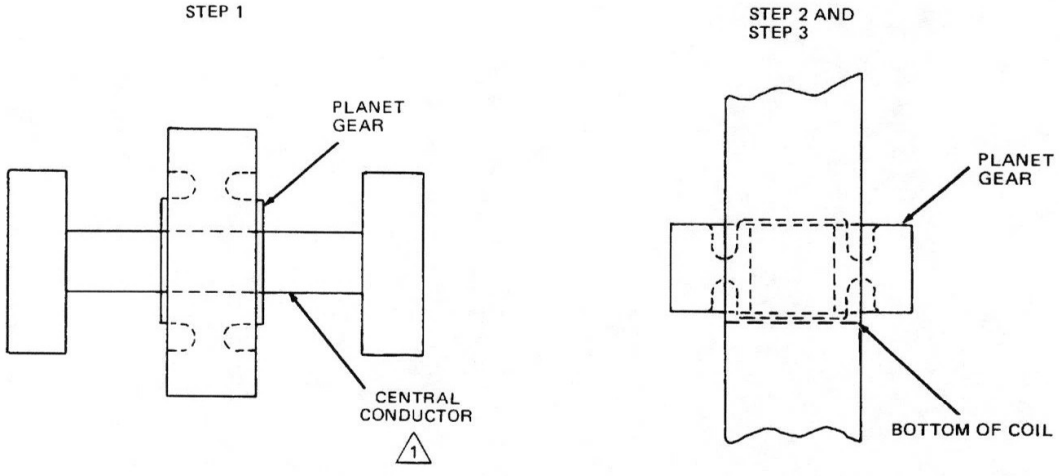
Table 801. Low Pressure Compressor Disc Assembly Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
ID	1.1804 (29.982)	1.1808 (29.992)	1.1804 (29.982)	1.1809* (29.995)	801 1

*Gears accepted to dimension 1.1809 inch (29.995 millimeter) ID, may only be matched to gearshafts with a 1.1814 inch (30.008 millimeter) OD or larger.



Planet Gear Dimensional Inspection
Figure 801



CIRCULAR MAGNETIZATION

LONGITUDINAL MAGNETIZATION

NOTES:

1 DIAMETER – 1 INCH (25.4 MILLIMETERS)

2 CURRENT – FULL WAVE DIRECT.

STEP 1. PLACE GEAR AS SHOWN. APPLY SUSPENSION; THEN MAGNETIZE USING 2800/3000 AMPS AND INSPECT.

STEP 2. PLACE GEAR IN COIL AS SHOWN. APPLY SUSPENSION; THEN MAGNETIZE USING 12,500 AMP TURNS AND INSPECT.

STEP 3. ROTATE GEAR IN COIL 90 DEGREES FROM ORIGINAL POSITION. APPLY SUSPENSION; THEN MAGNETIZE USING 12,500 AMP TURNS AND INSPECT.

A0479

Planet Gear Magnetic-Particle Inspection
Figure 802

PLANET GEAR – REPAIR-00

1. Repair/Part Number Index – Repair-00

The specific part numbers and the repairs that pertain to each part are listed below. Reference service bulletins are listed for parts introduced or obtained by service bulletins.

Part Number	Repair	Service Bulletin
2-023-071-01/-02/-03/-04	-01	None
2-023-013-14/-19/-20/-21/ -22/-23/-24	-01	None
2-023-013-23/-24	-02	None

PLANET GEAR – REPAIR-01

1. Repair Discrepant 1.1804 to 1.1808 Inch (29.982 to 29.992 Millimeter) Diameter, Where Up To 0.005 Inch (0.13 Millimeter) Plate Thickness is Required – Repair-01

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

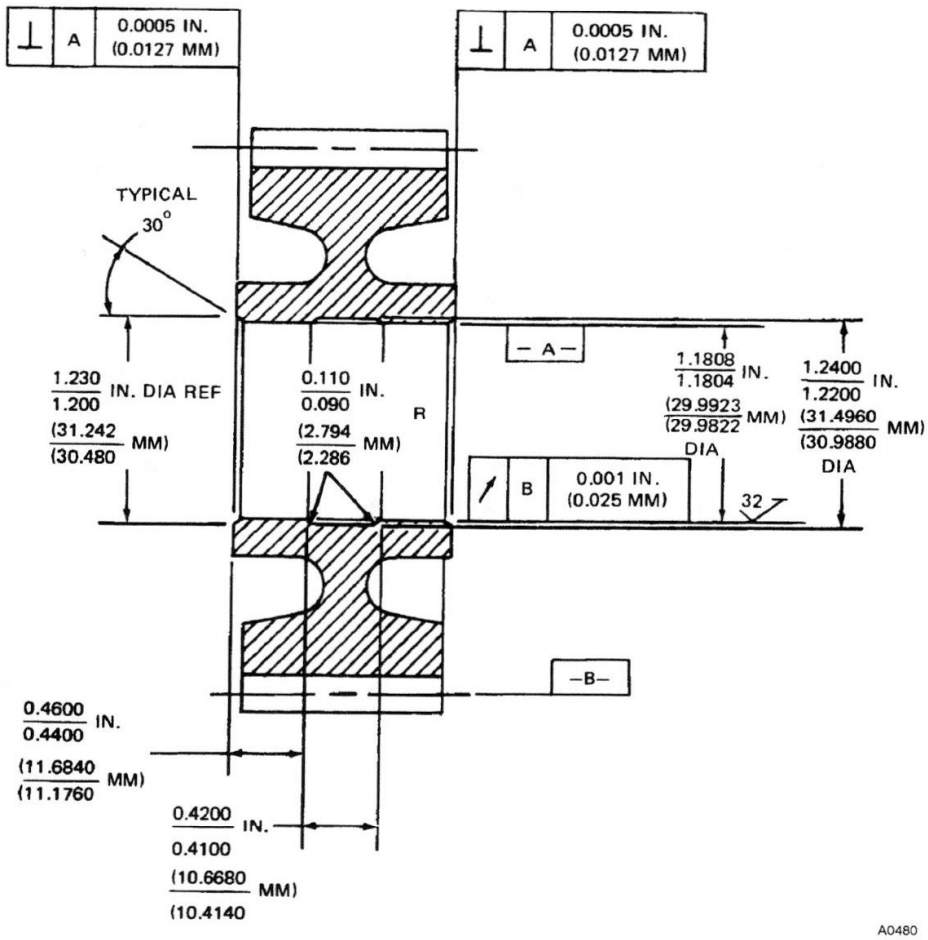
   B. Procedure

      (1) Machine area to obtain 0.002 inch (0.05 millimeter) minimum chrome-plate thickness after final machining.

      (2) Chrome-plate diameter. (Refer to, 70-35-01, SPM.)

      (3) Bake gear at 255 to 275°F (124 to 135°C) for 5 hours.

      (4) Machine to specified dimensions. (*See Figure 901.*)



Planet Gear Machining
Figure 901

PLANET GEAR – REPAIR-02

1. Refurbish Gears Showing Unacceptable Tooth Wear – Repair-02

   NOTE: Refer to Repair-00 for part number application.

   A. Equipment and Materials

      None.

   B. Procedure

      A repair is available to refurbish gears showing unacceptable tooth wear patterns, or to refurbish gears that are serviceable but would have to be scrapped due to the requirement that used planetary and sun gears remain a matched set after 50 hours of engine operation. This repair may not be used to refurbish gears that exhibit pitting on the working surfaces of the gear teeth.

      This is a controlled-source repair. For information on suppliers authorized to perform this repair, contact the following:

      Honeywell Engines, Systems & Services
      Customer Support Center
      P.O. Box 29003
      M/S 26-06/2102-323
      Phoenix, AZ 85038-9003
      Telephone: (Domestic) 1-800-601-3099 (International) 1-602-365-3099,
      FAX: 1-602-365-3343

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OIL DISTRIBUTION RING – CLEANING

1. Oil Distribution Ring (*See Figure 601*) – Cleaning

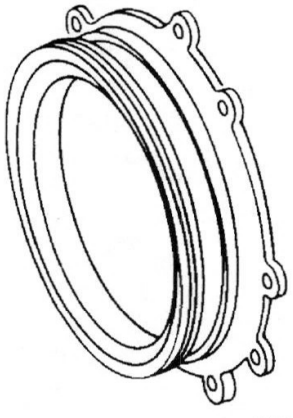
A. Equipment and Materials

Consumables:

Description	Refer To SPM 70-80-01 Group and Item Number
Dry Cleaning Solvent	07-48 or -49

B. Cleaning

Clean by pressure flushing with dry cleaning solvent.



Oil Distribution Ring
Figure 601

OIL DISTRIBUTION RING – INSPECTION/CHECK

1. Oil Distribution Ring – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

         (d) Corrosion. Local areas of corrosion are acceptable provided that after blend-repair, parent material removal does not exceed a depth of 0.015 inch (0.38 millimeter). (Refer to 70-25-01 SPM.)

      (2) Fluorescent-penetrant inspect for cracks. (Refer to 70-20-05, SPM.) Replace if cracks are noted.

PLANET GEAR RETAINING NUT – CLEANING

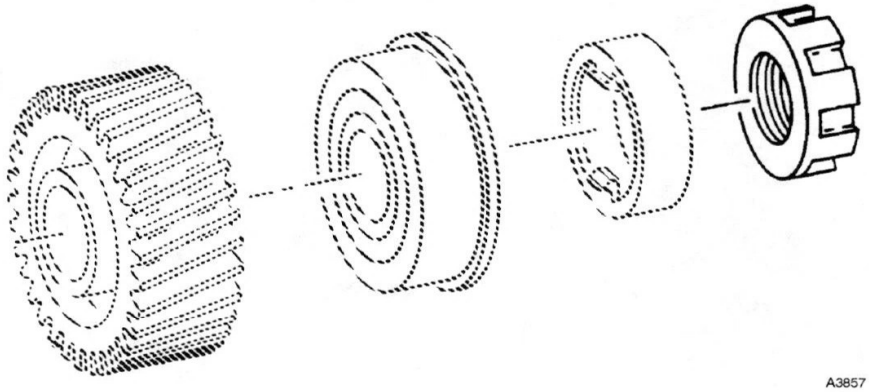
1. Planet Gear Retaining Nut (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Planet Gear Retaining Nut
Figure 601

PLANET GEAR RETAINING NUT – INSPECTION/CHECK

1. Planet Gear Retaining Nut – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Damaged threads. Repair. (Refer to 70-25-03, SPM.)

         (d) Cracks or distortion. Not acceptable. Replace.

LOCKING CUP – CLEANING

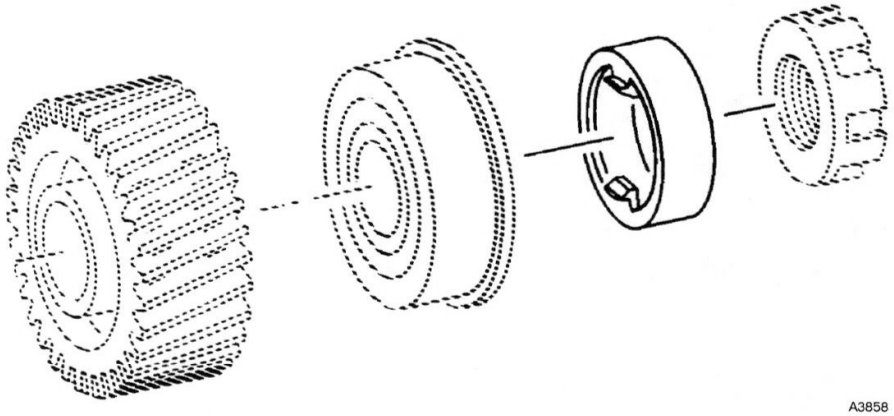
1. Locking Cup (*See Figure 601*) – Cleaning

   A. Equipment and materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



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Locking Cup
Figure 601

LOCKING CUP – INSPECTION/CHECK

1. Locking Cup – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

         (c) Cracks or distortion. Not acceptable. Replace.

ALIGNMENT SLEEVE – CLEANING

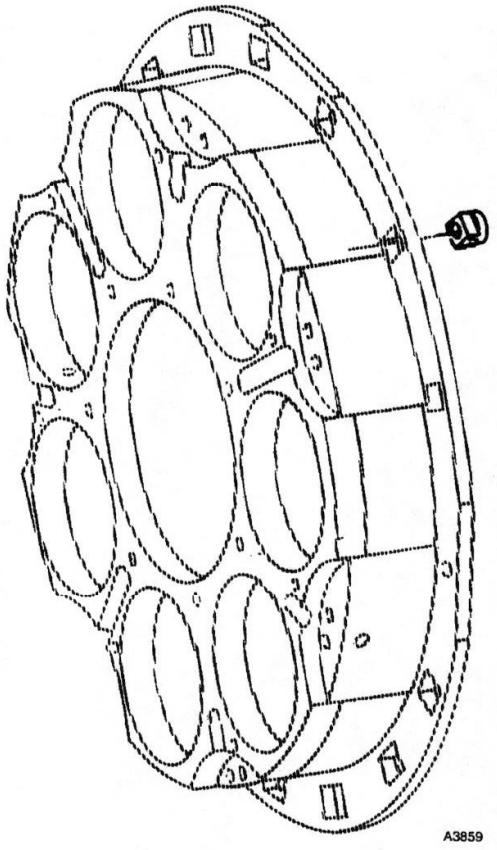
1. Alignment Sleeve (*See Figure 601*) – Cleaning

   A. Equipment and Materials

      None.

   B. Cleaning

      Clean using vapor degreasing method or dry cleaning solvent method. (Refer to 70-15-01 or 70-15-03, SPM.)



Alignment Sleeve
Figure 601

ALIGNMENT SLEEVE – INSPECTION/CHECK

1. Alignment Sleeve – Inspection/Check

   A. Equipment and Materials

      None.

   B. Inspection

      (1) Visually inspect for the following:

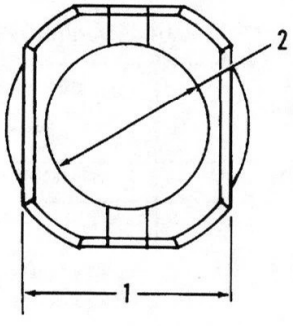
         (a) Severe damage. Not acceptable. Replace.

         (b) Nicks, burrs, and scratches. Blend-repair defects. (Refer to 70-25-01, SPM.)

      (2) Dimensionally inspect. (*Refer to Table 801 and Figure 801.*) Replace if limits cannot be met.

Table 801. Alignment Sleeve Dimensional Inspection

DIRECTION MEASURED	BLUEPRINT DIMENSIONS INCH (MILLIMETER)		SERVICE CENTER LEVEL DIMENSIONS INCH (MILLIMETER)		SEE FIGURE AND ITEM
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	
					801
Width	0.4695 (11.925)	0.4700 (11.938)	0.4690 (11.913)	0.4700 (11.938)	1
ID	0.3785 (9.614)	0.3790 (9.627)	0.3780 (9.601)	0.3790 (9.627)	2



Alignment Sleeve Dimensional Inspection Locations
Figure 801