



ALERT

COMMERCIAL ENGINE BULLETIN

Allison GAS TURBINE DIVISION

ENGINE, TURBINE - INSPECT TURBINE SHAFTING AND REPLACE
SPUR ADAPTER GEARSHAFT O-RING

1. PLANNING INFORMATION:

A. Effectivity:

All the following Model 250-C30, C30S engines installed in S-76A helicopters are affected by this bulletin; except engines having all four of the following CEB's incorporated.

<u>Model</u>	<u>Engine Serial Number</u>	<u>Turbine Serial Number</u>
(1) 250-C30, C30S	CAE 890001 through 890840, 890843 through 890847, 890849 through 890858, 890860, 890861, 890863	CAT 90001 through 90683 95001 through 95336, 95338 through 95347, 95349, 95350, 95352 through 95365, 95368, 95370, 95372 through 95374, 95376 through 95394, 95396, 95398 through 95407
250-C30, C30S	CEB 72-3096	Engine, Turbine - Exhaust Collector Modifications
250-C30, C30S	CEB 72-3100	Engine, Compressor Assembly, Spur Adapter Gearshaft - Modified by Adding Three Slots in Bore and Plugging Oil Feed Hole.
250-C30, C30S	CEB-A-72-3134	Engine, Turbine Assembly, Turbine to Compressor Coupling Shaft - Replace
250-C30, C30P, C30S	CEB-72-3059	Engine, Compressor and Gearbox Assemblies - Modify to Roller No. 2 1/2 Bearing Configuration.

B. Reason:

Leakage through the spur adapter gearshaft and turbine-to-compressor shaft joint reduces oil flow available for turbine shafting lubrication and cooling. When the O-ring between these two shafts seals properly, sufficient oil flows through the concentric gap between the gas producer and power turbine shafts to keep the shafting temperature below the carboning temperature of the oil. However, a damaged or wrong P/N O-ring may allow a significant portion of the cooling oil flow to leak back

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250-C30, C30S

CEB-A-72-3108

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1. PLANNING INFORMATION: (Continued)

into the gearbox rather than flow between the concentric shafts. The reduced oil flow between the shafts is NOT SUFFICIENT to cool the shafting below oil carboning temperatures. Carbon deposits on the O.D. of the turbine-to-compressor coupling and I.D. of the P. T. Inner Shaft and turbine-to-pinion coupling can build up until rub occurs. Continued rub could cause coupling or shaft failure.

C. Description:

1. A repetitive inspection of the power turbine and gas producer shafting is required on turbine assemblies that do not have the referenced CEB 72-3096, 72-3100, A-72-3134 and 72-3059 incorporated. The inspection is no longer required when these four bulletins are incorporated.
2. Turbine assemblies that were installed and did not have a new P/N AS3085-018 O-Ring installed (2 O-rings for P/N 23032345 coupling and 1 O-ring for P/N 6896895 or P/N 6889071 coupling) and/or did not comply with the maintenance procedures in 250-C30 Series CSL-3042 are to be inspected within the next 50 hours or 60 days whichever comes first.
3. Supplemental maintenance instructions are provided for inspection, cleaning and installation of turbine assembly, shafting and spur adapter gearshaft O-ring.

D. Approval: Technical aspects are FAA approved.

E. Compliance:

1. Inspect affected turbine assemblies per the following schedule:
 - (a) If the procedures of CSL-3042 were not used within the last 250 hours, inspect per Accomplishment Instructions of this CEB within 50 hours or 60 days, whichever comes first. Repeat inspection every 300 hours.
 - (b) If the procedures of CSL-3042 were used within the last 250 hours, inspect per Accomplishment Instructions of this CEB within 300 hours from compliance of CSL-3042. Repeat inspection every 300 hours.
2. Compliance with following CEB's (required no later than November 30, 1986) eliminates the inspection specified in this CEB.

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1. PLANNING INFORMATION: (Continued)

250-C30, C30S CEB 72-3096	Engine, Turbine - Exhaust Collector Modifications
250-C30, C30S CEB 72-3100	Engine, Compressor Assembly, Spur Adapter Gearshaft - Modified by Adding Three Slots in Bore and Plugging Oil Feed Hole.
250-C30, C30S CEB-A-72-3134	Engine, Turbine Assembly, Turbine-to-Compressor Coupling Shaft - Replace
250-C30, C30S CEB-72-3059	Engine, Compressor and Gearbox Assembly - Modify to Roller No. 2 1/2 Bearing Configuration.

F. Interchangeability: Not affected.

G. Material Availability:

<u>NEW P/N</u>	<u>NOMENCLATURE</u>	<u>QTY.</u>
AS3085-018	O-Ring	2
AS3085-158	O-Ring	1
MS21043-5	Nut	6
6874718	Gasket, Thermocouple	1
6889347	Ring, Piston Seal	2
MS9372-029	Seal	2

NOTE: Always replace the P/N AS3085-018 Spur Adapter Gearshaft O-Rings with new P/N AS3085-018 O-Rings whenever the turbine assembly is removed for any reason.

H. Tooling:

The following special tools are required:

- (1) P/N 23006785 Spur Adapter Gearshaft O-Ring Installation Tool, (see Figure 1).
- (2) P/N 23006784 Turbine-to-Compressor Installation Guide, (see Figure 2).
- (3) P/N 23006783 Turbine Upper Attach Nut Torque Adapter, (see Figure 3).
- (4) P/N 23006782 Turbine Lower Attach Nut Torque Adapter (see Figure 4).
- (5) P/N 23008710 Fixture, Holding Gas Producer Turbine Rotor (see Figure 7).

I. Weight and Balance: Not affected.

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1. PLANNING INFORMATION: (Continued)

J. Electrical Load Data: Not affected.

K. References:

250-C30 Series CSL-3042
CW 3437, CW 3452, CEB 72-3059, A-72-3134, 72-3096, 72-3100

L. Other Publications Affected:

(1) 14W2 Model 250-C30 Series Operating and Maintenance Manual.

M. Prerequisites: None.

2. ACCOMPLISHMENT INSTRUCTIONS:

Use the following procedures in conjunction with 250-C30 Series Operation and Maintenance Manual. When procedures differ, use the procedure in this CEB.

A. Inspect and clean turbine, turbine-to-compressor coupling, turbine-to-pinion coupling and spur adapter gearshaft as follows:

(1) Lock gas producer turbine rotor.

(a) Remove a thermocouple probe, using care not to damage harness. Retain bolts for reinstallation. Discard gasket.

(b) Carefully install P/N 23008710 Gas Producer Turbine Rotor Holding Fixture, or equivalent, into hole vacated by thermocouple and position to enter between two blades of second stage rotor. Turn gas producer gear train as necessary using P/N 6799790 Engine Turning Adapter. Do not use force. Install with the curved plastic covered probe towards the rear. Attach using one thermocouple attaching bolt. Holding fixture is illustrated in Figure 7.

NOTE: Equivalent tool must be of equivalent material and suitably covered to prevent damage to turbine blades. Do not use cadmium plated tools.

(2) Remove turbine assembly with G.P. rotor locked. Make sure the turbine-to-compressor coupling is not rotated from its position when the turbine assembly is removed.

CAUTION

DO NOT ALLOW THE TURBINE ASSEMBLY TO HANG ON
OR LOAD THE TURBINE-TO-COMPRESSOR COUPLING.

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

- (a) Mark the aft end of the turbine-to-compressor coupling at the 12 o'clock (top of engine) position by removing a small area of black oxide with emery cloth. This procedure will provide reassembly indexing reference in case factory match marks are no longer visible.

NOTE: If the turbine-to-compressor coupling remains installed in the turbine assembly when the turbine assembly is removed, mark the forward end of the turbine-to-compressor coupling at the 12 o'clock position, remove the coupling and transfer the mark to the aft end.

- (b) Retain turbine mounting alignment shims for reinstallation. Note the number and location. The required quantity of 0.002 in. shims is vibropeened adjacent to each turbine support leg on the forward face of the circumferential web. Shims can be in various combinations of 0.002, 0.004 or 0.008 in. thickness.
- (3) Remove turbine-to-compressor coupling and turbine-to-pinion coupling. Remove teflon ring seals.
- (4) Visually inspect the turbine-to-compressor coupling O.D., turbine-to-pinion coupling and power turbine inner shaft I.D. for carbon accumulation and signs of circumferential rubbing between turbine-to-compressor coupling O.D. and turbine-to-pinion coupling I.D. See Figure 6.
- (5) If there is indication of circumferential rub, the turbine-to-compressor coupling, turbine-to-pinion coupling and P.T. inner shaft are to be removed from service before further operation. Send turbine assembly along with affected shafting parts to an approved repair facility for repair.

CAUTION

RUB OF THE TURBINE-TO-COMPRESSOR COUPLING WITH CARBON IN THE P.T. INNER SHAFT OR TURBINE-TO-PINION COUPLING MAY PRODUCE LITTLE OR NO VISIBLE DAMAGE TO THE P.T. SHAFTING AFTER THE CARBON IS REMOVED. NEVERTHELESS, HEAT TEMPERING OF THE MATERIAL MAY HAVE OCCURRED, WHICH COULD RESULT IN SHAFT FAILURE.

- (6) If carbon accumulation is found, disassemble and clean turbine per Section 72-50-00 "Cleaning Power Turbine Labyrinth Seals".

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

- (a) Mask the No. 5 Bearing area to prevent cleaning chemicals or contamination from entering the bearing and seal area.

CAUTION

DO NOT USE CARBON REMOVING CHEMICALS ON THE
STATIONARY MEMBER OF THE LABYRINTH SEAL. CARBON
REMOVER WILL DAMAGE THE NICKEL GRAPHITE COATING.

- (b) Mask the No. 6 Bearing inner race area of the inner shaft to prevent damage during cleaning.

CAUTION

DO NOT ALLOW CLEANING CHEMICALS OR CONTAMINATION
TO ENTER BEARINGS OR CARBON SEAL AREA.

- (c) Fill the power turbine inner shaft with MEK (Methyl Ethyl Ketone) or Cities Service Solvent No. 26 and allow to soak for 60 minutes. Repeat soaking process as necessary until all carbon is removed. Use soft bristle brush as necessary. Dry with shop air.
- (7) Inspect power turbine inner shaft I.D. for corrosion pitting. If pitting is found reassemble turbine assembly and send together with turbine-to-compressor and turbine-to-pinion couplings for repair to an approved repair facility.
- (8) Soak turbine-to-compressor and turbine-to-pinion couplings in MEK, Cities Service Solvent No. 26, or equivalent, to remove carbon. Use soft bristle brush. Dry with shop air.
- (9) Clean power turbine support scavenge oil strut per Section 72-50-00 "Cleaning of Power Turbine Support Scavenge and Pressure Oil System Components".
- (10) Clean power turbine support pressure oil nozzle per Section 72-50-00 "Cleaning of Power Turbine Support Scavenge and Pressure Oil System Components".
- (11) If necessary, clean out spur adapter gearshaft I.D. using a soft swab or bristle brush and wipe with clean engine oil after cleaning. Pull carbon or sludge outwards. Do not push contamination into gearshaft. Ensure that bore and the three radial holes are clear.

CAUTION

DO NOT ALLOW CONTAMINANTS, LOOSE CARBON OR
CLEANING AGENTS TO ENTER INTERIOR OF GEARBOX.

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

- (12) If necessary clean the gas producer splined adapter locknut to expose the alignment mark which will appear as a blue gray paint dot or etched line on the chamfered face.

B. Assemble and install turbine, turbine-to-compressor coupling shaft, and spur adapter gearshaft as follows:

- (1) Reassemble turbine assembly.
- (2) Install new P/N AS3085-018 O-ring (2 O-rings for P/N 23032345 coupling and 1 O-ring for P/N 6896895 or P/N 6889071 coupling) on spur adapter gearshaft using tool illustrated in Figure 1. Lubricate liberally with clean engine oil prior to installation. Inspect each O-ring to ensure that it is symmetrically seated in it's groove and that it is not cut or mutilated.

CAUTION

ALWAYS REPLACE THE P/N AS3085-018 SPUR ADAPTER GEAR-SHAFT O-RINGS WITH NEW P/N AS3085-018 O-RINGS WHEN-EVER MAINTENANCE IS DONE IN THIS AREA AND THE O-RINGS ARE EXPOSED. USE PROPER INSTALLATION PROCEDURES.

- (3) Install turbine assembly per Section 72-50-00 "Turbine Assembly Replacement" using the following additional procedures:
- (a) Heat new teflon piston seal rings to 250°F in oil and install on turbine-to-pinion coupling. Allow to cool prior to installing coupling. Ensure rings are properly seated in grooves. If necessary heat coupling with rings installed in oil, remove from oil and allow to cool to seat rings. Lubricate liberally with clean engine oil.
- (b) The spur adapter gearshaft is marked at the aft end with any one of three methods:
1. An arrow or a dot vibropeened on the inner diameter, or
 2. A vibropeened "O" or dot on the chamfer, or
 3. A scribed mark about 1/16 in. wide on the aft face.
- (c) The turbine-to-compressor coupling is marked on the outer surface at both ends by a vibropeened "OO".

CAUTION

VIBROPEENED "O" MARKS ON THE TURBINE-TO-COMPRESSOR COUPLING ARE PROCESS MARKS AND SHOULD NOT BE CONFUSED WITH THE "OO" BALANCE MARK. THE "OO" MARKS AT EACH END ARE NOT NECESSARILY AXIALLY IN LINE WITH EACH OTHER.

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

- (d) Lubricate P/N 23006784 Guide (illustrated in Figure 2) liberally using clean engine oil and insert into I.D. of spur adapter gearshaft noting position of alignment mark.
- (e) Lubricate turbine-to-compressor coupling splines liberally with clean engine oil and slide over guide. Align alignment mark on coupling forward end with mark on spur adapter gearshaft, engage splines and push forward until O-ring is contacted. Push coupling steadily by hand to overcome O-ring resistance, until fully in. Do not hammer or use force by impact. Hold coupling in place and carefully extract guide.
- (f) Using a bright light and looking inside the bore of the power turbine inner shaft, establish the position of the alignment mark on the forward face of the gas producer turbine rotor splined adapter locknut. The mark is blue-gray paint, vibro-peened or electro-chemically etched line.
- (g) If the mark on the gas producer turbine rotor splined adapter locknut is not visible, reinstall the turbine assembly and turbine-to-compressor coupling in the same position as they were before disassembly. Do this by rotating the turbine-to-compressor coupling so that the mark made per Paragraph A.(2)(a) is aligned with the 12 o'clock (top) turbine attachment stud on the aft side of the accessory gearbox cover. Leave the turbine assembly with the G.P. rotor locked as per Paragraph A.(1)(b).
- (h) If the mark on the gas producer turbine rotor splined adapter locknut is visible, remove the gas producer turbine rotor holding fixture P/N 23008710 as installed per Paragraph A.(1)(b). Rotate the gas producer turbine rotor as necessary to align the alignment mark on the G.P. rotor splined adapter locknut with the 12 o'clock (top) turbine mounting foot. Reinstall the G.P. rotor holding fixture.
 - 1. Rotate the turbine-to-compressor coupling installed in Paragraph B.(3)(e) as necessary so that "00" alignment mark on the aft (exposed) end is aligned with the 12 o'clock (top) turbine attachment stud on the aft side of the accessory gearbox cover.
- (i) Liberally lubricate turbine-to-pinion coupling with clean engine oil and install in gearbox.
- (j) Install new P/N AS3085-158 O-ring on turbine support and exhaust collector pilot. Lubricate with petrolatum or equivalent.

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

- (k) Ensure that the proper number of P/N 23004214 (.002 in.), 23008001 (.004 in.) or 23008002 (.008 in.) shims are installed on each turbine assembly support stud on the gearbox. The required quantity of 0.002 in. shims is vibropeened adjacent to each turbine support leg on the forward face of the circumferential web. Multiply this number by 0.002 in. to get the required total shim thickness. Assemble various shim thicknesses to get the required total thickness with the least number of shims.

NOTE: At time of turbine assembly installation, use P/N 6799790 Engine Turning Adapter to ensure that the appropriate mark on the turbine-to-compressor coupling per Paragraph B., (3)(g) or (3)(h) and (3)(h)1., as applicable, is maintained at the 12 o'clock (top) position, prior to engagement with the gas producer turbine rotor splined adapter.

- (l) Support turbine assembly adequately and guide carefully over the turbine-to-compressor coupling. Do not load or damage the coupling. To engage turbine-to-compressor coupling, turn the gas producer gear train using P/N 6799790 Engine Turning Adapter. Turn counter-clockwise (viewed from the rear looking forward) only. To engage turbine-to-pinion coupling, gently rotate power turbine fourth stage wheel by hand through the exhaust.

CAUTION

DO NOT TURN GAS PRODUCER GEAR TRAIN MORE THAN NECESSARY TO ENGAGE SPLINES. DO NOT FORCE ROTATION WHILE ROTOR IS LOCKED BY GAS PRODUCER TURBINE HOLDING FIXTURE. ALIGNMENT OF ALIGNMENT MARKS SHOULD BE MAINTAINED AS CLOSELY AS POSSIBLE.

- (m) Coat turbine support stud threads lightly with anti-seize compound. Install six new P/N MS21043-5 Nuts. Torque to 120-150 lb. in (13.56 - 16.95 N·M). Use tools illustrated in Figures 3 and 4 or equivalent.

NOTE: When using an extension wrench that would change the effective length of the torque wrench, it is necessary to calculate the applied torque from the required torque. See Figure 5.

- (n) Remove P/N 23008710 Holding Fixture.
- (o) Reinstall thermocouple probe using new gasket and bolts removed in Paragraph 2.A.(1)(a). Torque bolts to 30-40 lb. in. Safety wire bolts.

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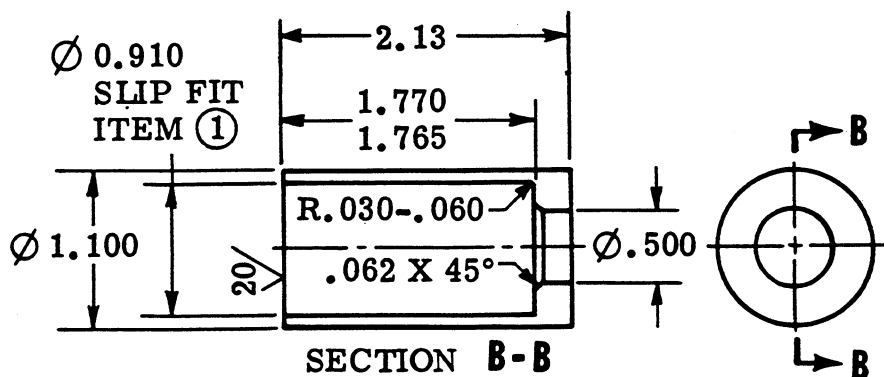
2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

(4) Change engine oil per Section 72-00-00 "Oil Change". MIL-L-23699 oils are preferred because of reduced coking and better lubricating qualities.

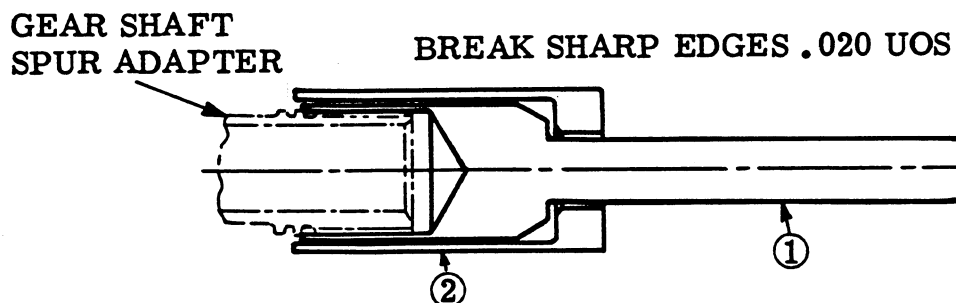
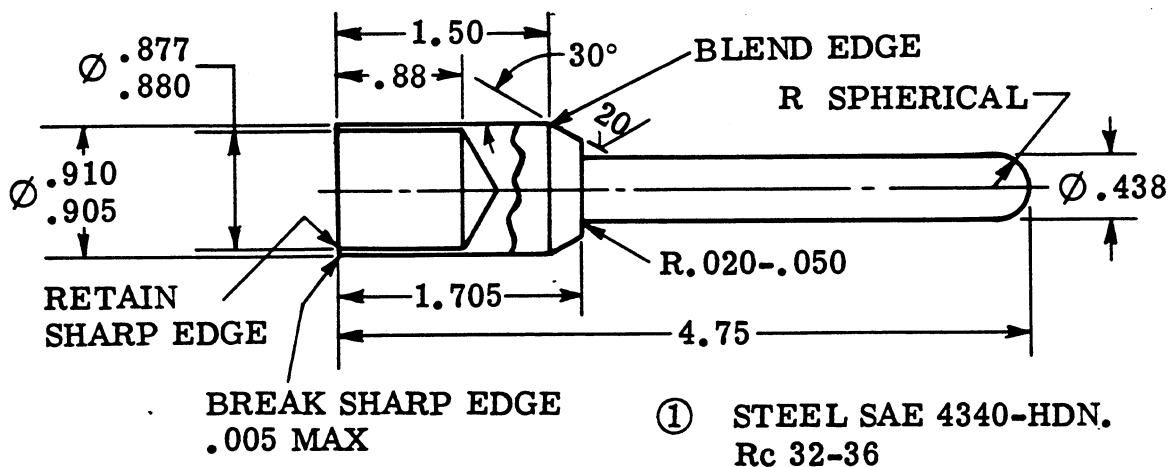
C. Record compliance with 250-C30, C30S CEB-A-72-3108, in the Engine Log Book, Turbine Assembly (pink pages), Inspection-Maintenance-Overhaul Record, Part IV.

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)



② STEEL SAE 4340-HDN. Rc 32-36

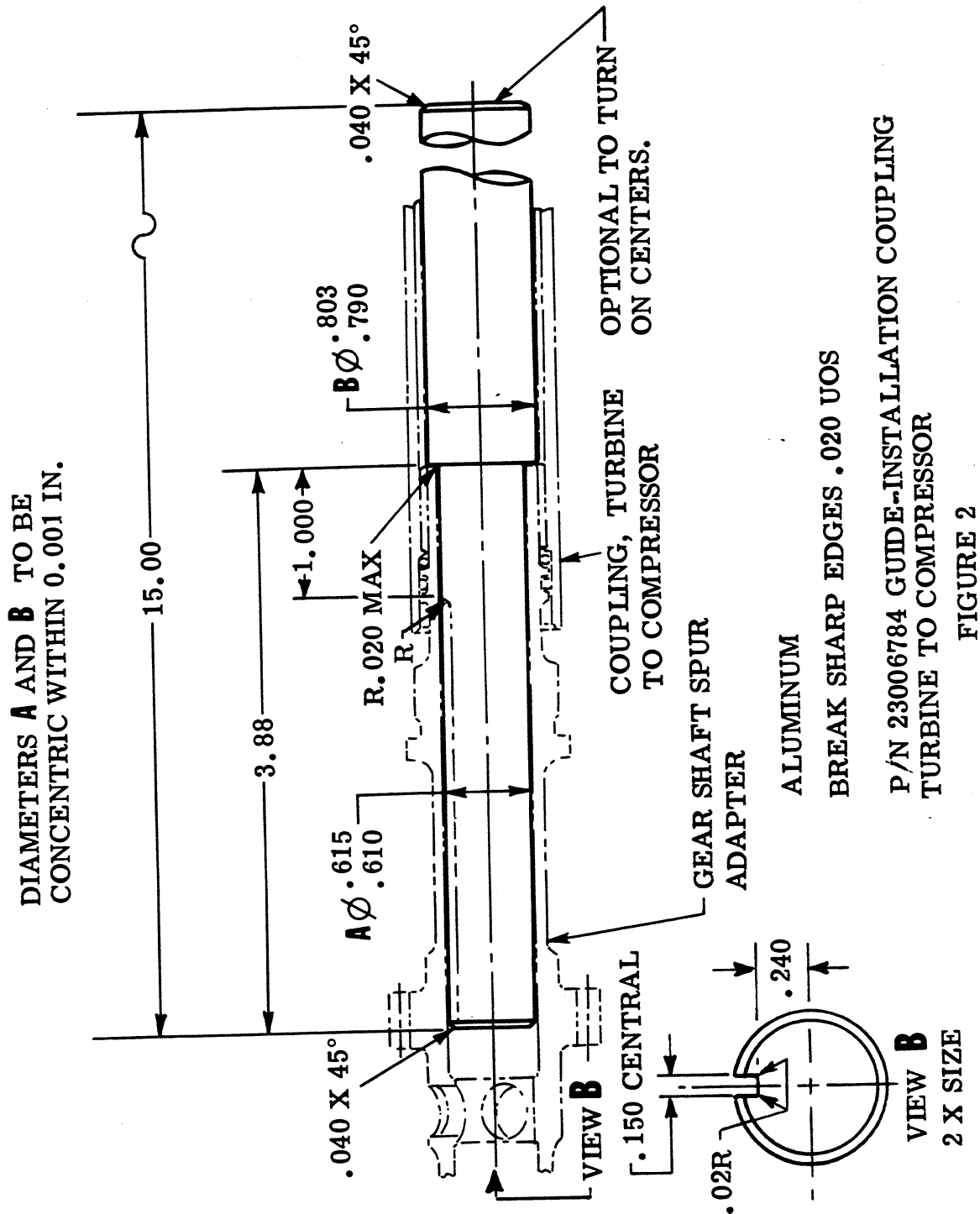


P/N 23006785 INSTALLATION TOOL - "O" RING
SPUR ADAPTER GEAR

FIGURE 1

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)



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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

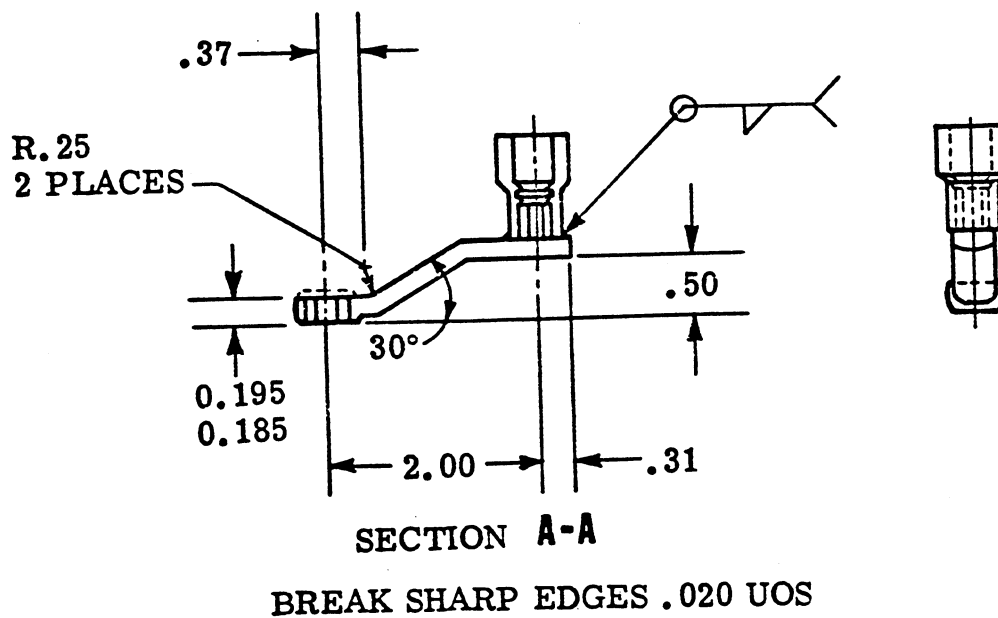
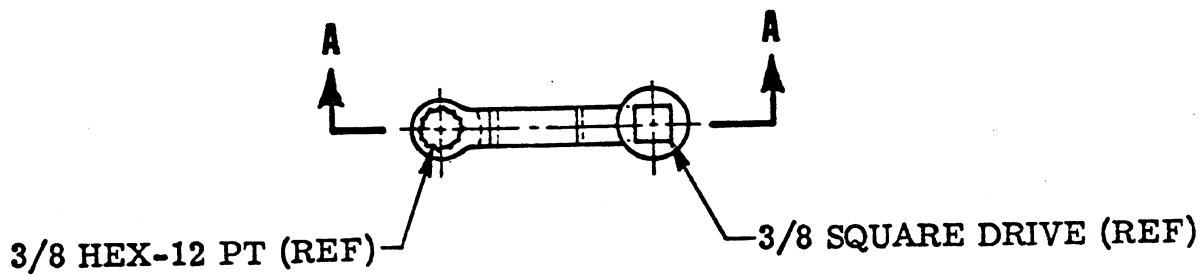
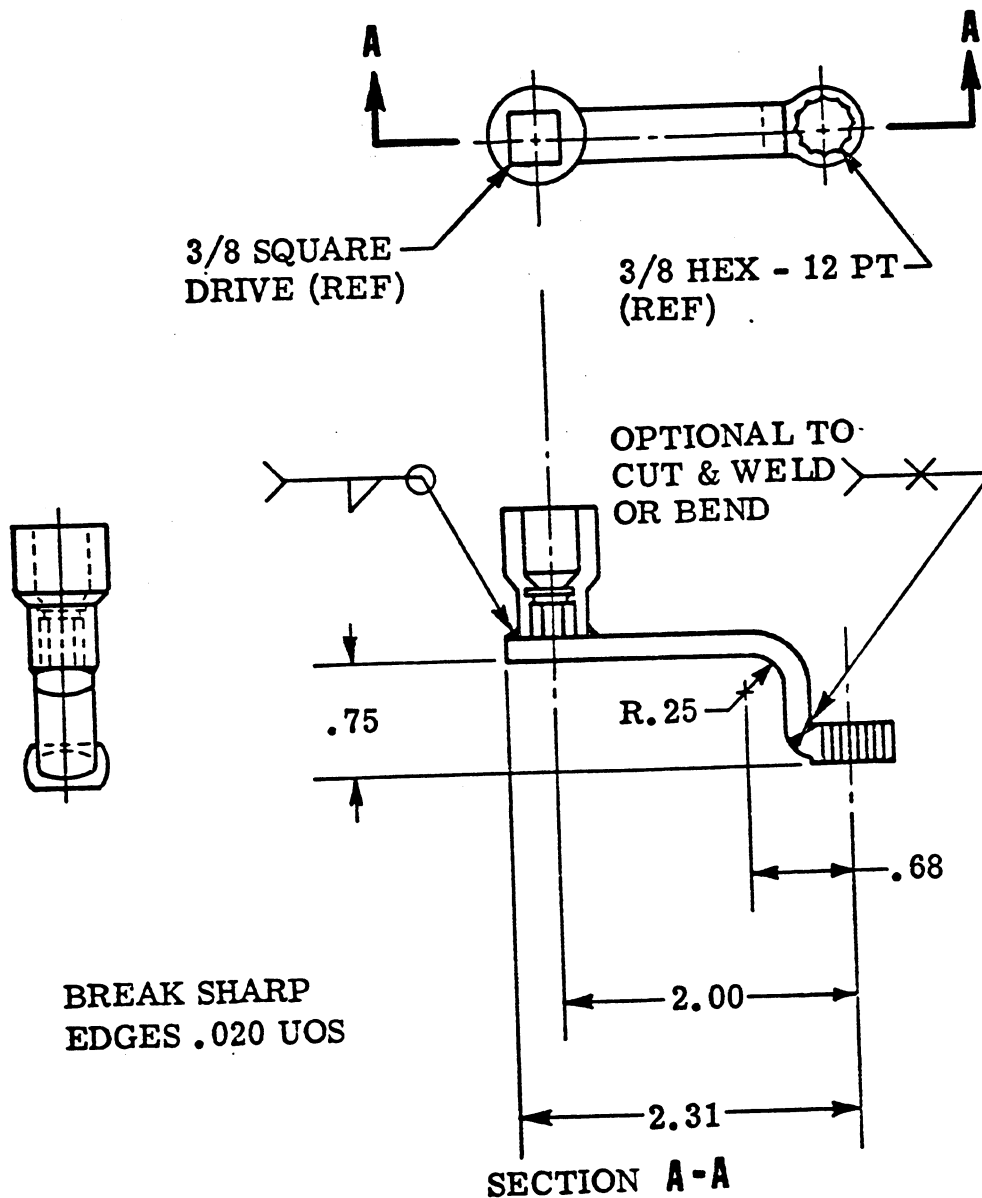


FIGURE 3
P/N 23006783 ADAPTER-TORQUE, TURBINE
ATTACH NUT, UPPER

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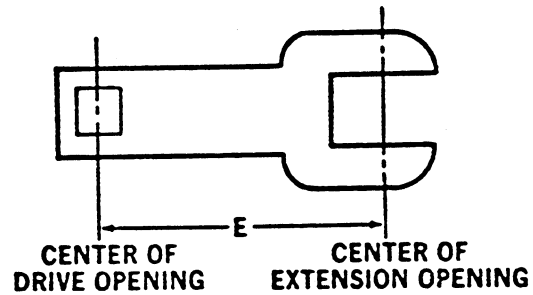
2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)



P/N 23006782 ADAPTER-TORQUE, TURBINE
ATTACH NUT, LOWER
FIGURE 4

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

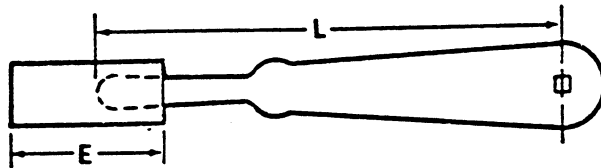


TYPICAL EXTENSION WRENCH

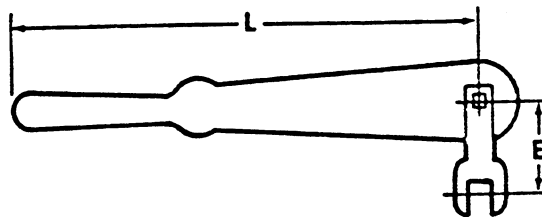
FIGURE A

EXAMPLE 1:

Effective length of torque wrench = L
Effective length of extension wrench = E



NO CORRECTION



NO CORRECTION

FIGURE B

FIGURE 5 (SHEET 1 OF 2)

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

EXAMPLE 2:

Effective length of torque wrench in inches = L
Effective length of extension wrench in inches = E

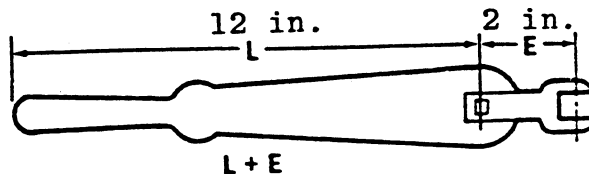


FIGURE C

Calculate applied torque:

$$\frac{\text{REQUIRED TORQUE} \times L}{(L+E)} = \text{APPLIED TORQUE}$$

- (1) Required torque = 100 in. lb.
- (2) Multiply REQUIRED TORQUE X L
 $100 \times 12 = 1200 \text{ in. lb.}$
- (3) Add L + E
 $12 + 2 = 14 \text{ in.}$
- (4) Divide (2) - (3)

$$\frac{1200}{14} = 85.72 \text{ in. lb. APPLIED TORQUE}$$

Apply 86 in. lb. at torque wrench to obtain required 100 in. lb.

EXAMPLE 3:

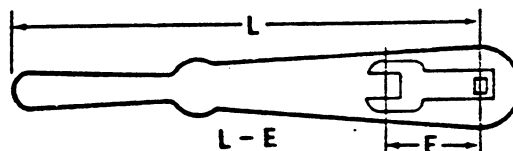


FIGURE D

$$\frac{\text{REQUIRED TORQUE} \times L}{(L-E)} = \text{APPLIED TORQUE}$$

$$\frac{1200}{10} = 120 \text{ in. lb. APPLIED TORQUE}$$

Apply 120 in. lb. at torque wrench to obtain required 100 in. lb.

FIGURE 5 (SHEET 2 OF 2)

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)

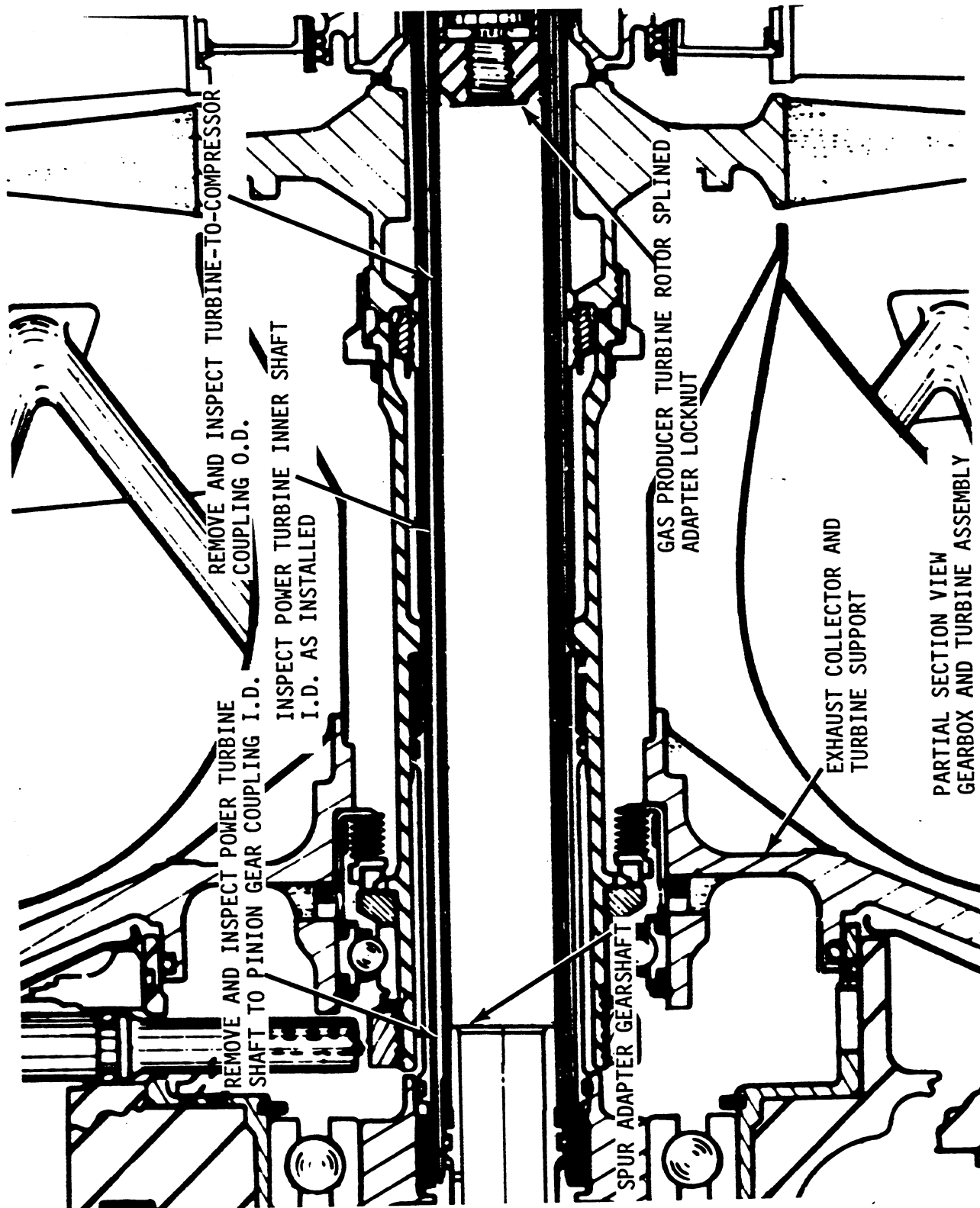
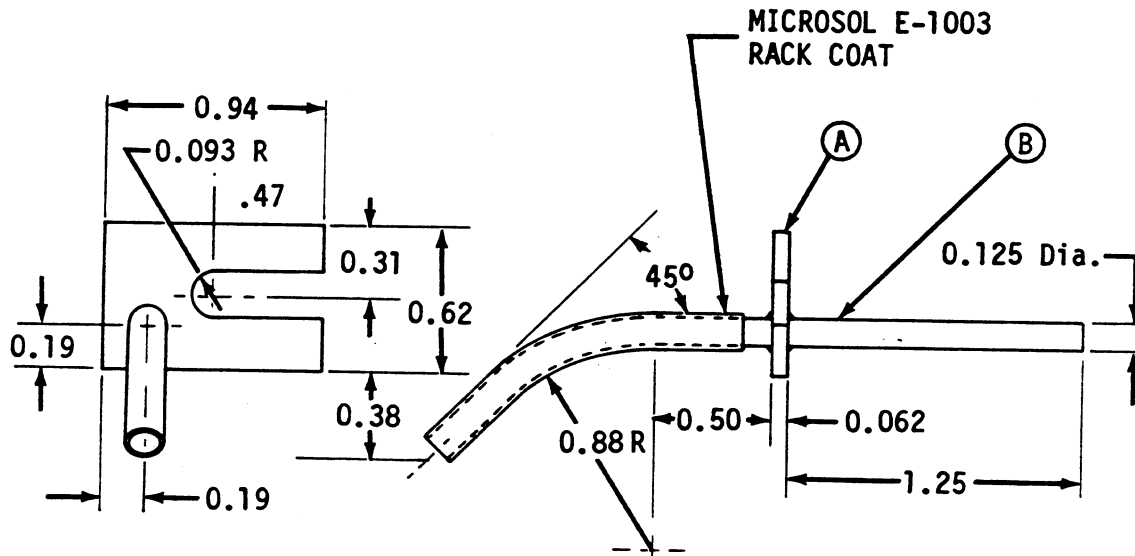


FIGURE 6

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2. ACCOMPLISHMENT INSTRUCTIONS: (Continued)



① (1) REQ'D. - BRAZED CONSTR.

(A) 1 REQ'D - .062 x .62 - 1.06 -STEEL

(B) 1 REQ'D .125 DIA. X 3.12 LG. BRASS

P/N 23008710 FIXTURE - HOLDING GAS PRODUCER TURBINE ROTOR
FIGURE 7

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3. MATERIAL INFORMATION:

- A. Basis for quantities is per engine assembly.
B. Bill of material:

<u>New P/N</u>	<u>Qty</u>	<u>Nomenclature</u>	<u>Old P/N</u>	<u>Qty</u>	<u>Instructions/ Disposition</u>
AS3085-018	2	O-Ring	AS3085-018	1	1
AS3085-158	1	O-Ring	AS3085-158	1	1
MS21043-5	6	Nut	MS21043-5	6	1
6874718	1	Gasket, Thermo- couple	6874718	1	1
6889347	2	Ring, Piston Seal	6889347	2	1
MS9372-029	2	Seal	MS9372-029	2	1

INSTRUCTIONS/DISPOSITION NOTES:

1. Scrap removed item.

PRODUCT SUPPORT
Allison Engine Company