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Work Aid Document: T-001
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Aligning the TH-28/480 Series Lower Drive System

1. Purpose:
 1. The purpose of this document is to provide additional reference information for aligning the lower drive system in the TH-28/480 Series helicopters. Use this document as additional reference information for the TH-28/480 Series Maintenance Manual instructions.
2. Preparation for Alignment (Refer to paragraph 11-17,A):
 1. Disconnect the engine ignition harness from the exciter box and remove the exciter box. The ignition harness can be damaged if it is connected to the exciter box when the exciter box is not installed on its mounts.
 2. If the lower pulley assembly is not installed in the aircraft, disassemble the aft coupling and reassemble it for alignment on the bench before installing the lower pulley assembly in the aircraft.
 3. When reassembling the aft coupling for alignment, all three spacers on the front side of the flex pack must be of equal thickness, and all three spacers on the aft side of the flex pack must be of equal thickness (See Figure 1).
 4. Depending on the measuring tools used to determine the flange spacing for axial alignment, use thinner spacers (of equal thickness) on one side of the aft flex pack to move the power output shaft flange and the lower pulley drive shaft flange closer together. Use thicker spacers to move the flanges farther apart.
 5. Disconnect the tie rods from the lower pulley assembly (See Figure 2).
3. Upper and Lower Pulley Alignment (Refer to paragraph 11-17,B):
 1. Using a combination square and a piece of chalk, mark an indexing line across the belt for checking belt tension during the tension and alignment procedure. Do not put the indexing line near the part number/serial number markings.
 2. Rotate the pulley system a minimum of one complete belt rotation after make a tension adjustment before checking belt tension.

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3. Belt tension range is 1,750 - 2,500 pounds (SIL T-016). Tension on the front side of the belt must be within \pm 500 pounds of the aft side.
 4. Ensure the alignment tool is contacting the upper pulley and lower pulley (See Figures 3 and 4).
4. Power Output Shaft to Lower Pulley Drive Shaft Alignment (Refer to paragraph 11-17.C):
1. The lower pulley system is a pendulum and movement is in an arc.
 2. Acceptable alignment is achieved when the bolt can be threaded into the power output shaft flange using finger pressure (See Figures 5 and 6).
 3. The engine hangs from the engine mounts. The vertical position of the engine is changed by adjusting the shim thickness between the pylon mounts (bi-pod on the left side and tri-pod on the right side) and the mounts installed on the engine (See Figures 7 and 8). The upper engine mount will support the weight of the engine; however, the purpose of the mount is to maintain the parallel alignment of the engine to the main rotor transmission and the lower pulley drive system.
 4. When adjusting the engine position, loosen the nut and jam nut on the top engine mount enough to allow the engine to drop approximately .060 inches before loosening the side mounts (See Figure 9).
 5. Adjust the shimming on the bi-pod mount (left side) before adjusting the tri-pod mount. Push on the engine fire pan in the area of the droop compensator bracket to help get the mount bolt installed or removed. Once the shims and the mount bolt are reinstalled, tighten the mount bolt assembly and then loosen one or two turns of the nut - the tri-pod mount does not allow much movement of the engine; loosening the bi-pod mount helps when adjusting the shimming on the tri-pod mount.
 6. When the shimming is correct, torque the side mount bolt assemblies. Turn the top engine mount nut until it contacts the top pylon mount and then tighten one more flat. Tighten the jam nut against the mount nut and lock wire to the nuts to the engine mount (See Figure 9).
 7. Use both tie rods when adjusting the lateral alignment of the lower pulley drive shaft to the power output shaft. Once the bolt can be threaded into the power output shaft, fine adjustments can be made with the help of a second person. As the bolt is slowly being threaded into the power output shaft, the second person slight adjusts the front tie rod as required for the bolt to freely thread into the power output shaft (See Figures 10 and 11).

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8. Axial alignment between the power output shaft and the lower pulley drive shaft is obtained by adjusting the aft tie rod. Use feeler gauges, telescoping gauges, gauge blocks, or other measuring device to determine the distance between the flanges at the 9 o'clock and 3 o'clock positions (See Figure 10 for 9 o'clock position; 3 o'clock position opposite).
5. Oil Cooler Blower Shaft Alignment (Refer to paragraph 11-17,D):
 1. Install the intermediate drive shaft onto the end of the lower pulley assembly using the T-0166 - Alignment Spacer(special tool) instead of the flex pack assembly (See Figures 12, 13, 14, 15, and 16).
 2. The slots on the bearing housing supports may be elongated if more lateral adjustment is required for alignment (Refer to SDB T-017).
 3. The tolerance for the distance between the flange faces ($\leq .005$ inches) is the same for the lateral position and vertical position.
 4. Adjust the position of the blower shroud as required after completing the oil cooler blower shaft alignment.
 6. Lower Drive System Reassembly (Refer to paragraph 11-17,E):
 1. Reassembly the lower pulley aft coupling using .250 inch spacers, P/N 4130521-25, between the flex pack and the flanges of the hub and the pulley shaft (See Figure 17).
 2. Determine the spacer thickness required between the forward flex pack and the flanges on the shafts using the following formula:
$$\frac{\text{Flange Distance minus Flex Pack Thickness}}{2}$$
 3. Measure the flange distance with the flanges aligned at the 9 o'clock position.
 4. The spacers, P/N 4130521-XX, are available in thicknesses between .090 to .250 inch in .020 inch increments. AN960C516L washers (.016 inch thick - nominal) may be used as required for additional shimming between the flanges and the flex pack. If required, install the washers between the shaft flange and the spacer; do not install the washers between the spacer and the flex pack.

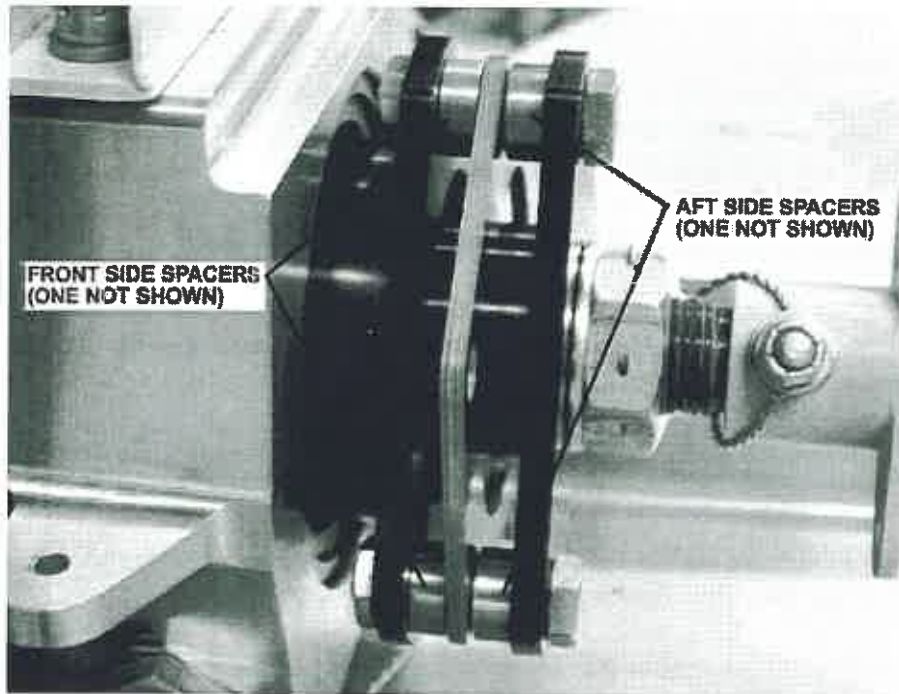


Figure 1 - Aft Coupling Assembled for Alignment

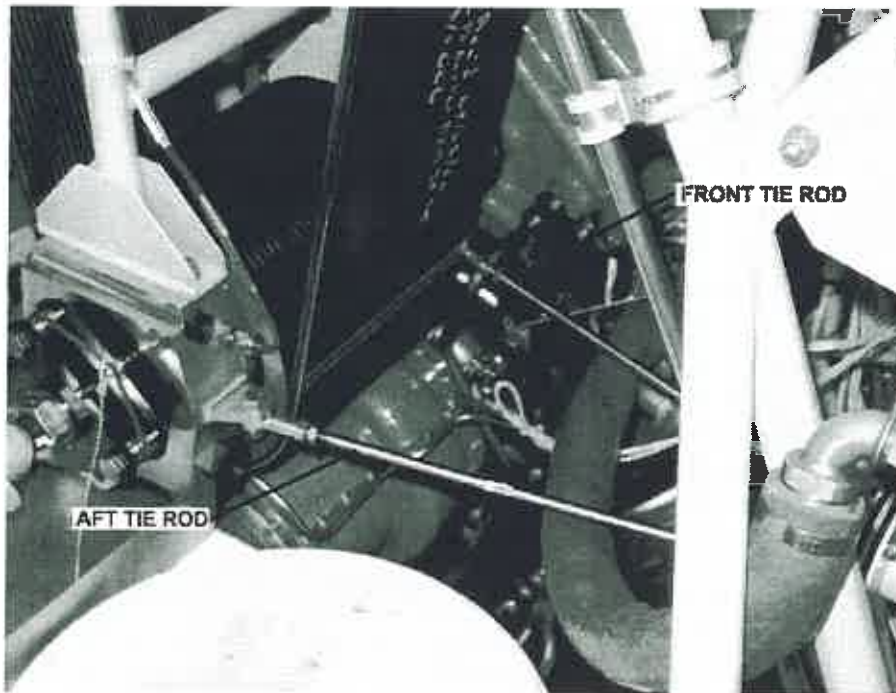


Figure 2 - Lower Pulley Tie Rods

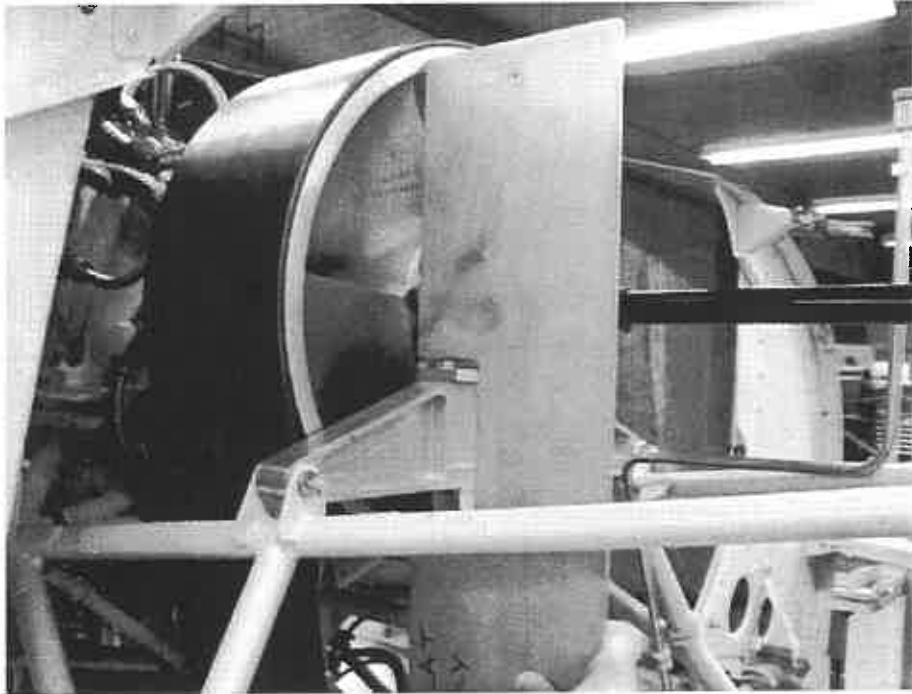


Figure 3 - Alignment Tool at Upper Pulley

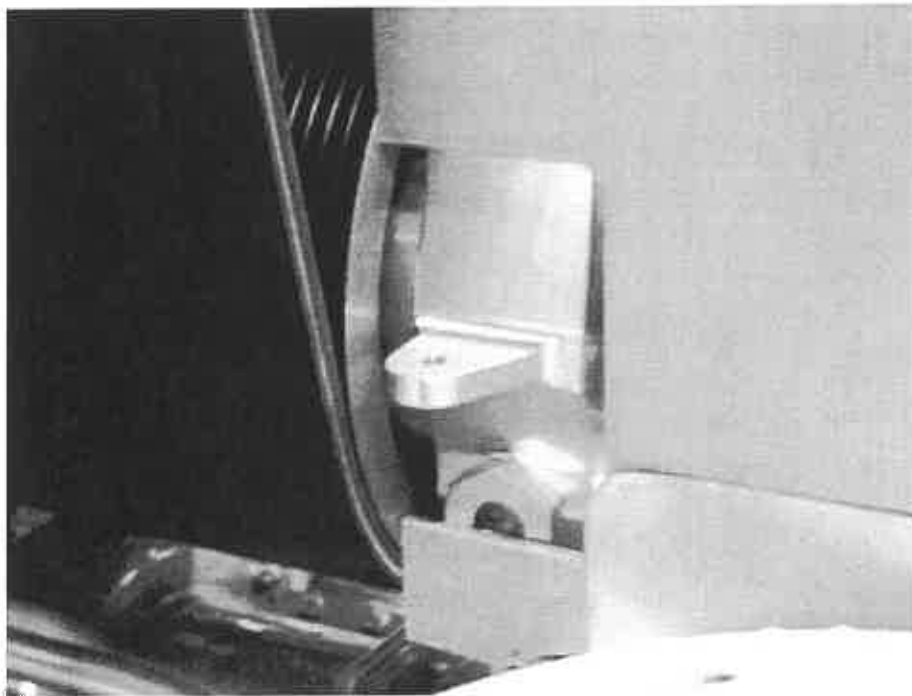


Figure 4 - Alignment Tool at Lower Pulley



Figure 5 - Engine to Lower Pulley Alignment (Engine Low)

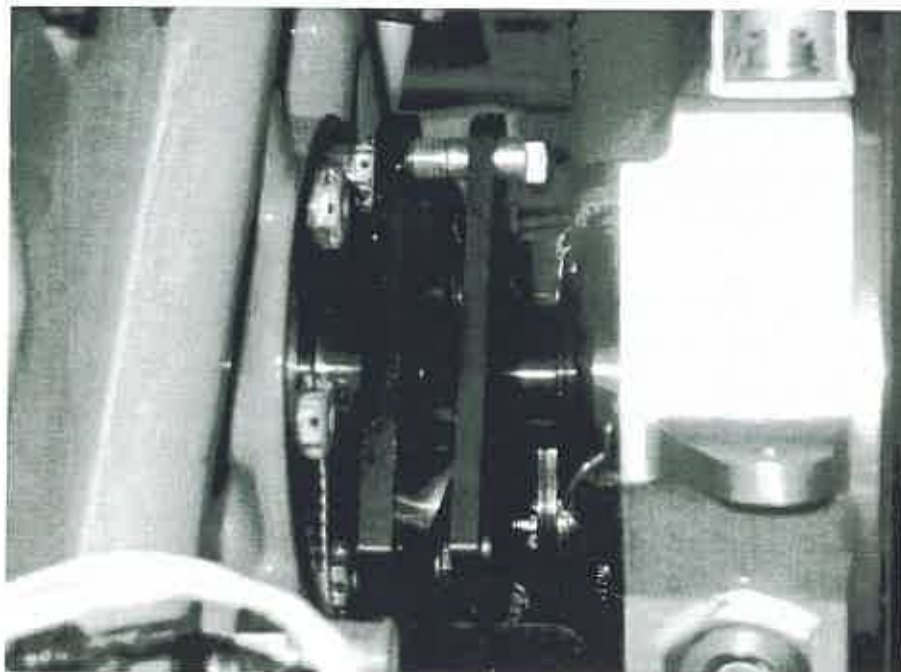


Figure 6 - Engine to Lower Pulley Alignment (Aligned)

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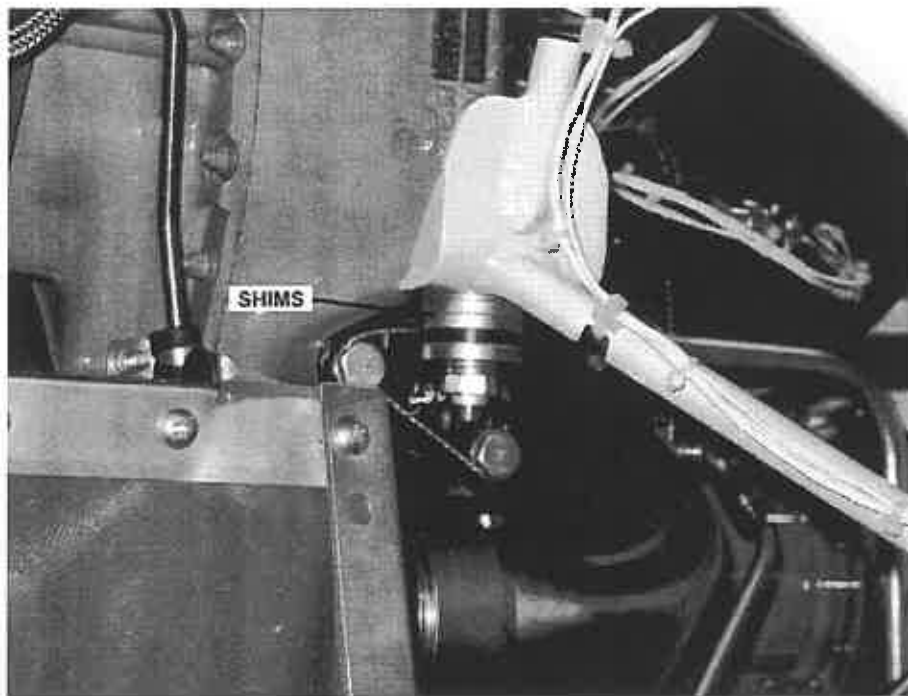


Figure 7 - Engine Bi-Pod Mount

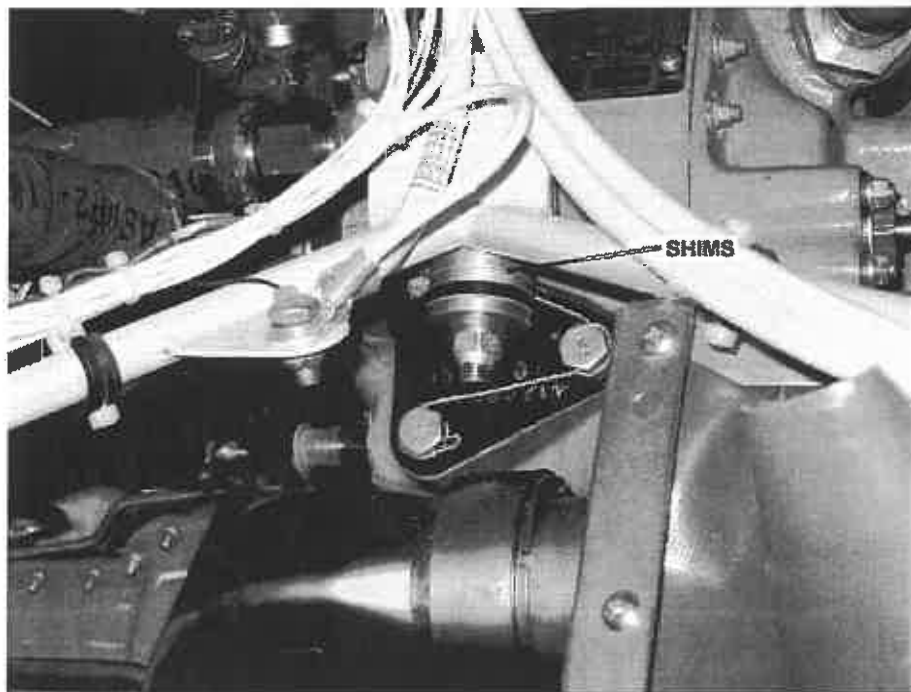


Figure 8 - Engine Tri-Pod Mount

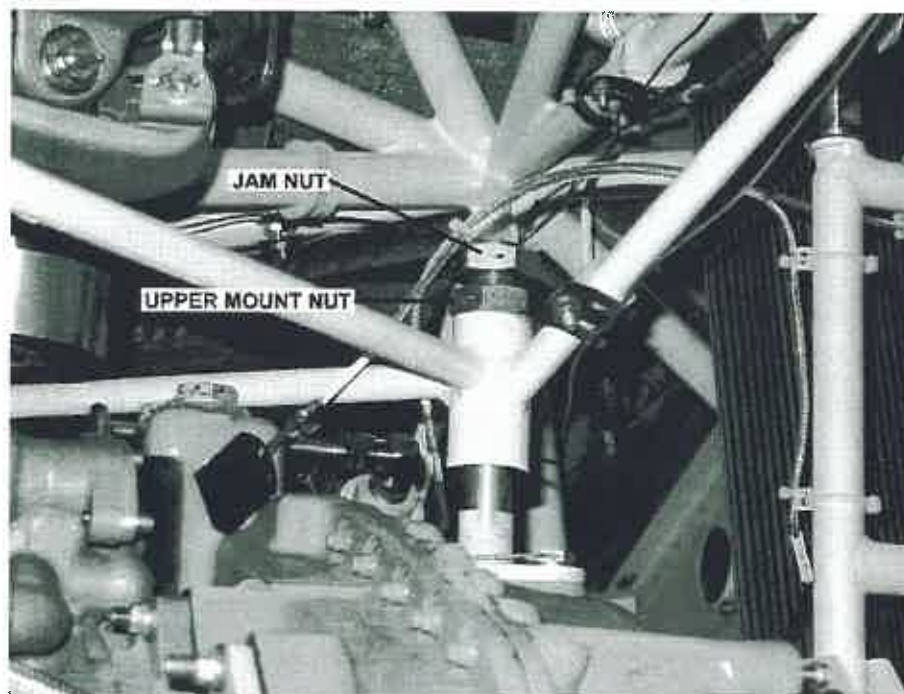


Figure 9 - Engine Upper Mount

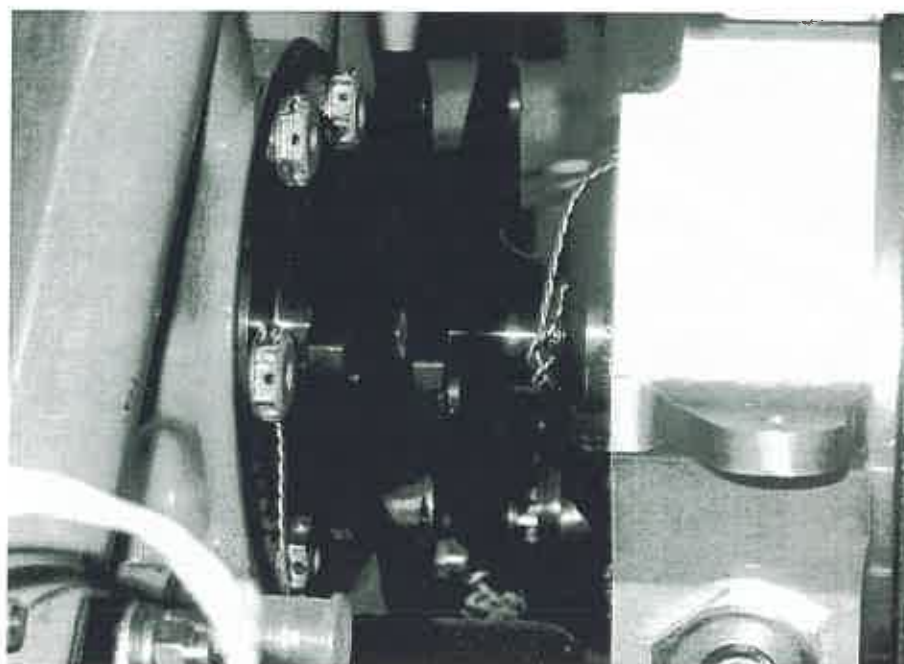


Figure 10 - Flange Position for Lateral and Axial Alignment Check

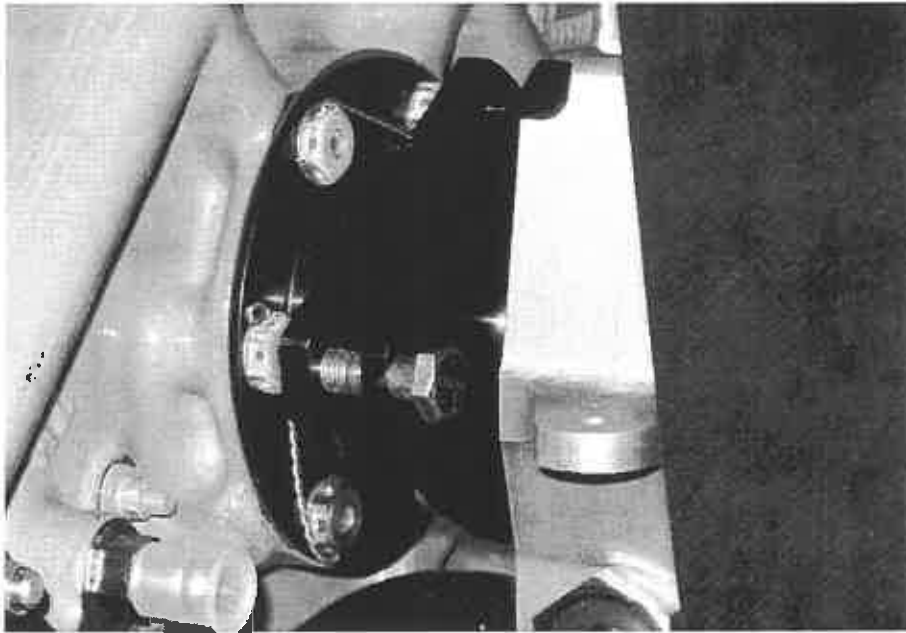


Figure 11 - Lateral Alignment (Aligned)

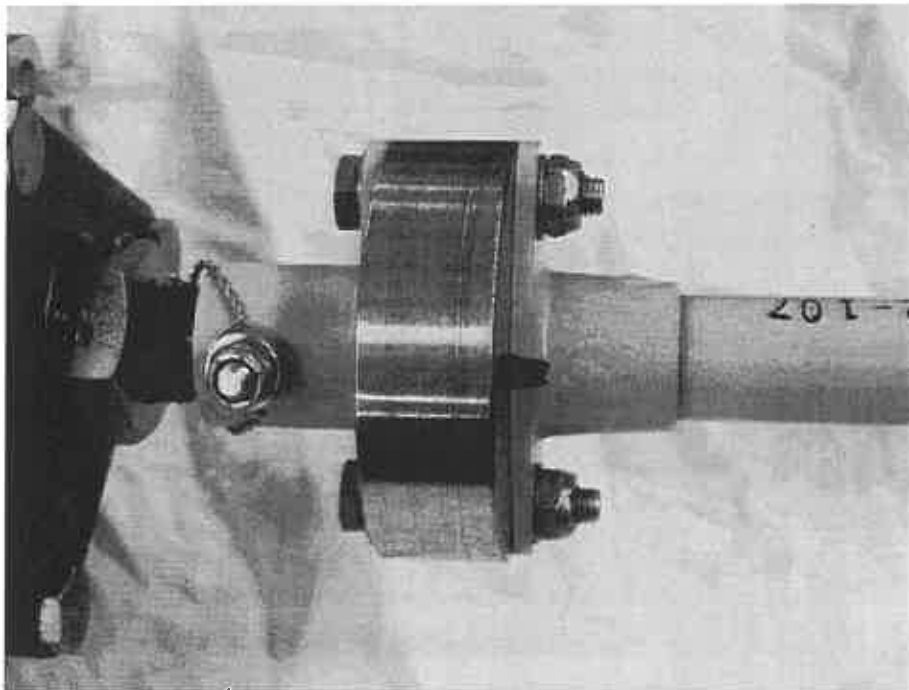
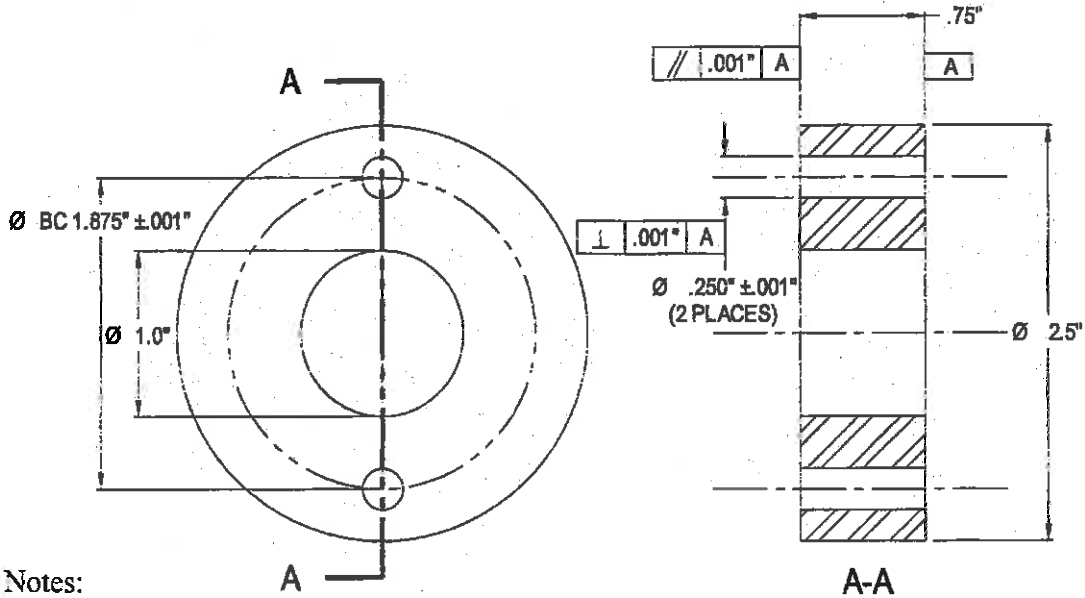


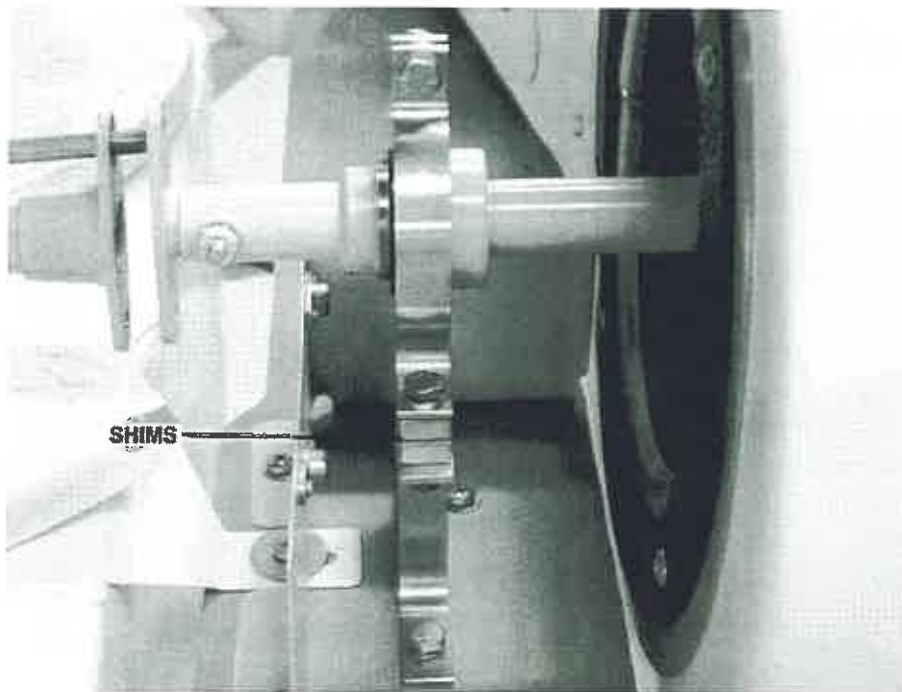
Figure 12 - Intermediate Shaft Installed with T-0166, Alignment Spacer



Notes:

1. Make from steel or aluminum.
2. Break all sharp edges.

Figure 13 - T-0166, Alignment Spacer



Note vertical misalignment

Figure 14 - Oil Cooler Blower Forward Mount

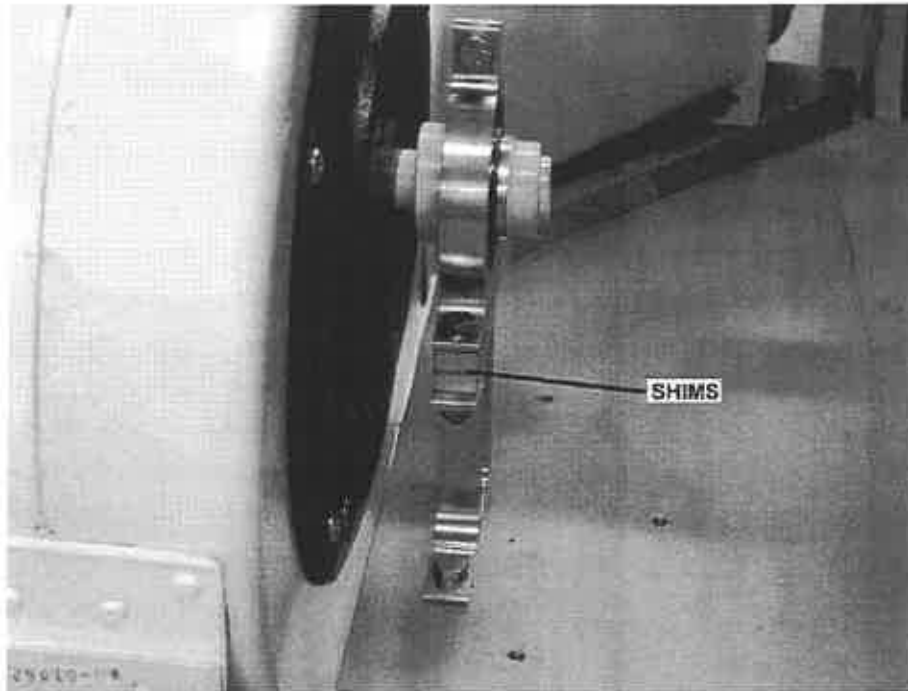


Figure 15 - Oil Cooler Blower Aft Mount

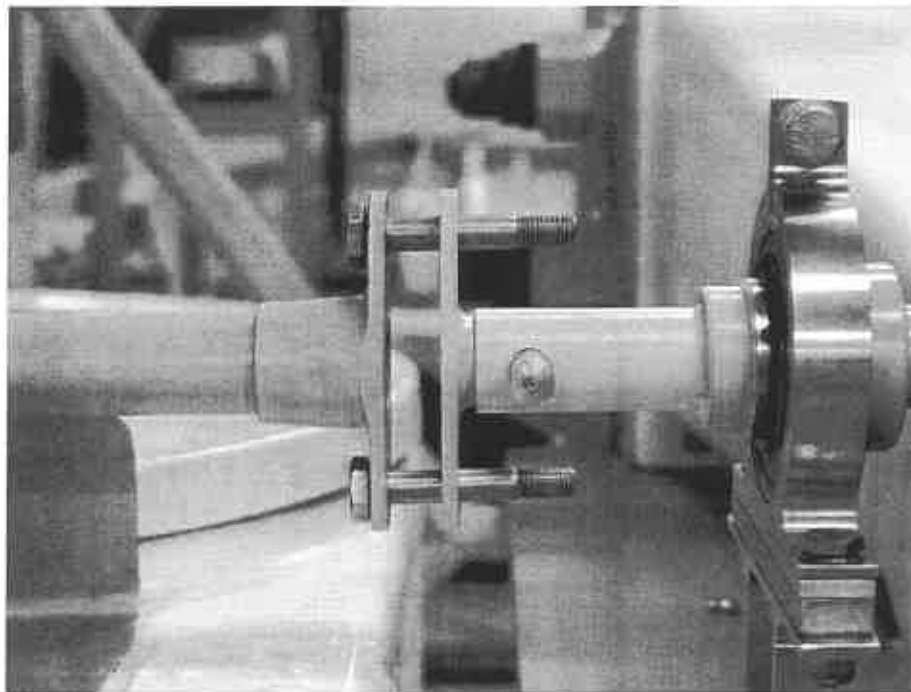


Figure 16 - Oil Cooler Blower Shaft Vertically Aligned

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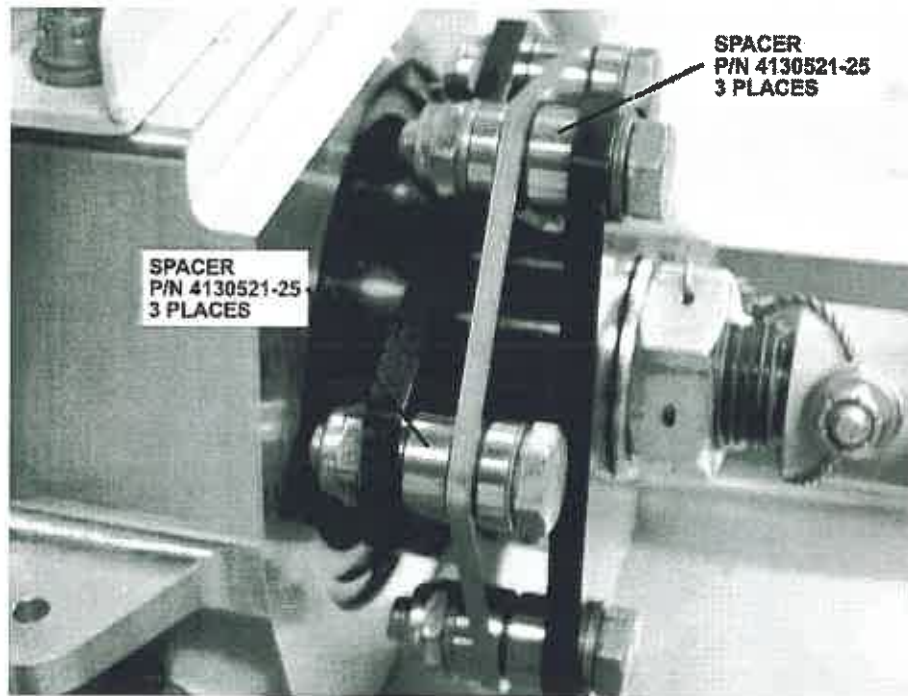


Figure 17 - Aft Coupling Normal Installation

Checklist for Belt Tension and Pulley Alignment

1	Remove side cowlings, discharge tubes, and baggage compartment forward bulkhead.
2	Remove upright stiffener for baggage door hinge attach if applicable.
3	Remove dog house scupper covers, (4 black plastic and aluminum parts).
4	Remove air conditioning compressor if installed.
5	Remove igniter box and blower support covers.
6	Make a drawing of the flex plate and shim installations.
7	Remove blower short shaft and flex plates.
8	Remove the forward pulley drive shaft flex plate.
9	Lock up the aft pulley drive flex plate couplings to make the assembly rigid for alignment.
10	Connect the lower pulley link rods, if disconnected.
11	Set the pulley alignment.
12	Tension belt while maintaining alignment... target 2300 lbs.
13	Check vertical alignment between engine drive shaft and pulley drive shaft.
14	Shim engine if necessary.
15	Check the horizontal alignment between the engine drive shaft and the pulley drive shaft.
16	Correct the horizontal alignment with the forward pulley link rod if necessary.
17	Check the lateral parallelism of the two drive shafts.
18	Correct the lateral parallelism of the two drive shafts using the aft pulley link rod.
19	Re-check the horizontal alignment if the aft link rod is adjusted.
20	Re-check the vertical alignment between the engine and pulley driveshafts.
21	Re-check the pulley alignments.
22	Install tool # T-0166 on the blower flex plate coupling on the aft end of the pulley driveshaft.
23	Install the blower short shaft to the tool T-0166.
24	Check that the TIR of the short shaft is within limits.
25	Check the vertical alignment of the blower shafts at the coupling.
26	Correct for vertical misalignment by shimming forward blower support as necessary.
27	Check the vertical parallelism between the two couplings using a feeler gauge or caliper.
28	Correct for out of parallel by shimming the aft blower support as necessary.
29	Check the horizontal alignment of the two blower couplings.
30	Correct out of alignment by shifting the lower support attachment on the baggage floor.
31	Check for horizontal parallelism of the two blower couplings.
32	Correct for out of parallel by shifting the aft blower support as necessary.
33	Remove short shaft and tool # 0166.
34	Return the aft pulley flex plate couplings to their original configuration.
35	Install the aft blower short shaft and flex plates.
36	Install the forward flex plate to the pulley drive shaft.
37	Attach the flex plate to the engine drive shaft, adjust shim thickness as req.
38	Secure the engine mount, H strut adjusters, and flex plate bolts as required.
39	Install the igniter box.
40	Install air conditioning compressor if applicable.
41	Install the discharge tubes, oil cooler duct, blower support covers, dog house scupper parts.
42	Install baggage hinge support, and baggage compartment bulkheads.
43	Ground run and check lower pulley assembly for abnormal vibration.
44	Install side panels.
45	Update log card for belt maintenance.

