

»» Service Letter

Technical Aspects are FAA Approved

Number: L99-19 B

Replaces ServL 99-019A

Date: 07/15/2004

Subject: Overhaul and repair of Superior connecting rods

Application: A complete listing of engine eligibilities and replaced OEM part numbers may be found in Superior Service Letter No. L99-18, latest revision.

Compliance: Any time the above connecting rod assemblies are removed for inspection, overhaul or repair.

This Service Letter provides the specific information required to inspect, overhaul and repair the listed Superior Air Parts, Inc. connecting rod assemblies. Differences between these connecting rods and the original equipment manufacturer's connecting rods, as it may pertain to inspection, repair and overhaul are covered. Specific procedures that are not addressed in this Service Letter are referred to the applicable procedure in the original equipment manufacturer's current overhaul manual or other approved service documents. The connecting rod assemblies are identified by part number, etched along the outside flange of the rod, as shown in Figure 2.

Visual Inspection:

Superior connecting rods are, except for the forged pockets in the rod beam section, fully machined and polished. These rods are all of the latest and strongest tongue and groove cap design. In this respect, Superior tongue and groove connecting rod assembly P/N's SL11750 and SL78030 differ from the Lycoming P/N's LW-11750 and 78030, which are not tongue and groove design. Under proper operating and assembly conditions, all Superior connecting rods should remain serviceable for an indefinite period. However, conditions, such as under-torqued rod bolts, overspeed, excessive manifold pressure operation and prop strikes, can result in unacceptable damage to the rod. When such damage is found, the rod must be repaired where possible or replaced. In no case should unacceptable rods be returned to service.

Visually inspect the outer body of the rod for cracks, nicks and dents. Small nicks and dents should be polished out as described in the Repair and Overhaul section. This should be done before MPI.

Visually inspect the mating surfaces between the rod and cap. Fretting (i.e., any evidence of movement or wear) on these surfaces indicates relative movement and damage to precise mating surfaces. Such damage will be cause for rejection of the rod.

Visually inspect the large end bore for galling (refer to the Non-Destructive Testing section below). Evidence of galling will require machining the bore to .010 inch oversize, as described in the Repair and Overhaul section.

Dimensional Inspection:

Measure the pin end bore at two points, 90 degrees apart, 1/8 inch in from each end and at the center of the bore. The acceptable dimensions, both with and without the bushing installed, are given as Diameter "C" and Diameter "C" Less Bushing", in Table 1. If diameter "C" is over the serviceable limits (refer to Note 1), the bushing must be replaced. See the Repair and Overhaul section below.

With the rod bolts properly torqued, measure the large end bore at three points, one at 90 degrees to the parting line and at 45 degrees either side of the 90 degree measurement. It is recommended that these measurements be made 1/8 inch in from each side and at the center of the bore. The acceptable limits for the large end bore, "Diameter "D" is given in Table 1. Both standard size and plus .010 inch oversize dimensions are given. All measurements must be within the limits given (no averaging is allowed).

Standard size rod bores, which do not meet acceptable limits, are subject to being machined to plus .010 inch oversize as described below. However, extreme caution is advised to assure that the cause of the discrepancy is not wear or damage to the mating surfaces of the rod and cap (see visual inspection, above). Plus 010 inch oversize rod bores which do not meet the limits in Table 1 must be rejected.

Parallelism and twist in the rod assembly must be checked and are critical to prevent abnormal wear of bearings, pistons and piston pin thrust buttons. Many unexplained wear problems are linked to bent and twisted rods or rods that have the pin bushing bore finished out of parallel with the big end bore. Inspection of these features requires access to either the connecting rod gage described in the OEM Overhaul Manual or to a surface plate, precision square and dial indicator graduated in .0001 of an inch. Limits for twist and parallelism are given in Table 1. The rod bolts must be properly torqued during the testing.

If the connecting rod gage described in the OEM Overhaul Manual is available, the following procedure will be used. With the rod installed on the gage, the difference between Dimensions "A" and "B", in Figure 2, must not vary more than .001 inch per inch of separation between the points at which "A" and "B" are measured. In other words, if "A" is measured 3 inches on one side of the rod and "B" is measured 3 inches on the other side, a spread of 6 inches, then "A" must equal "B" within .001 X 6 or .006 inch or less. If the difference exceeds .001 inch per inch, the rod must be rejected.

Using the gage, twist is measured in a somewhat similar manner, except the relative rotation of the pin bushing bore is measured by laying the rod and gage on two parallel bars. With the gage member in the large end bore resting firmly on both parallel bars, if the rod has no twist, the gage member through the pin bore will also rest firmly on the parallel bars at both ends of the gage member. If the rod is twisted (see Figure 3) there will be a gap under one end of the gage member through the pin bore. This gap is measured with a feeler gage. The gap may not exceed .0012 inch per inch of separation between the two parallel bars. Example, if the bars are 6 inches apart, the maximum allowable twist is .0012 X 6 = .007 inch. A rod exceeding this must be scrapped.

If the OEM gage is not available, both parallelism and twist can be reliably measured, using the alternate method with a surface plate, precision square and a dial indicator/height gage with .0001 graduations. To check parallelism, clamp the end face of the large end to the square, with the rod standing vertically. With the square on the surface plate, zero the dial indicator at the lowest point at one end of the big bore. Move the dial indicator to the low point at the other end of the big bore. It

should also read zero. Now move the indicator and zero it at the low point, ¼ inch in from one end of the pin end bore. Move the indicator to the low point, ¼ inch in from the other end of the pin bore (these two points are approximately an inch apart). The dial indicator reading at the second point should read within zero \pm .001 (i.e., .001 inch per inch).

Twist is measured similarly by clamping the end face of the big end against the square, with the rod in a horizontal position. The process is the same as described above for checking parallelism. Check that the big end bore is zero-zero. The pin end should read within zero \pm .0012 (i.e., .0012 inch per inch).

Non-Destructive Testing:

The Superior connecting rod bodies are manufactured from AMS 6327 aircraft quality SAE 8740 alloy steel forgings. The forgings are quenched and tempered to the optimum hardness to maximize toughness and tensile strength. After all machining is completed, the new rod bodies are magnetic particle inspected (MPI) per ASTM E1444 and accepted to MIL-STD-1907, Grade A.

After removal from the engine, and after any blending or machining, these Superior connecting rods should be cleaned to remove all traces of petroleum and varnish residue. If the pin bushing will require replacement, it should be removed at this time. MPI should be accomplished to the above or equivalent specifications. The procedures in the OEM Overhaul Manual and Service Instructions are acceptable equivalents.

Galling in the large end bore, due to bearing insert movement from overspeed or overpower operation may be repaired by machining the bore to .010 inch oversize, as described in the following sections. After such repair, the rod must again be subjected to MPI.

Repair and Overhaul:

Repair and overhaul procedures are limited to blending out minor nicks and dents, replacing the pin bushing and machining the big end bore to .010 inch oversize. Other procedures are not recommended, unless they are FAA approved for Superior or equivalent O.E.M. connecting rod assemblies.

Nicks and dents should be blended out to eliminate any sharp, stress inducing, discontinuities in the surface. A fine stone or abrasive cloth should be used to provide the final finish. Material removal should be minimal. After blending, clean thoroughly to remove all traces of abrasive and metal particles. The rod should then be subjected to MPI as described above.

The rod bushing may be replaced if it is worn oversize. The procedure given in the OEM Overhaul Manual is recommended. In addition to this procedure, Superior recommends that the rod bore be measured to see that it conforms to the limits for Diameter "C" Less Bushing in Table 1. Be sure the new bushing is installed with its split at $45^\circ \pm 10^\circ$ off the piston end centerline. After the bore of the bushing is burnished to finished size, re-measure the bore and check parallelism and twist per the procedures in the Dimensional Inspection section above.

In the event that the rod requires machining the big end bore to the Diameter "D" .010 inch oversize, proper fixturing and "slave" rod bolts are required. The "slave" rod bolts must be relieved to clear the big end bore where the bolts extend into the bore. The rod bolts must be torqued to proper limits. It is

critical that the .010 oversize bore is concentric and parallel to the existing standard bore. Published OEM instructions for this process should be followed.

Machine (grinding is recommended) the bore to the Diameter "D" .010 oversize dimensional limits from Table 1. The maximum surface finish of the plus .010 bore surface is 80 micro-inches. After machining, check the bore diameter, dimension "L", parallelism and twist (refer to the Dimensional Inspection section above). The rod must also be subjected to MPI to assure all defects related to galling have been removed.

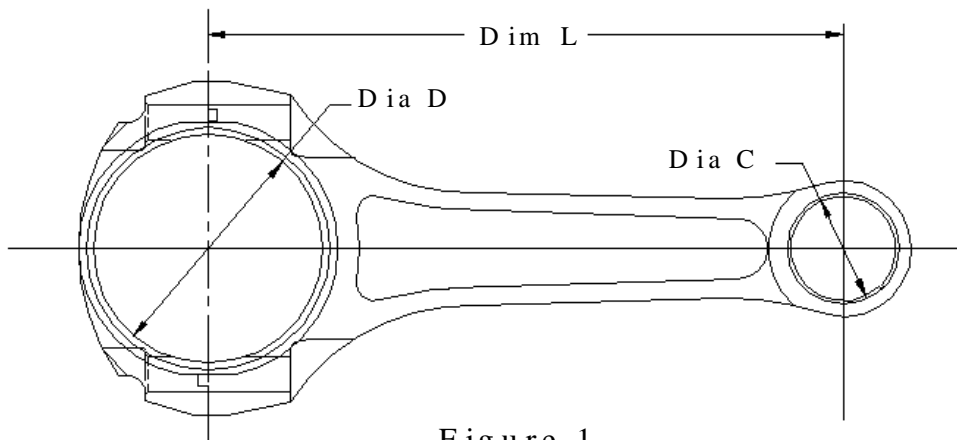


Figure 1

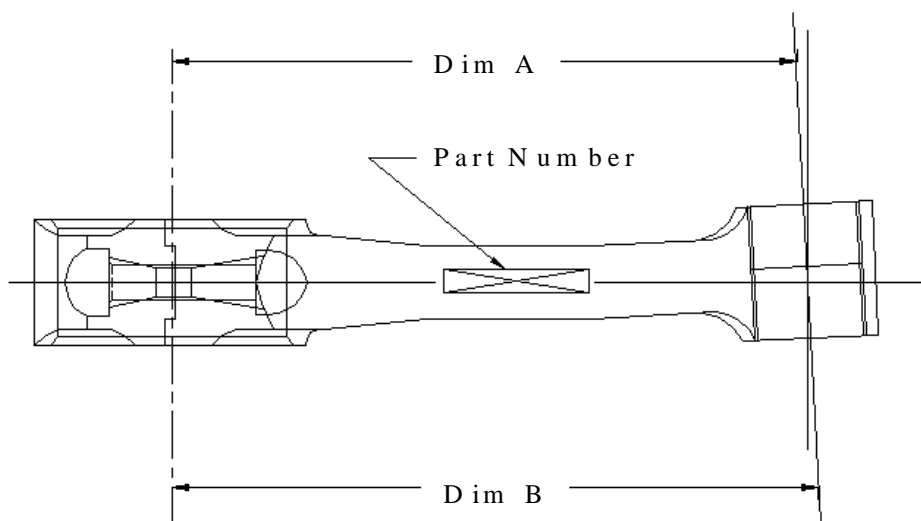


Figure 2

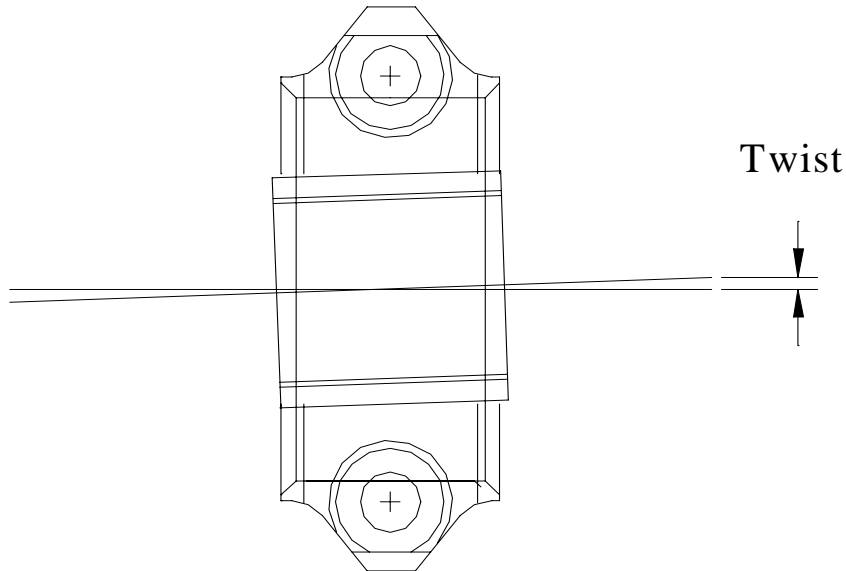


Figure 3

Table 1

Rod Part Number	Diameter "C"	Diameter "C" Less Bushing	Diameter "D" (Standard)	Diameter "D" .010 Inch Oversize
SL11750, SL13422, SL13937, SL77450, SL78030	1.1262-1.1254 (See Note 1.)	1.185-1.184	2.2875-2.2870	2.2975-2.2970
SL19332	1.1262-1.1254 (See Note 1.)	1.185-1.184	2.4210-2.4205	2.4310-2.4305

Note 1. Pin bushing bore Diameter "C" may exceed 1.1262 so long as the bushing diameter to piston pin diameter clearance does not exceed the .0025 serviceable limit.

Rod Part Number	Dimension "L"	Parallelism Maximum Limit	Twist Maximum Limit
SL11750, SL77450, SL19322, SL13422, SL13937	6.7515-6.7485	.010 inch in 10 inches (.001 inch per inch)	.012 inch in 10 inches (.0012 inch per inch)
SL78030	6.5015-6.4985	.010 inch in 10 inches (.001 inch per inch)	.012 inch in 10 inches (.0012 inch per inch)