Bearings

A bearing is any surface which supports, or is supported by, another surface.

A good bearing must be composed of material that is strong enough to withstand the pressure imposed on it and should permit the other surface to move with a minimum of friction and wear

Bearings are required to take radial loads, thrust loads, or a combination of the two

An example of a radial load would be a rotating shaft being held or contained in one position on a radial plane.

Thrust load would be the rotating shaft being contained from moving axially along the shafts axis

There are two ways in which bearing surfaces move in relation to each other.

One is by the sliding movement of one metal against the other (sliding friction),

and the second is for one surface to roll over the other (rolling friction)

The three different types of bearings in general use are **plain**, **roller**, and **ball**

1, A ball bearing assembly consists of grooved inner and outer races, one or more sets of balls, in bearings designed for disassembly, and a bearing retainer.

They are used for shaft bearings and rocker arm bearings in some reciprocating engines.

Special deep-groove ball bearings are used to transmit propeller thrust and radial loads to the engine nose section of radial engines.

Since this type of bearing can accept both radial and thrust loads, it is used in gas turbine engines to support one end of a shaft (radial loads)and to keep the shaft from moving axially (thrust loads)

2, Plain bearings are generally used for the crankshaft, cam ring, camshaft, connecting rods, and the accessory drive shaft bearings

Such bearings are usually subjected to radial loads only, although some have been designed to take thrust loads.

3, Roller bearings are made in many types and shapes, but the two types generally used in the aircraft engine are the straight roller and the tapered roller bearings

Straight roller bearings are used where the bearing is subjected to radial loads only.

In tapered roller bearings, the inner- and outer-race bearing surfaces are cone-shaped. Such bearings withstand both radial and thrust loads.

Straight roller bearings are used in high power reciprocating aircraft engines for the crankshaft main bearings.

They are also used in gas turbine applications where radial loads are high.

Maintenance practices on bearings includes:

disassembly for access, cleaning, inspection, and lubrication of bearings.

CLEANING THE WHEEL BEARINGS

1, The bearings should be removed from the wheel to be cleaned with the recommended solvent.

2, Soaking the bearings in solvent is acceptable to loosen any dried-on grease

3, Bearings are brushed clean with a soft bristle brush and dried with compressed air

4, Never rotate the bearing while drying with compressed air

5, Always avoid steam cleaning of bearings

WHEEL BEARING INSPECTION

1, Once cleaned, the wheel bearing is inspected

2, There are many unacceptable conditions of the bearing and bearing cup, which are grounds for rejection

3, Nearly any flaw detected in a bearing assembly is likely to be grounds for replacement

Common Issues:

Galling

1, Caused by rubbing of mating surfaces

2, The metal gets so hot it welds, and the surface metal is destroyed as the motion continues and pulls the metal apart in the direction of motion.

Spalling

a chipped away portion of the hardened surface of a bearing roller or race.

Overheating

1, caused by lack of sufficient lubrication results in a bluish tint to the metal surface

2, The ends of the rollers shown were overheated causing the metal to flow and deform, as well as discolor.

3, The bearing cup raceway is usually discolored.

Brinelling

1, is caused by excessive impact

2, It appears as indentations in the bearing cup raceways

3, Any static overload or severe impact can cause true brinelling, which leads to vibration and premature bearing failure.

False brinelling is caused by vibration of the bearing while in a static state.

Even with a static overload, it can force the lubricant from between the rollers and the raceway.

It can be identified by a rusty coloring of the lubricant.

Staining and surface marks on the bearing cup

1, that grayish black streaks with the same spacing as the rollers are caused by water that has gotten into the bearing

2, It is the first stage of deeper corrosion that will follow.

Etching and corrosion

1, caused when water, and the damage caused by water, penetrates the surface treatment of the bearing element.

2, It appears as a reddish/brown discoloration.

Bruising

1, caused by fine particle contamination possibly from a bad seal or improper maintenance of bearing cleanliness

2, It leaves a less than smooth surface on the bearing cup.

Bearing cups should be tight in the wheel boss and should never rotate.

The outside of a bearing cup that was spinning while installed in the wheel is shown.

CONTAMINATION AND CORROSION

1, Contamination is a leading cause of bearing failure

2, Abrasive substances like sand, grit, or dust that get in a bearing can cause dents or scratches in the bearing race or rolling elements.

3, This results in vibration and wear.

4, Common sources of contamination are poor handling procedures, dirty hands or tools, and foreign matter in the lubricant or cleaning fluid used on the bearing.

5, A clean, properly lubricated, and installed bearing delivers extensively reliable service.

ELECTRIC CURRENT DAMAGE

1, When an electric current passes through a bearing, proceeding from one ring to the other via the rolling elements, damage will occur.

2, Fluting caused by the passage of electric current, in the outer ring of a spherical roller bearing

3, The outer ring of a self-aligning ball bearing damaged by electric current

BEARING HANDLING AND LUBRICATION

1, Handling of bearings is of the utmost importance. Contamination, moisture, and vibration, even while the bearing is in a static state, can ruin a bearing.

2, Avoid conditions where these may affect bearings and be sure to install and torque bearings into place according to manufacturer's instructions.

3, Proper lubrication is a partial deterrent to negative environmental impacts on a bearing.

4, Use the lubricant recommended by the manufacturer.

5, Use of a pressure bearing packing tool or adapter is also recommended as the best method to remove any contaminants from inside the bearing that may have remained after cleaning.