Abdulla Aljunibi

BEARINGS AND SEALS

CONSTRUCTION AND PRINCIPLES OF BEARINGS

The main bearings of a turbine engine have the critical function of:
- supporting the main engine rotor

The number of bearings necessary for:
- proper engine support is, for the most part, determined by the length and weight of the engine rotor.

The length and weight are directly affected by the type of:
- compressor used in the engine.

Naturally, a two spool compressor requires:
- more bearing support

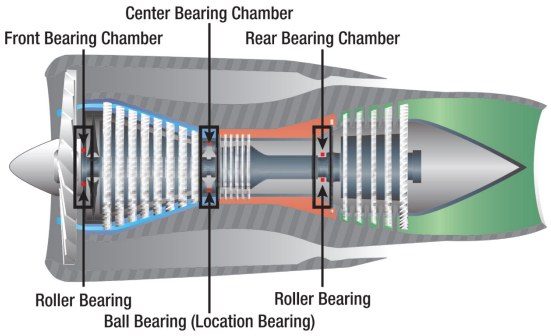

Figure 8-1. Bearing locations on a typical turbine engine, forward and aft of the compressor, and forward of the turbine section.

depicts the three bearing locations on a typical engine

The minimum number of bearings required to support one shaft is
- one deep groove ball bearing (thrust and radial loads)
- one straight roller bearing (radial load only).

The gas turbine rotors are supported by :
- ball and roller bearings, which are antifriction bearings

Sometimes, it is necessary to use more than one roller bearing if the shaft is subject to
- vibration or its length is excessive

In general, antifriction bearings are preferred largely because they:
- Offer little rotational resistance,
- Facilitate precision alignment of rotating elements,
- Are relatively inexpensive,
- Are easily replaced,
- Withstand high momentary overloads,
- Are simple to cool, lubricate, and maintain,
- Accommodate both radial and axial loads,
- Are relatively resistant to elevated temperatures.

The main disadvantages are their:
- vulnerability to foreign matter (by the lubricant)
- tendency to fail without appreciable warning

(if the bearing fails the engine fails)

Usually the ball bearings are positioned on the:
- compressor or turbine shaft

so that they can absorb:
- any axial (thrust) loads or radial loads

Because the roller bearings present a larger working surface, they are:
- better equipped to support radial loads than thrust loads

CONSTRUCTION AND PRINCIPLES OF SEALS

The bearing housing usually contains:
- oil seals to prevent the oil leaking from its normal path of flow

It also delivers the oil to the:
- bearing for its lubrication, usually through spray nozzles.

The oil seals may be the:
- labyrinth

or
- thread (helical) type

These seals also may be:
- pressurized to minimize oil leaking along the compressor shaft.

The labyrinth seal is usually :
- pressurized

but the helical seal depends solely on
- reverse threading to stop oil leakage.

These two types of seals are:
- very similar

differing only in :
- thread size and the fact that the labyrinth seal is pressurized

The bearing surface is usually provided by a:
- machined journal on the appropriate shaft

The bearing is usually locked in position by a:
- steel snap ring or other suitable locking device

The rotor shaft also provides the :
- matching surface for the oil seals in the bearing housing.

These machined surfaces are called:
- lands and fit in rather close to the oil seal.

CARBON SEALS

These seals are usually:

- spring loaded and are similar in material and application to the carbon brushes used in electrical motors
- Full contact to the shaft

Carbon seals rest against a surface provided to create a:

- sealed bearing cavity or void; thus,
- the oil is prevented from leaking out along the shaft into the compressor airflow or the turbine section