SYNOPSIS

This thesis presents analytical and experimental studies of externally pressurized air journal bearing behaviour which includes the effect of axial and circumferential flow. The bearing configurations considered have double-plane admission feeder holes at quarter stations along the circumferential line, with orifice compensation.

In the existing theoretical studies of externally pressurized bearing performance it is assumed that flow through the bearing takes place only in the axial direction. There is a large discrepancy between this theory and actual practice. This large discrepancy is due, mainly, to circumferential flow in the clearance gap.

In the proposed theoretical investigations, an approximate solution is given by assuming (i) that the circumferential flow from one station ends at the neighbouring station and (ii) that the film thickness is uniform in the region between these two stations. A more accurate analytical method has been developed for predicting bearing performance without these two assumptions.

The pressure distribution, load-carrying capacity, flow requirement and stiffness, all expressed in non-dimensional parameters, are presented for a finite bearing

(slenderness ratio, $\frac{L}{D} = 1.05$) over a wide range of bearing design parameters, eccentricity ratios and pressure ratios.

An experimental rig-up is designed and fabricated to verify the theoretically predicted values. A description of the experimental set-up and instrumentations are given. The experiments are carried out on three bearings having 4, 6, and 8 orifice stations, at a series of supply pressures with various orifice dimensions. The results are presented in graphical forms. Discussions of these results are also given. A design procedure for one such bearing is outlined either for maximum load or for maximum stiffness.

The comparision between theory and experimental results indicates that the method makes a good prediction of actual bearing performance. The proposed approximate analysis gives fairly good results for bearings with light and moderate loads.