

ISCORAMA-4, Calgary, Alberta, Canada, 27-31 August 2007

FREQUENCY EFFECTS ON LINEAR STIFFNESS AND DAMPING COEFFICIENTS OF TILTING-PAD JOURNAL BEARINGS

Dr. Waldemar Dmochowski, Senior Research Officer

National Research Council Canada

Institute for Aerospace Research

1200 Montreal Rd.

Ottawa, Ontario, K1A 0R6

waldek.dmochowski@nrc-cnrc.gc.ca

(613) 990-0457

ABSTRACT

It has long been expected that the dynamic properties of tilting-pad bearings (TPJBs) can vary with frequency of excitation. However the nature of these variations has been unclear. This paper presents experimental and theoretical results obtained for a TPJB of a diameter of 3.875 in operating at shaft speeds of up to 15,000 rpm and subjected to multifrequency excitation.

The analysis of the results indicates that pad inertia forces and pivot flexibility can be behind variations of both stiffness and damping linear coefficients of the TPJBs. The excitation frequency effects are more pronounced for lightly loaded bearings. In particular, under some operating condition a drastic decrease in damping capabilities has been observed. The results have also shown that excitation frequency does not affect the cross coupling coefficients.

The experimental study is supplemented by uncertainty analysis. The uncertainties of measurements have been estimated from an analysis of error propagation when using frequency domain techniques.

Keywords: tilting-pad journal bearing, dynamic coefficients