central pressure for lift-off is 7× greater than that for steady operation. The lift-off and steady state ratios are equal only for $R_o = R_i$, at which point there is no bearing.

Having arrived at a qualitative understanding it is important to demonstrate quantitative agreement. Figure 6 shows data from our experiments in the form of $p_c/\dot{m}$ in MPa-s/kg versus $\dot{m}/W$ in μs/m. The central curve is the linear theoretical line for d = 209 μm. (In most cases our expected experimental erors are of the size of the points. Only for the smallest fluxes are they larger.) The solid curve is for $d = 0$, and it is clearly qualitatively different from the nonzero d curves.

The question of spacing is somewhat more problematical. Figure 7 shows h_o in μm as a function of $\dot{m}/W$. There is an ambiguity in the location of the zero for h_o, and we have added 51, 26, and 7 μm to the data for W = 22.27, 66.86 and 93.17 N, respectively. These account for the imperfections in the outer rims of the two plates. The required correction decreases with increasing load. Some irregularities are no doubt removed elastically at the higher loads.

Finally, it should be noted the behavior of this system is not particularly sensitive to the exact form of the concavity. This is in marked contrast to the care that must be taken to insure parallelism when that is the aim.

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DISCUSSION

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I think that, for the purpose of insuring parallelism of two plate, it is useful to measure the central pressure and/or the lift off pressure by the system shown in Fig. 1 and compare them with the predicted values.

The authors have concluded that the behavior of this system such as the central pressure or the lift off pressure (i.e., the load carrying capacity) is not sensitive to the exact form of concavity, but it should be recognized that this only comes from the average effect. The pressure distribution will be remarkably influenced by the exact form of the surface.

Meanwhile, it should be noted the following points in the application of this system to the practical bearing. As well known, from the viewpoint of stability, it is recommended that the bearing has no recess. In this case, in order to realize the small lift off pressure (i.e., the large load carrying capacity), which is one of the main aims of this bearing, it becomes necessary to increase the concavity of surface, i.e., to increase d. On the other hand, the coefficient of damping may decreases and becomes negative at all as d increases.[2] Therefore, the form of concavity, i.e., the magnitude of d, should be carefully choosen from the considerations of these points described above.

Moreover, the bearing performances in the system shown in Fig. 1 may be sensitive to the imperfection of the outer rim of plate, so I recommend giving some extent parallel region in the outer part of bearing.

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[2] Hayashi, K., and Hirasata, K., "Comparison of Theoretical Characteristics of Two Types of Externally Pressurized, Gas Lubricated, Compliant Surface Thrust Bearings," *Proc. of 13th Leeds-Lyon Symposium on Tribology*, Leeds, UK, September 8-12, 1986.

Authors' Closure

Professor Hayashi's comments are well-taken. He is correct that the local pressure depends critically on the local gap and its horizontal derivatives. That is one reason we chose to model the system as a simple cone rather than attempting to reproduce the actual, more complexly deformed surface. One of our points is that the insensitivity of the total load and mean spacing to the actual form of the "conical" surface is a welcome discovery.

We have not analyzed the stability of this system, nor have we made any serious time-dependent measurements. We have also not seen the work cited by Professor Hayashi. For these reasons it is rash to try to make a definitive response to his comments regarding stability. We only note in passing that the experimental apparatus that we used gives the appearance of being very stable. Lift-off is smooth, and running is quiescent.

Professor Hayashi's comment about the sensitivity of performance to the shape of the outer rim is also well-taken. We noted this as the likely explanation of the variable amount of offset that we needed to add to our data to obtain a good fit for the height vs mass flux relation. Our outer rim was clearly imperfect. The imperfection may actually aid in the smooth lift off by removing a singularity. If there is no true seal the flow can grow smoothly from zero. The imperfection will delay lift off slightly, but should also make it smoother. The addition of a parallel annular region near the rim would defeat this smoothness, making the configuration more like that of an ordinary recessed bearing.