

bearings

small orifices or restrictors which supply the gas to the bearing clearance space because of the association of bearing stability with certain types of entrance geometries. As a result of this research, this division has published several reports relating to the design of externally pressurized thrust and journal bearings.

Gas bearings will always be more handicapped by their comparative bulk than rolling element or plain journal oil-lubricated bearings. This may restrict the use of gas bearings in certain industrial applications, but as performance demands increase the need for higher rotational speeds and for more power from smaller packages, the special advantages of gas bearings make them realistic contenders in the field of low-friction rotational machinery.

The advantages of gas lubricated bearings over conventional oil lubricated bearings are also found at the low- and high-temperature extremes of the operating range. Gaseous lubricants do not undergo changes of composition such as other lubricants which may melt, freeze, vaporize, burn or decompose between the limits of temperature for industrial service.

Gas lubricated bearings are clean in operation. In extremely complicated technical instruments which require precise maintenance, there is no danger of contamination from the lubricant since it is a dry, processed gas. Leakage of conventional liquid lubricants may foul the entire system. This important advantage of air bearings is put to use in gyroscopes, in ballistic missiles and in machinery associated with nuclear projects. The first American satellite was guided into orbit by a gyroscope utilizing pressurized gas bearings.

"Some years ago a high-speed camera was required for NRC's plasma research and those that were available were elaborate and very expensive," says E.H. Dudgeon, of NRC's Gas Dynamics Laboratory. "Our laboratory designed and built a streak camera with gas bearings which allowed rotors to travel at speeds of up to 3,000 revolutions per second. This speed could be maintained indefinitely, without wear, and without danger of oil contamination of the film or optical surfaces. This was one of our first applications for air bearings. A model of this camera was licensed and built commercially. The Department of Energy, Mines and Resources, Queen's

University and the Division of Physics of NRC also built high-speed cameras with gas bearings following our design recommendations."

NRC's Division of Physics has employed many air pressured bearings in delicate photogrammetric machinery. In Lincap, a length measuring instrument developed by Dr. David Makow of the Division of Physics, four externally pressurized air bearings aid in precise measurement by providing friction-free sliding elements. Over a range of more than 20 centimetres, Lincap has an accuracy of better than one micrometre. The moving elements of the Lincap do not touch the stationary parts and, therefore, there is no wear.

Dr. I.R.G. Lowe of the Gas Dynamics Laboratory says to get the best advantage of air bearing technology, the air bearings must be an integral part of the design right from the beginning. The laboratory is available to give information on gas bearings and advice on design to industry, but in order to be effective, gas bearings must be considered in the planning stages to avoid compromising the early design by later adaptations.

"The air lubricated bearing will not eliminate the conventional oil-lubricated bearing in the future but can provide clean, low friction, quiet operation in specific industrial applications," Mr. Dudgeon says. It is able to withstand temperature extremes and promises a long mechanical life in rotary or linear movements which must be performed to high standards of accuracy. However, air bearings must be chosen and designed with particular attention to the advantages which they offer." □ Donald Crockford

Opposite / Page de droite

E.H. Dudgeon holds one of the components of a gas bearing seal developed for compressors used by Eldorado Nuclear Limited, Port Hope, Ontario. • M. E.H. Dudgeon tient l'un des éléments d'un joint de roulement à air mis au point pour la compagnie Eldorado Nuclear Ltée de Port Hope, dans l'Ontario.

Below / Ci-dessous

Test car used by the National Aeronautical Establishment in crash barrier studies mounted on a hemispherical air bearing for moment of inertia measurement. • Voiture utilisée par l'Établissement aéronautique national pour faire des essais d'impact sur glissières d'autoroutes. La voiture est montée sur une rotule à air pour déterminer les moments d'inertie.

