



Materials Engineering Branch

TIP*



No. 068 Anti-creep Films for Oil Lubricants

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One of the problems that have been encountered in oil lubricated spacecraft and gyroscope ball bearings is that of loss of oil by means of surface migration, or creep, of the oil out of the ball groove. Because these bearings are normally only lightly lubricated in order to minimize drag, any loss of oil from the ball/groove contact zone is detrimental to bearing life. Such creep takes place even during periods of static operation or storage and is more likely with oils having low surface tension. It can occur whether the bearings are in their individual manufacturer's packages or installed in the mechanism. Unfortunately, some of the better oil lubricants, such as Krytox 143 AB and Brayco 815z have the lowest surface tensions and are most subject to creep.

As a result of a study of this problem, the Navy¹ has pioneered the use of anti-creep films on bearings as a means of solving lubricant creep. These barrier films have a lower surface energy than most of the oils. Therefore, the oils will not wet them and will not creep across them. The films are made of a fluoro-chemical polymer in a solvent, e.g., a fluorinated methacrylate in xylene hexafluoride, some of which have a fluorescent material added² to assist in monitoring the film application using an ultraviolet lamp for detection. The film material is covered by military specifications³. An example of a barrier film is NyeBar[®] Q produced by Nye Lubricants.

In the application of the film to a clean bearing, care must be taken to avoid contaminating the lubricated areas of the bearing, e.g., balls, ball grooves, ball cage or lands. Application should be performed with the use of low magnification (e.g.: 10X) usually with a cleaned cotton swab dampened with the solution. The bearing faces and adjacent housing surfaces are the areas normally coated. After evaporation of the solvent, the remaining film is so

¹ V. Fitzsimmons, et al, "A New approach to Lubricating Ball Bearings", NRL Report 6356, December 1965.

² V. Fitzsimmons, et al, "The Wettability and Detection of Fluorescent Films", NRL Report 7391, February 1972.

³ Mil-B-81744 Rev A (AS), "Barrier Coating Solution, Lubricant Migration Deterring" (superseding Mil-B-81774), December 1976.

thin that it does not alter the bearing dimensions. Barrier film-treated bearings must not be subsequently exposed to solvents.