



Materials Engineering Branch

TIP*



No. 018 Transfer Film Lubrication

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One method of providing solid film lubrication for ball bearings on spacecraft is that of transferring Teflon from the ball cage by rubbing contact and then to the ball grooves of the races. Such a transfer film should be developed within the bearing before it is assembled into the flight mechanism. This transfer mechanism continues as the bearing is operated so that one failure cause is the development of too much debris within the bearing that results in high torque spikes or even jamming.

This lubrication method works best when rotation is continuous and unidirectional and bearing jitter is of no concern. Small angle oscillatory motion is not a good operating regime for this method.

Prior burnishing of the balls can minimize the debris buildup and ball grooves with a thin continuous film of Teflon before the bearing is assembled and by maintaining the axial preload at a low level.

There are many Teflon-base materials that are used as ball cages such as Duroid 5813, Bartemp and Rulon. Each of these contains other materials in addition to Teflon, such as fiberglass, iron oxide and MoS₂. However, it is the Teflon that serves as the primary solid lubricant. Because of the greater thermal expansion of these plastic materials, care must be taken to ensure adequate clearances if operation is to be over a wide temperature range.