

August 1969

Brief 69-10252

# NASA TECH BRIEF



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## Study of High Temperature Bearing Materials

An experimental investigation has identified materials suitable for use in potassium lubricated turbo-generator journal bearing and shaft applications at temperatures from 400° to 1,600°F. Much of the information obtained during the program appeared useful to other high temperature bearing applications.

From a compiled list of 100 materials, 14 candidates were selected for detailed evaluation singly and in combination. The candidates represented five broad classes of materials: Nonrefractory metals and alloys, refractory metals and alloys, Fe-Ni-Co bonded carbides, refractory compounds (oxides, carbides, borides), and refractory metal bonded carbides.

Evaluation of the materials was based on the following experimental information:

- 1) Friction and wear behavior in high vacuum ( $10^{-9}$  torr; no lubrication).
- 2) Friction and wear behavior under boundary lubrication with liquid potassium.
- 3) Compatibility in potassium in Cb-1Zr.
- 4) Dimensional stability.
- 5) Strength.
- 6) Hardness.
- 7) Wettability by potassium.

Particular attention was given to the predicted chemical stability of the materials. Also, two separate service temperature regimes were established: above 1000°F and below 1000°F. The higher temperature simplifies system design. The lower simplifies bearing

materials selection.

The most appropriate materials for this service were: TiC + 10% Cb, commercial cobalt bonded carbides (e.g., carboloy 907 or equivalent material), a cold pressed and sintered alloy of tungsten and molybdenum. The first two groups of material were applicable above 1000°F and the third applicable below 1000°F.

### Notes:

1. Additional documentation is available from:  
Clearinghouse for Federal Scientific  
and Technical Information  
Springfield, Virginia 22151  
Price \$3.00  
Reference: TSP69-10252
2. Technical questions may be directed to:  
Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B69-10252

### Patent status:

No patent action is contemplated by NASA.

Source: R. G. Frank of  
General Electric Company  
under contract to  
Lewis Research Center  
(LEW-10829)

Category 03