lar gap between itself and the inner surface of the liner. The wick is fabricated from molybdenum foil and contains evenly spaced circular perforations. One end of the wick is welded to the evaporator end cap, while the other end is left free.

During the fabrication process, the finned C–C shell condenser section is exposed to an atomic oxygen (AO) ion source for a total AO fluence of 4×10^{20} atoms/cm^2, thereby raising its surface emissivity to values between 0.85 and 0.90 at design operating temperature, thus reducing the radiator area required for a specified value of heat rejection to space. The prototype heat pipe performed well in initial low power tests. Based on test results and computer modeling, the heat pipe should be capable of transporting heat at a rate of 900 W at evaporator temperatures in the 850 to 875 K range. Computer modeling also indicates that, if scaled up from a prototype length of 36 cm to a full design length of 91 cm, the heat pipe should be capable of transporting heat at a rate of 2.2 kW at the same evaporator temperature range. At its 1.45 kg/m^2 specific mass for two-sided heat rejection, its power-to-mass ratio will be 6.5 kW/kg.

This work was done by Albert J. Juhasz of Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18307-1.

Lightweight Heat Pipes Made From Magnesium

Lyndon B. Johnson Space Center, Houston, Texas

Magnesium has shown promise as a lighter-weight alternative to the aluminum alloys now used to make the main structural components of axially grooved heat pipes that contain ammonia as the working fluid. Magnesium heat-pipe structures can be fabricated by conventional processes that include extrusion, machining, welding, and bending. The thermal performances of magnesium heat pipes are the same as those of equal-sized aluminum heat pipes. However, by virtue of the lower mass density of magnesium, the magnesium heat pipes weigh 35 percent less. Conceived for use aboard spacecraft, magnesium heat pipes could also be attractive as heat-transfer devices in terrestrial applications in which minimization of weight is sought: examples include radio-communication equipment and laptop computers.

This work was done by John H. Rosenfeld, Sergei N. Zarembo, and G. Yale Eastman of Thermacore, Inc. for Johnson Space Center. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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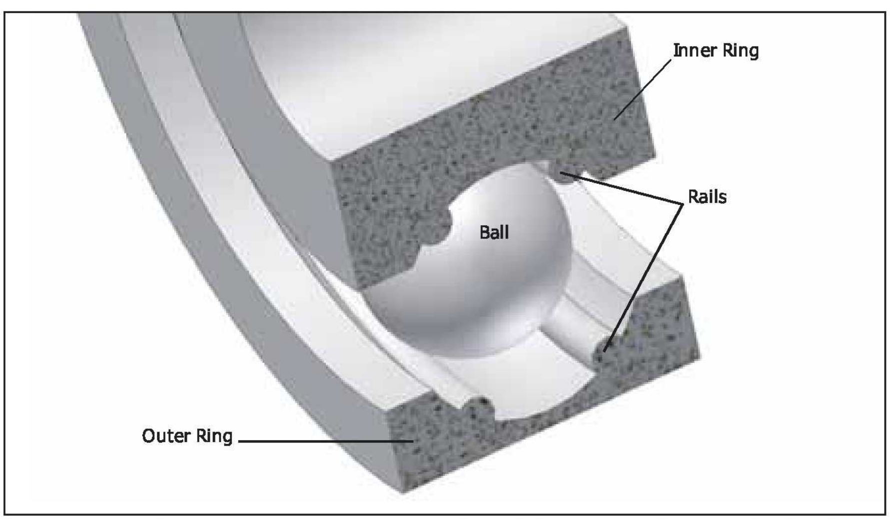
Refer to MSC-23397-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

Ceramic Rail-Race Ball Bearings

These bearings would tolerate dust better than conventional ball bearings.

NASA's Jet Propulsion Laboratory, Pasadena, California

Non-lubricated ball bearings featuring rail races have been proposed for use in mechanisms that are required to function in the presence of mineral dust particles in very low-pressure, dry environments with extended life. Like a conventional ball bearing, the proposed bearing would include an inner and an outer ring separated by balls in rolling contact with the races. However, unlike a conventional ball bearing, the balls would not roll in semi-circular or gothic arch race grooves in the rings: instead, the races would be shaped to form two or more rails (see figure). During operation, the motion of the balls would push dust particles into the spaces between the rails where the particles could not generate rolling resistance for the balls.



A **Ball Bearing as Proposed** would contain rail races instead of conventional races. Preferably, the balls, rings and rail-races would be made of a ceramic or similar hard material.

The rail and ball materials must have very high compressive strength, hardness, and wear resistance in order for the rail-race bearing to have a reasonable load capacity and be able to operate in the presence of the dust particles with minimal wear. Preferably, both the rails and the balls would be made of ceramics identical or similar to those now used in some commercially available bearings. These ceramics have strengths and hardnesses greater than those of the dust particles. The rails would be integral with the rings and formed by grinding ceramic ring blanks.

This work was done by Mark A. Balzer, Greg S. Mungas, and Gregory H. Peters of Caltech for NASA's Jet Propulsion Laboratory.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to NPO-44908, volume and number of this NASA Tech Briefs *issue, and the page number.*