A document proposes an improved liquid-ring nutation damper for a spin-stabilized spacecraft. The improvement addresses the problem of accommodating thermal expansion of the damping liquid. Heretofore, the problem has been solved by either (1) filling the ring completely with liquid and accommodating expansion by attaching a bellows or (2) partially filling the ring and accepting the formation of bubbles. The disadvantage of (1) is that a bellows is expensive and may not be reliable; the disadvantage of (2) is that bubbles can cause fluid lockup and consequent loss of damping. In the improved damper, the ring would be nearly completely filled with liquid, and expansion would be accommodated, but not by a bellows. Instead, an escape tube would be attached to the ring. The escape tube would be positioned and oriented so that the artificial gravitation and the associated buoyant force generated by the spin of the spacecraft would cause the bubbles to migrate toward the tip of the tube. In addition, when the spacecraft was on the launch pad, the escape tube would be at the top of the ring, so that bubbles would rise into the tube.

This work was done by Mark A. Woodard of Goddard Space Flight Center. Further information is contained in a TSP (see page 1).

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Improved Nutation Damper for a Spin-Stabilized Spacecraft

Goddard Space Flight Center, Greenbelt, Maryland

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