PAYLOAD POSITIONING SYSTEM FOR GRAVITY GRADIENT SATELLITE

By M. Holliday, D. Pancratz, E. Park & D. B. Putnam
Stanford University & Lockheed Missiles & Space Co.

ABSTRACT

Many current satellites rely on active control systems to maintain attitude. Passively controlled gravity gradient satellites cost less and are more reliable, but have difficulty accommodating independently moving payloads such as pointable telescopes. To eliminate these difficulties, use of a counter rotating inertia is proposed to negate payload induced transient instabilities. Counter rotating inertias have been used before with limited success due to residual torque/momentum. In gravity gradient satellites, this is absorbed by the gravity gradient restoring torques. A single axis (of a three axis) demonstration gimbal using a bifilar pendulum with PC controlled servo feedback loop and simulated pointable payload was designed and tested. Results without momentum compensation resulted in large excursions and pointing stability problems. Measured displacements using the counter rotating inertia momentum compensation system were within specified and predicted values.