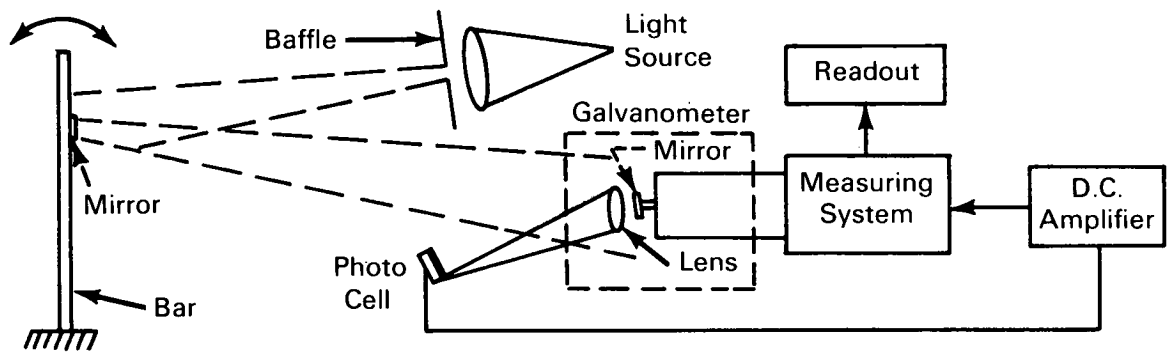
NASA TECH BRIEF

System Measures Angular Displacement Without Contact



The problem: To accurately measure the angular displacement of an object without the use of electrical or mechanical connection to the object.

The solution: A system of optics coupled to an electronic detection and measuring system whereby angular movement of reflected light is converted to a direct readout.

How it's done: The measuring system is based on the well-known optical lever principle and uses a photocell, amplifier, and galvanometer to provide the electrical readout. A mirror mounted on the test object under observation reflects light from a fixed source to the detection system. As the object vibrates or rotates, the light beam reflected from the attached mirror sweeps through an angle equal to twice the angle by which the object is displaced. This light beam is reflected from a second mirror and focused on the edge of a photocell. The second mirror is mounted on a galvanometer and its attitude is a function of galvanometer current. A change in the angle of the test object causes a corresponding change in the amount of light striking the photocell and thus a change in the output current of the photocell. This current is fed to the amplifier, measuring system, and readout and is used to deflect the galvanometer mirror to maintain the light beam in a position locked on the edge of the photocell. The current flowing through the loop is therefore a measure of the angle of the test object.

Notes:

1. This system has given accurate measurements to within 0.1 percent over a frequency range from dc to several thousand cps.
2. In conjunction with servos, this system could be used effectively to maintain relative attitude of two or more items in severe environments.
3. Application examples include fatigue tests in vacuum chambers, flutter research, damping measurements, and control systems requiring deflection input.

(continued overleaf)

4. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia, 23365
Reference: B65-10073

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546

Source: W. T. Davis
(Langley-46)