

May 1965

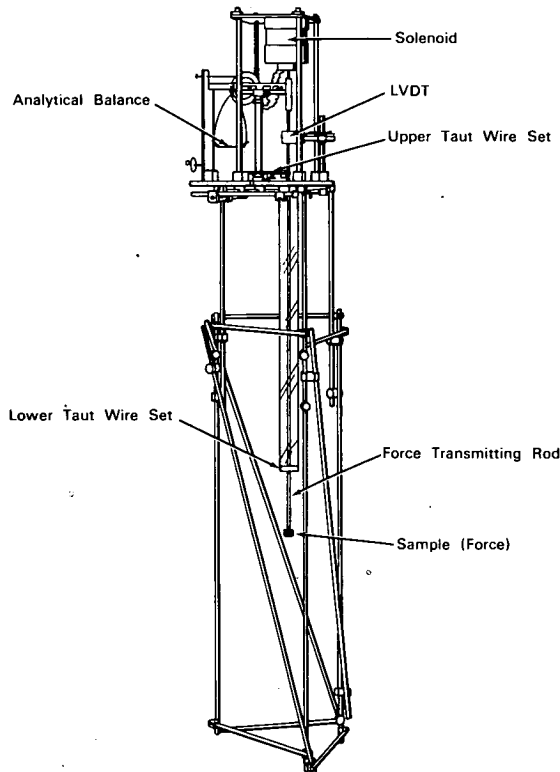
Brief 65-10154

# NASA TECH BRIEF



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## System Measures Unidirectional Forces, Excludes Extraneous Forces



**The problem:** In order to make precise unidirectional force measurement, forces in any direction other than the direction of interest must be rigorously constrained.

**The solution:** A system for measuring unidirectional forces in the range 10 mg to 20 g to an accuracy of  $\pm 0.5$  mg. The measuring member is mounted in such a way that it may move vertically but is constrained from horizontal or rotational movement.

**How it's done:** The system consists of a tubular framework that mounts detecting, measuring, and balancing devices, plus a taut wire suspension system which constrains movement of a force-transmitting rod to the vertical only. The rod, solenoid, and LVDT (Linear Variable Differential Transformer) core together weigh many times the forces to be measured. To offset this dead weight, a modified analytical balance is applied and the balance point adjusted until minimum output (null) is reached on the readout from

(continued overleaf)

the LVDT. The sample (force) is then attached to the lower end of the rod causing torque in the taut wires and deflection in the LVDT readout. Direct current is applied to the solenoid until the LVDT readout is brought to the null position again. The amplitude of the dc current required to null the LVDT is a direct measurement of the force exerted by the sample.

Vertical motion of the force transmitting rod results in twisting of the taut wires, which requires only small forces. Motions of the rod in a horizontal or rotational direction are transformed into bowing of the wires. This requires much greater forces and the rod is effectively limited to vertical motion over its design range.

**Notes:**

1. This system can be used to accurately measure small forces in one direction, or as an analytic balance.

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio, 44135  
Reference: B65-10154

**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.

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