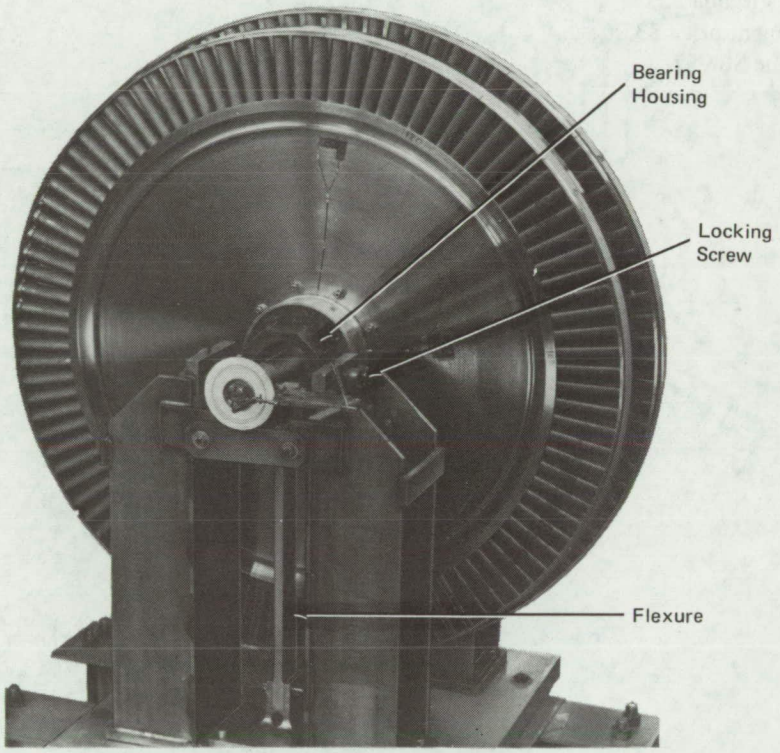
July 1972

B72-10377

NASA TECH BRIEF

Lewis Research Center

Simple Turbine Balancing Test Apparatus



Test Rotor Mounted On Balancing Apparatus

A simple, inexpensive apparatus has been devised for testing the dynamic balance of turbine rotors. No elaborate instrumentation is required. The rotor is spun by directing a jet from an air hose against the blades.

The test apparatus with a rotor installed is shown in the figure. The rotor is mounted on a shaft supported at each end by antifriction bearings. The bearings are mounted on the upper ends of a pair of flexure supports; the lower ends of the flexures are attached to a baseplate. The bearing ends of the flexures are free to move sideways or can be locked in place if desired. In operation, the rotor to be balanced is driven to speed by an air jet and then allowed to coast freely. As the speed drops toward the resonant frequency of the system, a pencil is pushed against a card affixed to one end of the rotating shaft. In response to the force generated by the rotor unbalance, the bearing end of the flexure vibrates from side to side. The pencil then traces a non-circular path on the card which indicates the radius along which the unbalanced mass is concentrated.

The basic principle involved is that of the vibration of a mass on a spring. The resonant frequency of the system is determined by the mass and the spring constant. The rotational speed at which resonance occurs can therefore be chosen by proper design of the flexures.

(continued overleaf)

This apparatus can be used where conventional, expensive, balance facilities are not readily available, or as an inexpensive method for balance testing rotors in large-scale production.

Conventional instrumentation can be used in lieu of the card and pencil to obtain more precise measurements. Horizontal shaft deflections have been detected by a proximeter pickup with the output displayed on an oscilloscope. A flux cutter and magnetic pickups were used to detect angular position which was also indicated on the oscilloscope.

Notes:

1. The following documentation may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)
   Reference: NASA CR-1967 (N72-20452), Spin Test of Turbine Rotor
2. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B72-10377

Patent status:

No patent action is contemplated by NASA.

Source: M. H. Vavra, J. E. Hammer, and L. E. Bell of Astro-Aeronautical Propulsion Laboratory under contract to Lewis Research Center (LEW-11658)