NASA TECH BRIEF

Laser System Used for Dynamic Balancing of Gyros

A system employing a pulsed ruby laser has been developed for dynamic balancing or trimming of gyro rotors spinning at speeds of up to 24,000 rpm. The laser system is designed to detect high spots on the spinning rotor and to focus a precisely timed laser beam on the detected high spots. The system conforms to the following specifications:

Rotor speed range:	2,000 to 24,000 rpm
Rotor diameter:	Up to 5 cm
Pulse width:	Mode 1: 500 microseconds Mode 2: 40 microseconds
Pulse energy:	Mode 1: 25 joules Mode 2: 10 joules
Focused spot size:	1 mm
Pulse synchronization:	Panel meter enables operator to set laser beam at any point on the rotor.
Typical metal removal per pulse:	Mode 1: 0 to 2.0 milligrams Mode 2: 0 to 0.5 milligram

In tests on rotors made of a number of different metals, photographs were taken of the plumes resulting from the metal vapor produced by the laser beam. These photographs showed that normal incidence of the laser beam on the workpiece results in the greatest amount of back splatter. Angles of incidence approaching tangency to the workpiece produce the least amount of back splatter. For any particular metal, an optimum angle of incidence must be determined experimentally.

This laser system could be used to dynamically balance most types of small, rotating high-speed components, including air turbines. The system offers the primary advantage that the component to be balanced does not have to be removed from its bearings. With conventional balancing methods, which require drilling or grinding of the component, the component must sometimes be removed from its bearings. These methods are more time-consuming and less accurate than the laser beam method and may result in damage to the bearings.

Note:

Details may be obtained from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10225

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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