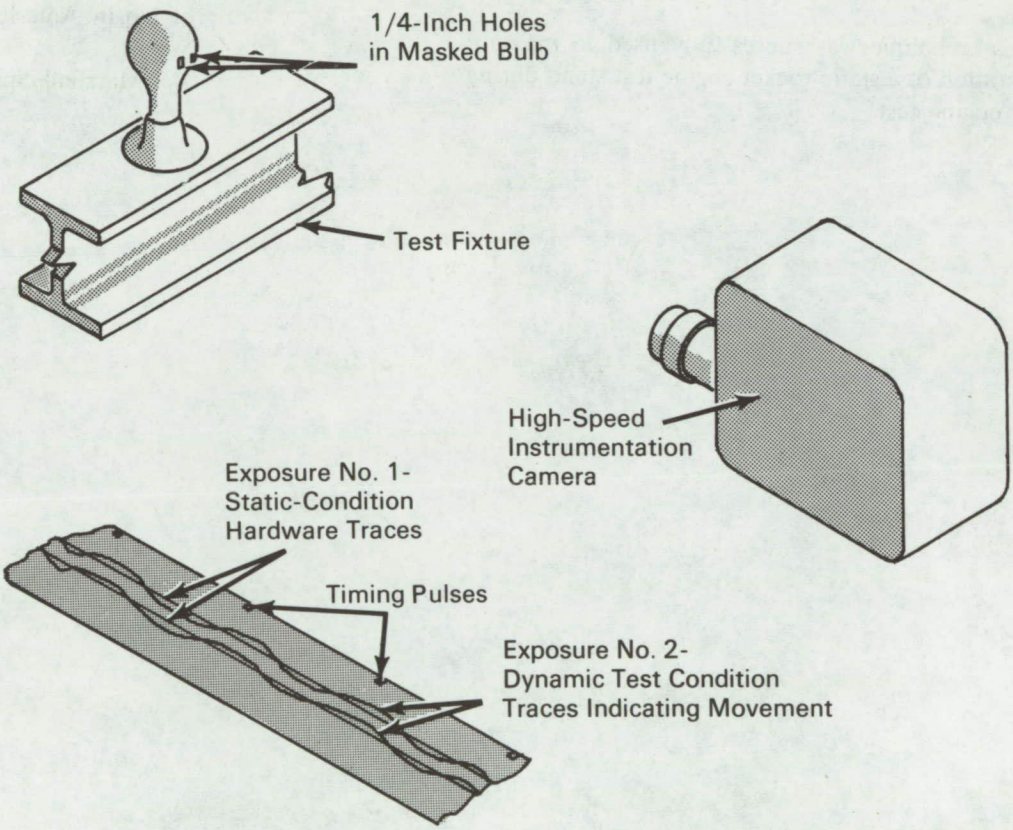
NASA TECH BRIEF

Rocket Engine Vibration Accurately Measured by Photography



The problem:

To provide an accurate, simple, and inexpensive means of measuring rocket engine vibration when conventional electronic vibration instrumentation is unavailable. The method must permit measurement of all established engine performance parameters.

The solution:

A test setup which includes a high speed instrumentation camera that is focused on a partially masked light bulb (two small holes, ¼ inch apart, are cut into the masking) which is securely mounted to the test fixture.

(continued overleaf)

How it's done:

With the test hardware in a static condition, the light bulb is energized and the prefocused camera photographs the light rays emitted from the two small holes in the mask. The film is then rewound and used to photograph the same bulb during a dynamic test, with a timing trace added to the film edge. Any movement of the test fixture during the test is recorded on the film as a light trace deviating from the light rays photographed in the static hardware condition.

The amplitude of excursions are then computed since the distance between the holes in the mask is known. The frequency of vibration is determined by comparison with the timing trace that is added to the film on the second exposure under dynamic conditions.

Notes:

1. This technique was successfully used to measure vibration of a static rocket engine test stand during an engine test.
2. The technique may be utilized to measure the lateral excursions of rotation shafts by backlighting the shaft and photographing its relative position under static condition, rewinding the film, and reexposing with the shaft in the dynamic mode.
3. Inquiries concerning this invention may be made to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B66-10652

Patent status:

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

Source: Kenneth A. Craig
of North American Aviation, Inc.
under contract to
Marshall Space Flight Center
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