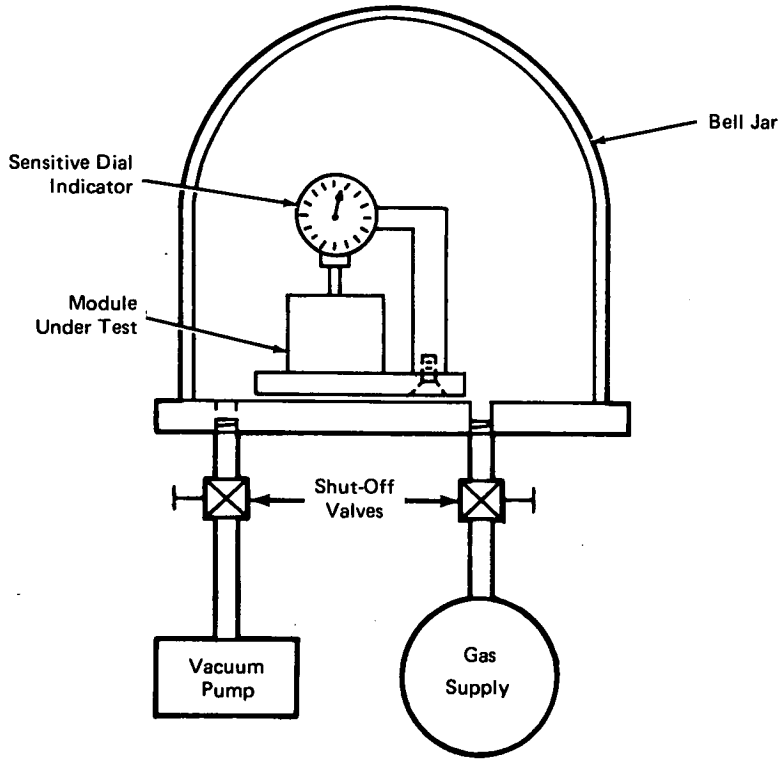
NASA TECH BRIEF

Langley Research Center

Nondestructive Leak Testing

A method has been devised to leak test hermetically-sealed instrument modules, such as those used for electronic circuitry and delicate mechanical equipment. It provides an opportunity to effect repairs without compromising the integrity of the enclosed circuitry or mechanism by loss of atmosphere or by ingestion of foreign matter or gas. With this method, it is possible to detect leaks in, and determine the leak rate of, modules which are sealed while fully evacuated, partially evacuated, or containing some form of gas. It has proven effective for nondestructive leak testing of relatively small sealed modules, ranging in structure from semi-flexible to semirigid.

The illustration shows a typical test setup. A module is placed in the fixture. The dial indicator is zeroed while its probe is in contact with a centrally located point on the most flexible surface of the module. A bell jar is placed over the fixture and partially or completely evacuated by the vacuum pump. Complete evacuation will create an inside-to-outside module pressure differential equal to the pressure of the atmosphere within the module. This, in turn, will cause even a slightly flexible surface area to act as a diaphragm and produce a deflection of the gauge dial. No gauge deflection indicates a gross leak, initial gauge deflection that falls back toward zero indicates a fine leak, and gauge



Nondestructive Leak-Test System

(continued overleaf)

deflection which remains steady indicates a sealed unit. Leak rate can be calculated from leak-down time.

If the module has been filled with gas, it will be evacuated during the test if a leak is present. In such a case, the gas can be replaced by closing the valve to the vacuum pump and flooding the bell jar with the same gas through a separate supply inlet. This will provide an opportunity to repair the module under original conditions.

The test setup shown is effective for gauge deflections of 0.00127 cm (0.0005 in.) or greater. For very small or more rigid modules, the apparatus is modified by removing the dial indicator and replacing it with a sensitive strain gauge connected to a digital readout. This modified apparatus can then be calibrated to detect smaller diaphragm movements.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Langley Research Center
Mail Stop 139-A
Hampton, Virginia 23665
Reference: B73-10464

Patent status:

NASA has decided not to apply for a patent.

Source: T. K. Lusby, Jr., and Frank Lawrence
Langley Research Center
(LAR-11561)