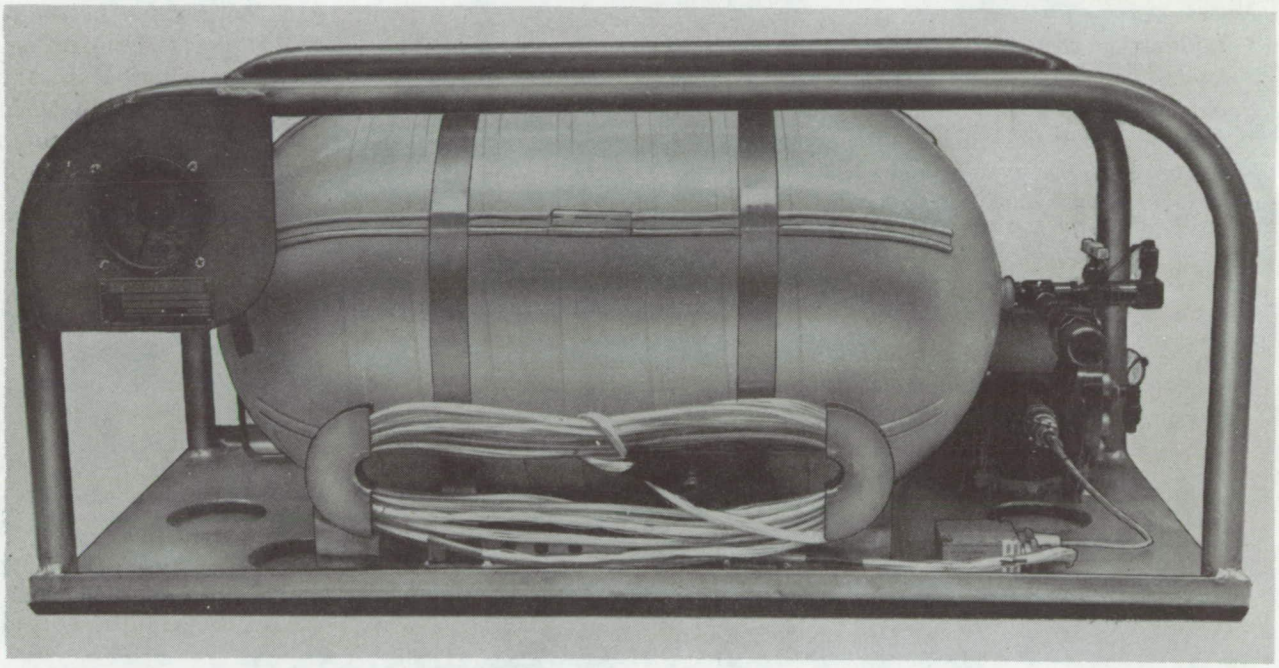
September 1972 B72-10376

NASA TECH BRIEF

Marshall Space Flight Center

Leak Test System



A leak test system used for quantitative determination of leak rates in large pressurized compartments in an aerospace program appears feasible for adaptation in industrial fabrication and maintenance operations.

The method utilizes a pressure reference cylinder (see figure) placed in thermal contact with the internal environment of the compartment tested. The cylinder is equipped with a differential pressure transducer (0.0-34.1 cm or 13.5 in H_2O column range), an amplifier with a signal output of 0.0 to 5.0 VDC corresponding to the transducer range, and cabling to integrate the pressure reference cylinder with a signal readout unit (with power supply) located outside the compartment tested. The signal readout unit provides a 28 VDC input power to the differential pressure transducer and millivolt digital readout of the amplifier output.

The pressure reference cylinder is pressurized to 1.37 x 10^5 N/m^2 (5.2 psig), placed within the compartment to be tested, and integrated with the signal readout unit. An electrical pass-through is provided in the wall of the compartment under test (or a test closure assembly in some test configurations) to permit integration of the system. The compartment under test is then closed and pressurized until the signal output of the pressure reference cylinder transducer indicates 13 cm (5 in) H_2O column differential between cylinder and compartment pressures. Gas flow to the compartment, at this time, is reduced to a specified leakage value. An increase or decrease in compartment pressure, with respect to the cylinder reference pressure, serves as an indication of whether the compartment leakage is less than or exceeds, respectively, the maximum allowable specification value.

(continued overleaf)

The flow is then varied until signal output indicates a stabilized condition of 13 cm H_2O column pressure differential between the cylinder and compartment. The delivery flow rate at this time is a directly readable parameter and is equal to the compartment leak rate.

Since the gases within the cylinder and compartment undergo essentially the same temperature transients, the effects of temperature changes on test result accuracies and on the ease of balancing flows are significantly reduced. Application of this test method has demonstrated a system sensitivity which responds, within 15 minutes, to changes in the delivery flow into a volume of 47.6m^3 (1700 $ft.^3$) that are as small as 150 std. cm^3/sec.

Notes:

1. Information concerning this innovation may be of interest to manufacturers of holding tanks, tank cars, processing vessels used for handling hazardous materials and aircraft and ship pressurized compartments.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&PS-TU
   Marshall Space Flight Center, Alabama 35812
   Reference: B72-10576

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel
Marshall Space Flight Center
Code A&PS-PAT
Marshall Space Flight Center, Alabama 35812

Source: R. G. Morris and A. L. Rose of
McDonnell Douglas Corp.
under contract to
Marshall Space Flight Center
(MFS-21788)