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# NASA TECH BRIEF

## *Marshall Space Flight Center*



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### Metabolic Breath Analyzer

An instrument incorporating a small analog computer measures the metabolic breathing rate and the dynamics of human beings in atmospheres ranging from normal air to 100% oxygen at ambient pressures from 14.7 to 3.0 psia. Quantities measured are: oxygen consumption, carbon dioxide production, respiratory volume, respiratory exchange ratio, nitrogen content, water vapor content, and vital lung capacity (including subdivisions thereof). The measurements can be made on subjects at rest or performing standardized tasks up to their maximum physical capacity under either zero or normal gravity.

The instrument includes two diaphragm-sealed, piston-displacement spirometers which measure the volumes of the inhaled and exhaled breath. Temperature and pressure transducers correct these volumes to standard conditions. A magnetically focused mass spectrometer simultaneously analyzes the composition of the inhaled and exhaled gases with respect to oxygen and carbon dioxide, as well as nitrogen and water vapor content. Pressurized bottles containing standard mixtures of these gases are used for periodic calibration of the mass spectrometer.

Logic circuitry in the computer receives signals from the spirometers to initiate automatic refilling of the inhale spirometer and emptying of the exhale spirometer in exact rhythm to the subject's breathing cycle. Other computer circuitry receives volume, temperature, pressure, gas analysis, and timing signals for computation of the indicated components. The resulting data are displayed for readout at predetermined intervals.

#### Note:

Requests for further information may be directed to:

Technology Utilization Officer  
Code A&TS-TU  
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Reference: B71-10466

#### Patent status:

No patent action is contemplated by NASA.

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