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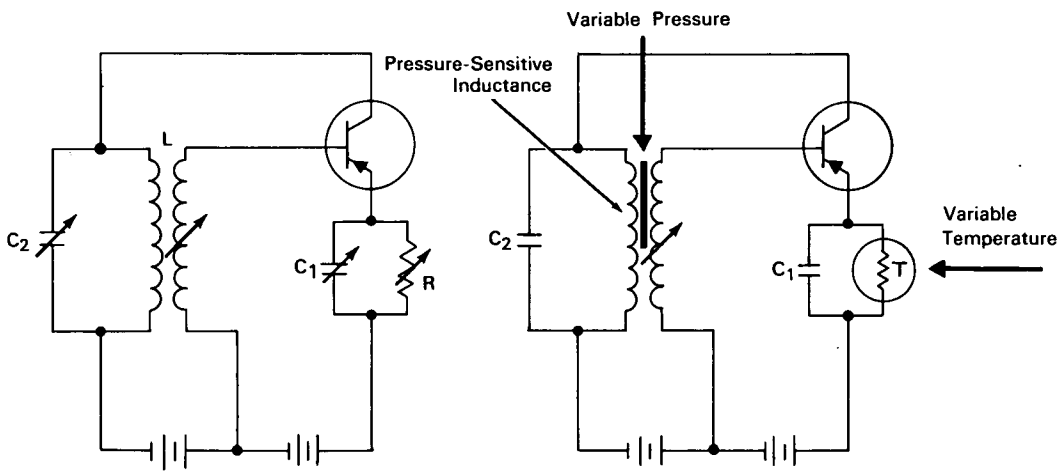
NASA TECH BRIEF

This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the space program.

Tiny Sensor-Transmitter Can Withstand Extreme Acceleration, Gives Digital Output



BASIC CIRCUIT

ONE FORM OF CIRCUIT FOR MEASUREMENT OF PRESSURE AND TEMPERATURE

The problem: The measurement and simultaneous transmission of physical magnitudes, e.g., pressure and temperature, on a projectile.

The solution: A compact, dual mode, radio-frequency transmitter, capable of withstanding severe accelerations and shocks.

How it's done: The transmitter is a self-pulsing oscillator that transmits a signal in pulses. The time between pulses is controlled by the RC_1 network, and the frequency is controlled by the LC_2 network. With proper choice of component values, the basic circuit transmits at a frequency of 136 mc. Variations in the component values in each of the two networks due to environmental (e.g., pressure and temperature) changes will appear as changes in frequency and time between pulses in the transmitted signal. To measure pressure, the basic oscillator frequency can be varied by a pressure-sensitive inductance in place of L or by a pressure-sensitive capacitor in place of C_2. To measure temperature, the time between pulses can be varied by a thermistor in place of R or by a temperature-sensitive capacitor in place of C_1. The second illustration shows the circuit using a pressure-sensitive inductance and thermistor for measurement of pressure and temperature.

The sensor-transmitter has a 60-hour operating life on its self-contained batteries and a range of 25 feet without an antenna. Its transmitting range can be considerably increased with the addition of an antenna. The device, including batteries, potted in a cylindrical

(continued overleaf)

container measures only 7/16 inch o.d. by 7/8 inch in length and weighs 2.5 grams. It has successfully transmitted data from projectiles during flight at hypersonic speeds in the ballistic ranges and continued to function normally after impact.

Notes:

1. Because of its unique ability to withstand high accelerations, this device might find application in situations where data transmission is required after launch to remote locations and subsequent impact. Examples of such inaccessible areas might be mountainous regions, mines, and oil wells.
2. The device may also be useful as a sensor and transmitter in meteorological, military, police, and rescue work.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California, 94035
   Reference: B63-10561

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA, and a patent application has been filed. When patented, royalty-free nonexclusive licenses for its commercial use will be available. Inquries concerning license rights should be made to NASA Headquarters, Washington, D.C., 20546.

Source: Gilbert Robinson and Ralph L. Mossino
(ARC-22)