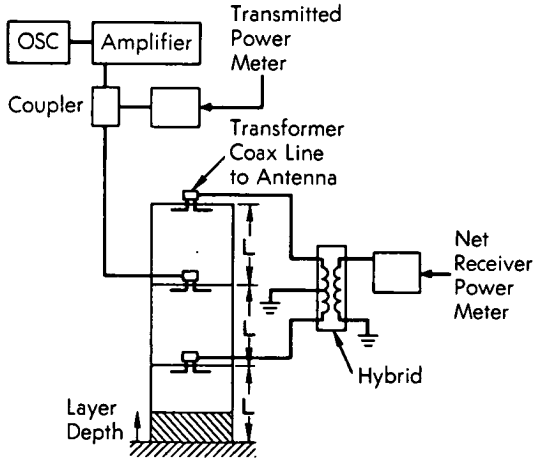
NASA TECH BRIEF

Ames Research Center

Remote Measurement of the Water Content of Snowpacks

The direct application of some of the basic research in the NASA lunar exploration program has resulted in the development of a number of concepts for electromagnetic remote-sensing devices which should be valuable for the measurement of snowpacks on earth. Knowledge of the water content of a snowpack is important in the management of water resources. At present, trained personnel traverse snow courses and make measurements to obtain snow depths and density data. Typical measuring methods include "Montrose tubes" to obtain samples for weight determinations, a "pressure pillow" to weigh the snow above it, and the attenuation of gamma rays by the snow layer. Although all methods in current use have proved to be of great value in providing information which permits forecast of water runoff, each depends on the statistical evaluation of the readings reported at a limited number of stations. Efforts have been made to encompass larger regions on a reasonably periodic basis, for example, photography from airplanes or satellites to provide large-scale information of the extent of snow cover; however, photography does not provide information of snow depth and density.

Tests on snowpacks shoveled under a wood tower have been made to verify the applicability of the general theories developed during studies for lunar exploration systems. Typically, a 290-MHz oscillator and power amplifier was used to feed constant power to an antenna configuration on the tower; two receiving antenas were connected to a "hybrid" which produced a vector sum of the antenna signals. The net output of the antennas was monitored and considered to be the net receiver power. The three antennas were 242 cm apart; the arrangement permitted removal of the direct signal from the transmitter via the vector-sum process in the hybrid, and so only the signal reflected by the snow layer and the earth under



it produced the significant portion of the receiver output. The results of the tests show that the technique should prove useful in airborne applications for remote measurement of snowpack water content.

Note:

Requests for further information may be directed to:

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Reference: TSP 72-10567

Patent status:

NASA has decided not to apply for a patent.

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Category 02, 03