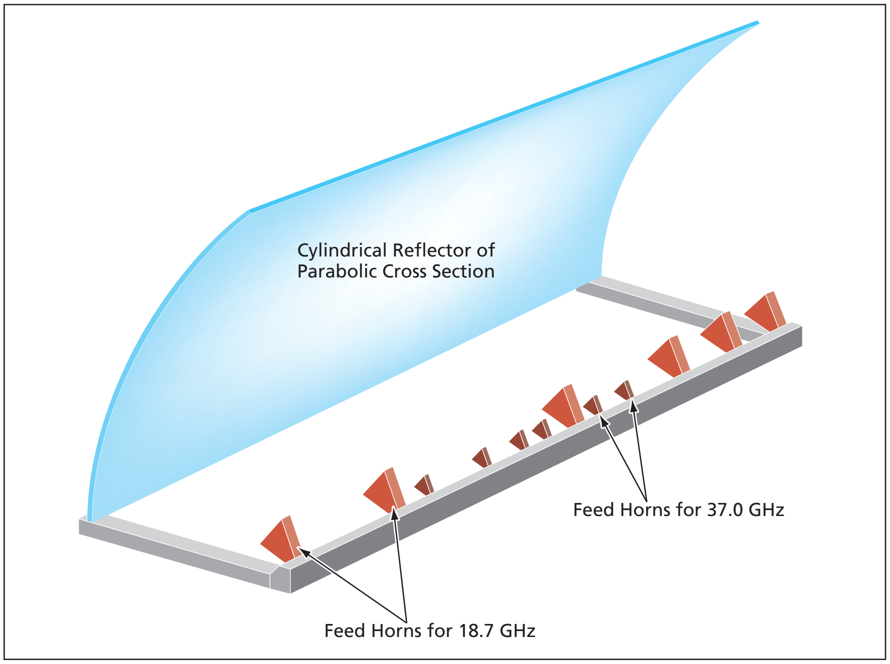
A One-Dimensional Synthetic-Aperture Microwave Radiometer

Phased microwave feed horns would be arrayed sparsely along a cylindrical parabolic reflector.

Goddard Space Flight Center, Greenbelt, Maryland

A proposed one-dimensional synthetic-aperture microwave radiometer could serve as an alternative to either the two-dimensional synthetic-aperture radiometer described in the immediately preceding article or to a prior one-dimensional one, denoted the Electrically Scanned Thinned Array Radiometer (ESTAR), mentioned in that article. The proposed radiometer would operate in a "pushbroom" imaging mode, utilizing (1) interferometric cross-track scanning to obtain cross-track resolution and (2) the focusing property of a reflector for along-track resolution.

The most novel aspect of the proposed system would be the antenna (see figure), which would include a cylindrical reflector of offset parabolic cross section. The reflector could be made of a lightweight, flexible material amenable to stowage and deployment. Other than a stowage/deployment mechanism, the antenna would not include moving parts, and cross-track scanning would not entail mechanical rotation of the antenna. During operation, the focal line, parallel to the cylindrical axis, would be oriented in the cross-track direction, so that placement of receiving/radiating elements at the focal line would afford the desired along-track resolution.



The **Antenna of the Proposed Radiometer** would consist of microwave feed horns positioned along the focal line of a cylindrical parabolic reflector. In one potential application, there would be two sets of feed horns for operation at two frequencies: the larger ones would be 18.7 GHz, the smaller ones for 37.0 GHz.

The elements would be microwave feed horns sparsely arrayed along the focal line. The feed horns would be oriented with their short and long cross-sectional dimensions parallel and perpendicular, respectively, to the cylindrical axis to obtain fan-shaped beams having their broad and narrow cross-sectional dimensions parallel and perpendicular, respectively, to the cylindrical axis. The interference among the beams would be controlled in the same manner as in the ESTAR to obtain along-cylindrical-axis (cross-track) resolution and cross-track scanning.

This work was done by Terence Doiron and Jeffrey Piepmeier of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-14748-1

Electrical Switching of Perovskite Thin-Film Resistors

Physical properties are altered in useful ways by applying electrical pulses.

Marshall Space Flight Center, Alabama

Electronic devices that exploit electrical switching of physical properties of thin films of perovskite materials (especially colossal magnetoresistive materials) have been invented. Unlike some related prior devices, these devices function at room temperature and do not depend on externally applied magnetic fields. Devices of this type can be designed to function as sensors (exhibiting varying electrical resistance in response to varying temperature, magnetic field, electric field, and/or mechanical pressure) and as elements of electronic memories.

The underlying principle is that the application of one or more short electrical pulse(s) can induce a reversible, irreversible, or partly reversible change in the electrical, thermal, mechanical, and magnetic properties of a thin perovskite film. The energy in the pulse must be large enough to induce the desired change but not so large as to destroy the film. Depending on the requirements of a specific application, the pulse(s) can have any of a large variety of waveforms (e.g., square, triangular, or sine) and be of positive, negative, or alternating polarity. In some applications, it could be necessary to use multiple pulses to induce successive incremental physical changes.

In one class of applications, electrical pulses of suitable shapes, sizes, and polarities are applied to vary the detection sensitivities of sensors. Another class of applications arises in electronic circuits in which certain resistance values are required to be variable: Incorporating the