Portable Airborne Laser System Measures Forest-Canopy Height

This system can be built, operated, and repaired at relatively low cost.

Goddard Space Flight Center, Greenbelt, Maryland

The Portable Airborne Laser System (PALS) is a combination of laser ranging, video imaging, positioning, and data-processing subsystems designed for measuring the heights of forest canopies along linear transects from tens to thousands of kilometers long. Unlike prior laser ranging systems designed to serve the same purpose, the PALS is not restricted to use aboard a single aircraft of a specific type: the PALS fits into two large suitcases that can be carried to any convenient location, and the PALS can be installed in almost any local aircraft for hire, thereby making it possible to sample remote forests at relatively low cost. The initial cost and the cost of repairing the PALS are also lower because the PALS hardware consists mostly of commercial off-the-shelf (COTS) units that can easily be replaced in the field.

The COTS units include a laser ranging transceiver, a charge-coupled-device camera that images the laser-illuminated targets, a differential Global Positioning System (dGPS) receiver capable of operation within the Wide Area Augmentation System, a video titler, a video cassette recorder (VCR), and a laptop computer equipped with two serial ports. The VCR and computer are powered by batteries; the other units are powered at 12 VDC from the 28-VDC aircraft power system via a low-pass filter and a voltage converter.

The dGPS receiver feeds location and time data, at an update rate of 0.5 Hz, to the video titler and the computer. The laser ranging transceiver, operating at a sampling rate of 2 kHz, feeds its serial range and amplitude data stream to the computer. The analog video signal from the CCD camera is fed into the video titler wherein the signal is annotated with position and time information. The titler then forwards the annotated signal to the VCR for recording on 8-mm tapes. The dGPS and laser range and amplitude serial data streams are processed by software that displays the laser trace and the dGPS information as they are fed into the computer, subsamples the laser range and amplitude data, interleaves the subsampled data with the dGPS information, and records the resulting interleaved data stream.

This work was done by Ross Nelson of **Goddard Space Flight Center**. *Further information is contained in a TSP (see page 1).*
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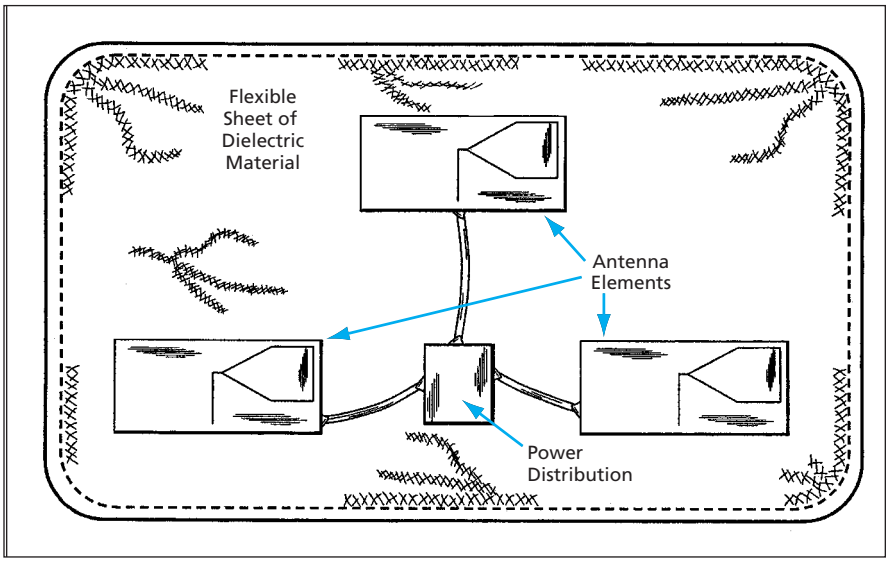
Deployable Wide-Aperture Array Antennas

Antennas would be unrolled or unfolded to full size when and where needed.

Lyndon B. Johnson Space Center, Houston, Texas

Inexpensive, lightweight array antennas on flexible substrates are under development to satisfy a need for large-aperture antennas that can be stored compactly during transport and deployed to full size in the field. Conceived for use aboard spacecraft, antennas of this type also have potential terrestrial uses — most likely, as means to extend the ranges of cellular telephones in rural settings.

Several simple deployment mechanisms are envisioned. One example is shown in the figure, where the deployment mechanism, a springlike material contained in a sleeve around the perimeter of a flexible membrane, is based on a common automobile window shade. The array can be formed of antenna elements that are printed on small sections of semi-flexible laminates, or preferably, elements that are constructed of conducting fabric. Likewise,



A **Wide Array of Four Radiating Antenna Elements** and their transmission line would be made from flexible conductive materials on a flexible dielectric sheet. When not in use, the antenna could be rolled into a compact cylinder in the manner of a window shade.