May 1971

Brief 71-10121

NASA TECH BRIEF

Lewis Research Center

Low-Cost Quasi-Parabolic Antenna

A low-cost quasi-parabolic antenna design employs flat petal-shaped sheets of aluminum and a novel rim configuration. Usually, small parabolic antennas are constructed from metal, plastic, fiberglass, or combinations of these materials. The materials are formed in dies and jigs by stamping, spinning, molding, stretch forming, and other operations to produce surfaces of very close tolerance to the ideal parabolic surfaces. These conventional antennas are relatively expensive, a limiting factor to their application. In many communications systems, however, a close tolerance parabolic surface is not needed, and considerable savings can be realized by using the new antenna, which can be made by inexpensive methods and has only slightly degraded performance.

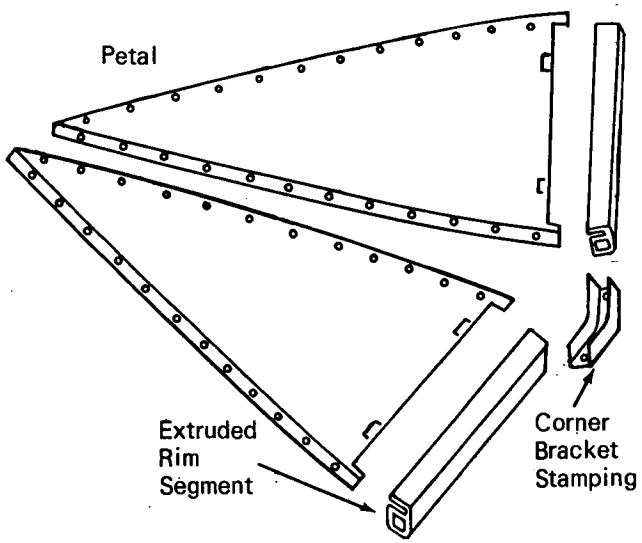

Figure 1. Antenna Components

The design resulted from a program to develop a low-cost antenna that could be shipped in a compact package and easily assembled in the field to form a rigid structure independent of the mounting method and positioning supports.

An error analysis program was developed to determine the optimum number and shape of the antenna sections for any desired frequency and antenna size. A second program related antenna costs to desired gain and frequency selection. With these programs, it is possible to select the optimum antenna size for any frequency.

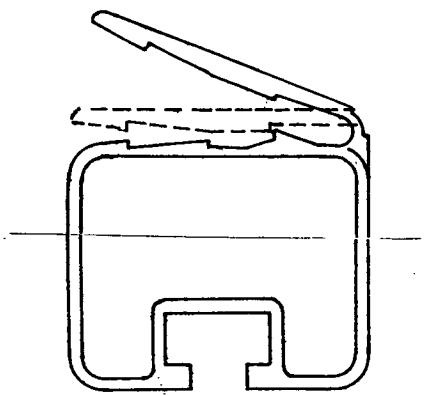

Figure 2. Extrusion for Rim

The antenna is 2.1 m (7 ft.) in diameter and is made from ten flat aluminum petals of 0.10 cm (0.04 in.) aluminum sheet stamped in a one- or two-step operation by a sheet metal press (see Figure 1). One of the unique features is that the petal sections remain flat until the antenna is assembled. When the petals are fastened together along their seams, the antenna assumes a quasi-parabolic shape. The edge contour of the petal uniquely defines the overall surface shape of the assembled antenna, and was optimally chosen to achieve the maximum gain.

Structural rigidity of the antenna is provided by ten extruded box-rim segments (see Figure 2)

(continued overleaf)

fastened together around the rim by stamped corner brackets which slip over adjoining segments and are bolted in place. The flat petals are folded in and fastened along their seams with pop rivets to form the complete structure. The rim provides convenient attaching points for mounts and feed supports, and is one of the most crucial parts of the antenna design, serving many functions. It provides the structure for keeping the entire antenna rigid against bending and torsional loads.

This antenna can be manufactured in a series operation from flat dies, which are less expensive than compound-curve dies. In large or small production or prototype quantities, the production costs are comparatively low. The entire antenna, unassembled, and with all mounts, can be shipped in a box 1.2 × 0.75 × 0.15 m (48 × 28 × 6 in.), and weighing 24 kg (65 lbs.).

Notes:

1. The advantages of this antenna design are: (1) low-cost tooling and fabrication; (2) convenient size and shape for transport and assembly; and (3) simple assembly procedure.
2. The following documentation may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)
   Reference:
   NASA-CR-72773 (N71-17707), The Design and Development of a Low-Cost Microwave Adapter Suitable for Television Reception from High-Power Communications Satellites
3. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B71-10121

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
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