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ELECTROSTATIC FORMING

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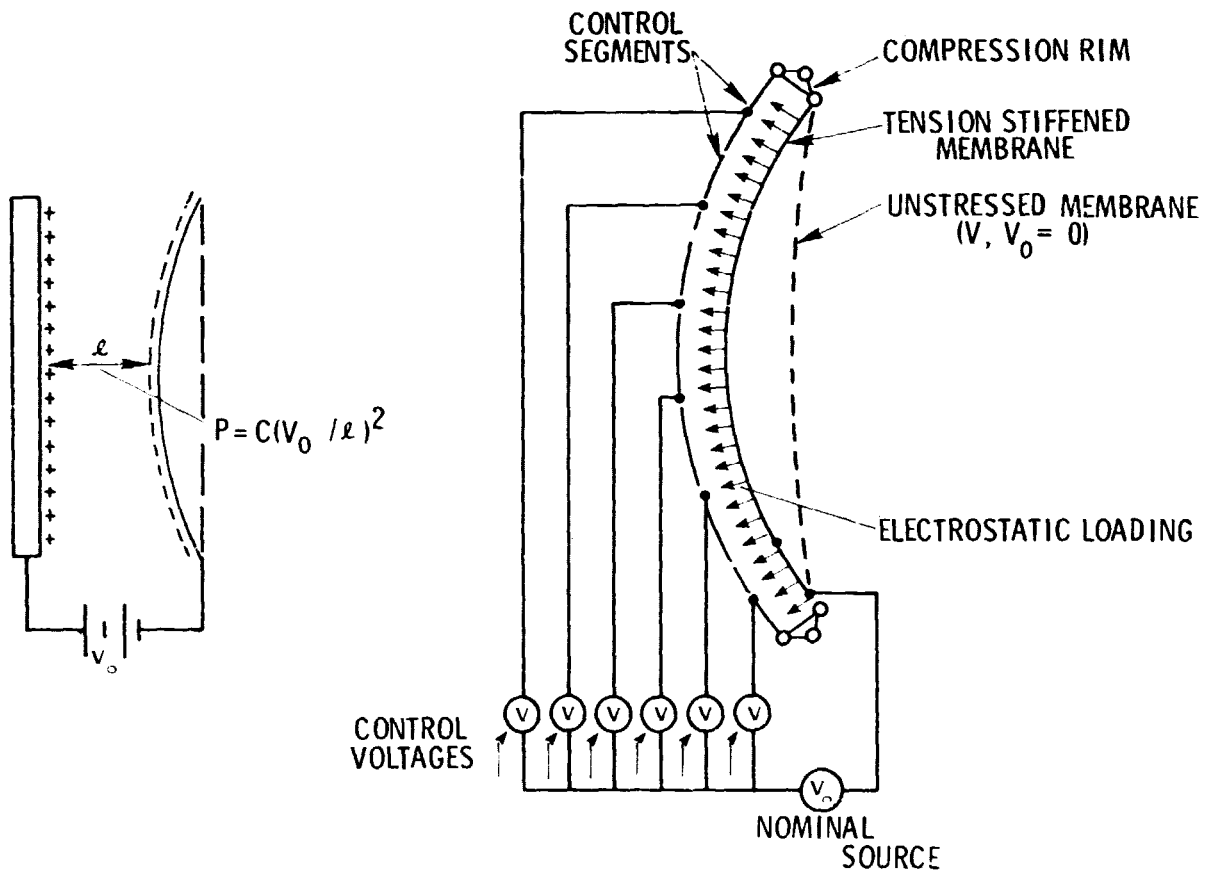
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ELECTROSTATIC FORMING

Electrostatic forming of antenna or reflector surfaces was proposed to Langley in 1978 by General Research Corporation (GRC). A small 0.91-m (3-foot) diameter reflector was fabricated by GRC and demonstrated to various groups both at Langley and NASA Headquarters.

This viewgraph demonstrates the concept and shows how the membrane deflects when a voltage is applied between the membrane surface and back electrodes.

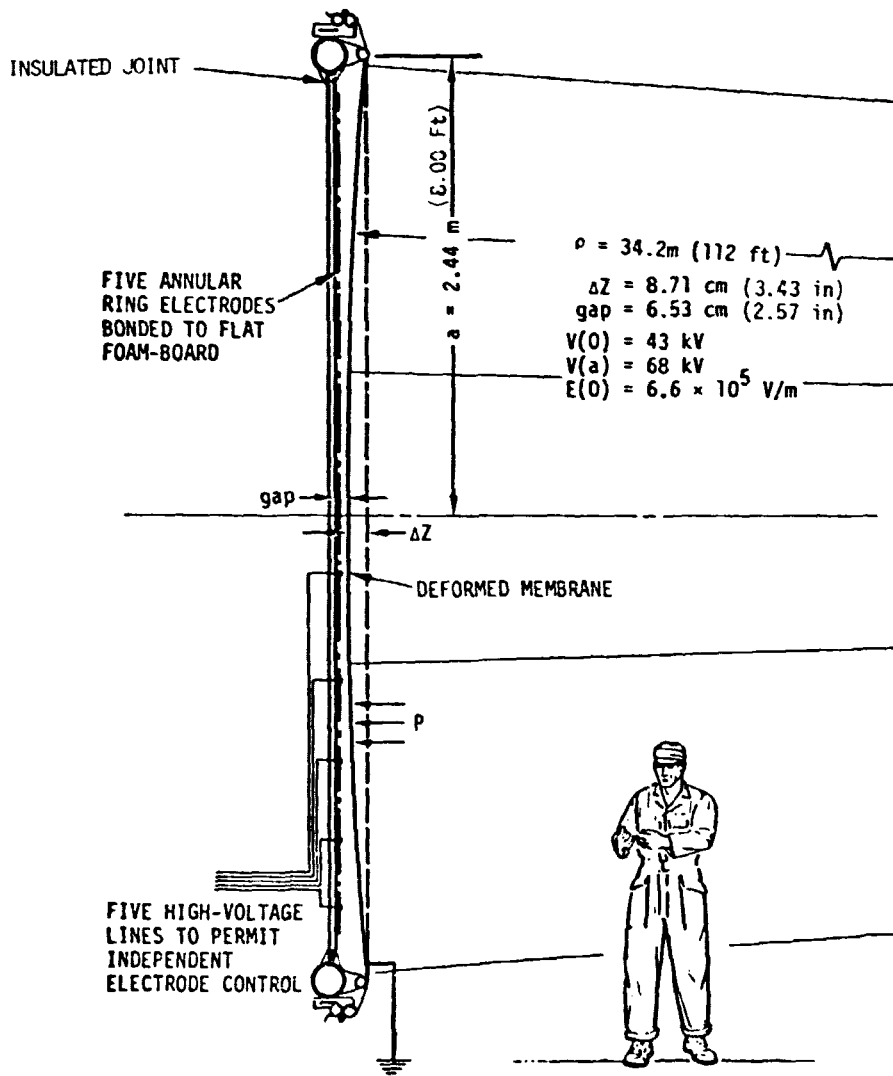
ELECTROSTATICALLY CONTROLLED MEMBRANE CONCEPT



ELECTROSTATIC FORMING

Langley funded a study by GRC to conduct a parametric study and preliminary design of a 4.88-m (16-foot) diameter test fixture which is to be used to prove that the electrostatic forming technique is a viable means of forming antenna surfaces. After the study was completed in February 1979, Kentron was given the job of producing a working design of the test fixture. The final drawings were completed in September 1979.

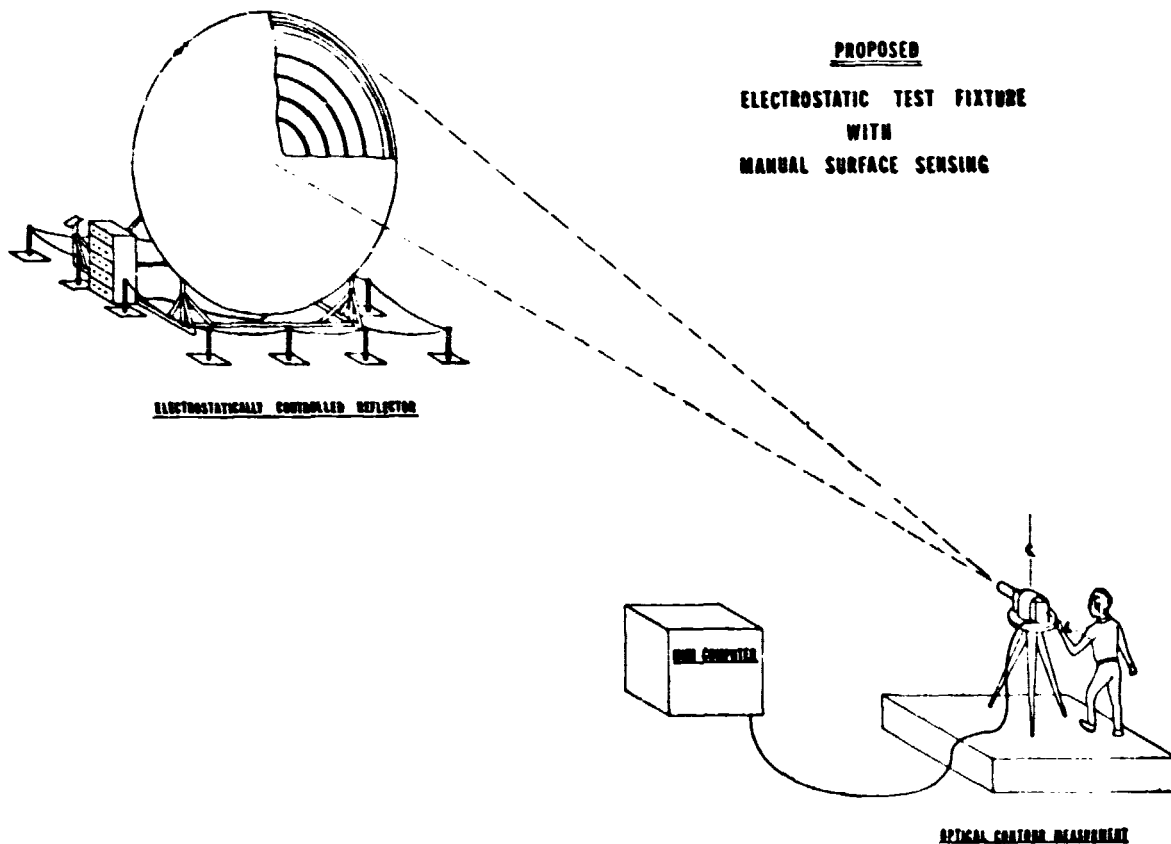
In connection with developing the details of the 4.88-m (16-foot) test fixture, Kentron fabricated a 1.83-m (6-foot) diameter preprototype test fixture which was used to try out some of the ideas which went into the design of the 4.88-m (16-foot) test fixture. The 1.83-m (6-foot) fixture is set up at Langley along with the laser surface sensing device which Robert Spiers will discuss in the next paper.



ELECTROSTATIC FORMING

The drawings of the 4.88-m (16-foot) diameter test fixture have been released to the shops and we anticipate that it will be completed in March 1980. Also, by that time, we hope to have a surface sensing technique clearly defined.

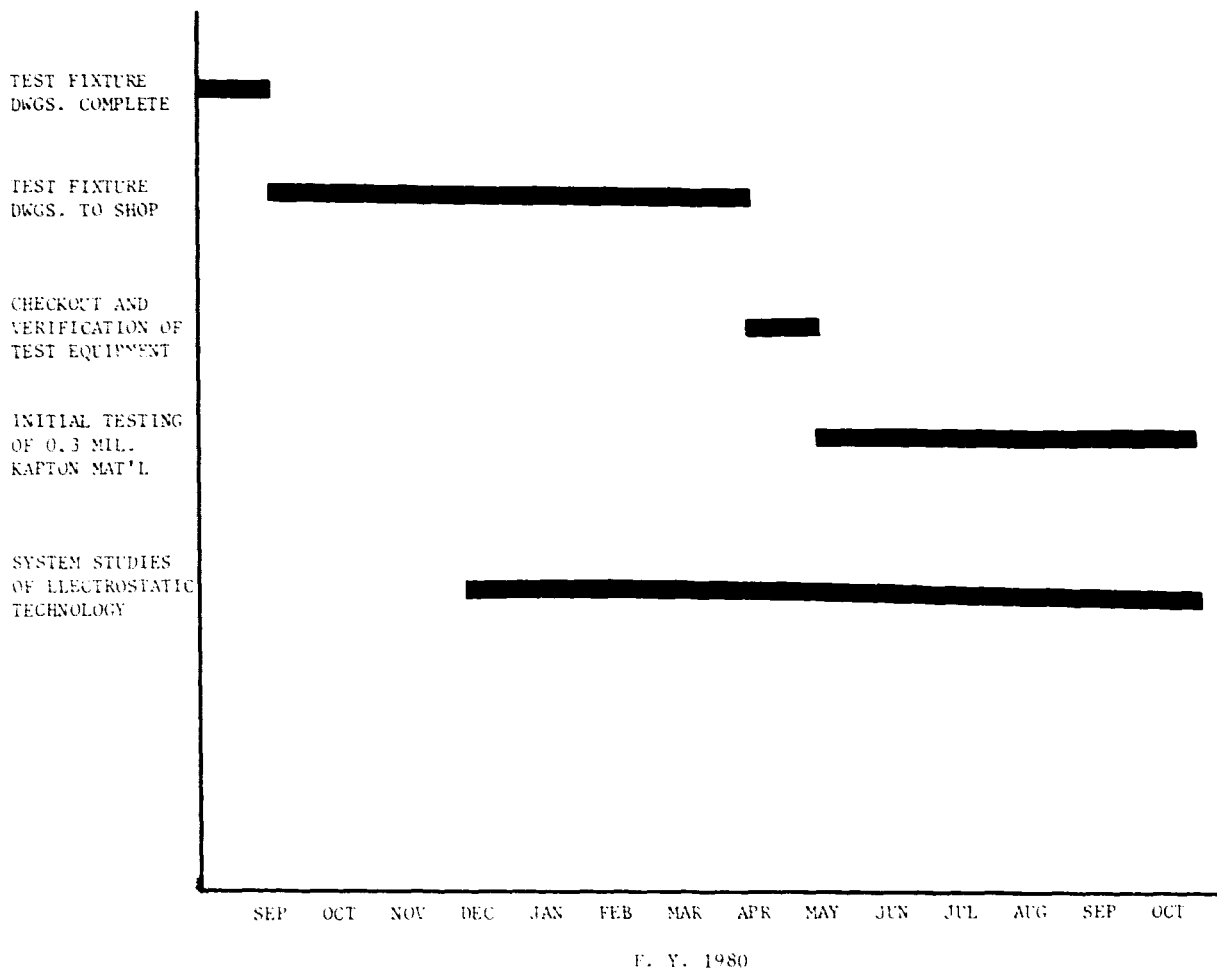
This viewgraph shows how the 4.88-m (16-foot) diameter test fixture will be set up with the surface sensing device at the radius of curvature which will be at 34.2 meters (112 feet) from the surface.



ELECTROSTATIC FORMING

The initial material we intend to test is 0.3 mil. Aluminized Kapton which will have several seams after fabrication. Later on, we want to test other plastic materials as well as some of the meshes that are being used for antennas.

This viewgraph shows the proposed schedule for the F. Y. 1980 efforts.



ELECTROSTATIC FORMING

We also intend to examine the electrostatic forming technique from a system technology viewpoint during F. Y. 1980 to determine some of the potential antenna characteristics. Also, we want to determine if space charging effects would create any potential problems on an electrostatically formed antenna. From an analytical viewpoint, we want to develop further understanding of the electrostatic technique and how it can be used in future applications.

This viewgraph shows the areas to be investigated in system technology.

ELECTROSTATIC SYSTEM STUDY AREAS

- Study of LEO and GEO Environmental Effects on Electrostatically Charged Surfaces
 - Determine Floating Potential
 - Determine Vacuum and Plasma Effects on Electrostatically Charged Surfaces
 - Determine Stress in Insulation Due to Electrical Field
- System Study of Technology Involved in Electrostatically Formed Antennas
 - Mechanical Interface Between Reflector and Supporting Structure
 - Thermal Effects on Antenna System
 - Structural Configuration
 - Deployment Concept
 - Mass of System
 - Stowed Volume
- Analysis and Scaling of 4.88-m (16-Foot) Diameter Test Data
 - Test Data Analytic Representation
 - Validation of Reflector Shape
 - First Order Scaling to Large Sizes