Air Force SBIR/STTR

Impact

Low Cost, Low Radar Cross Section Antennas

Company:
Mission Research Corporation

Location:
Beavercreek, Ohio

Employees:
356

President:
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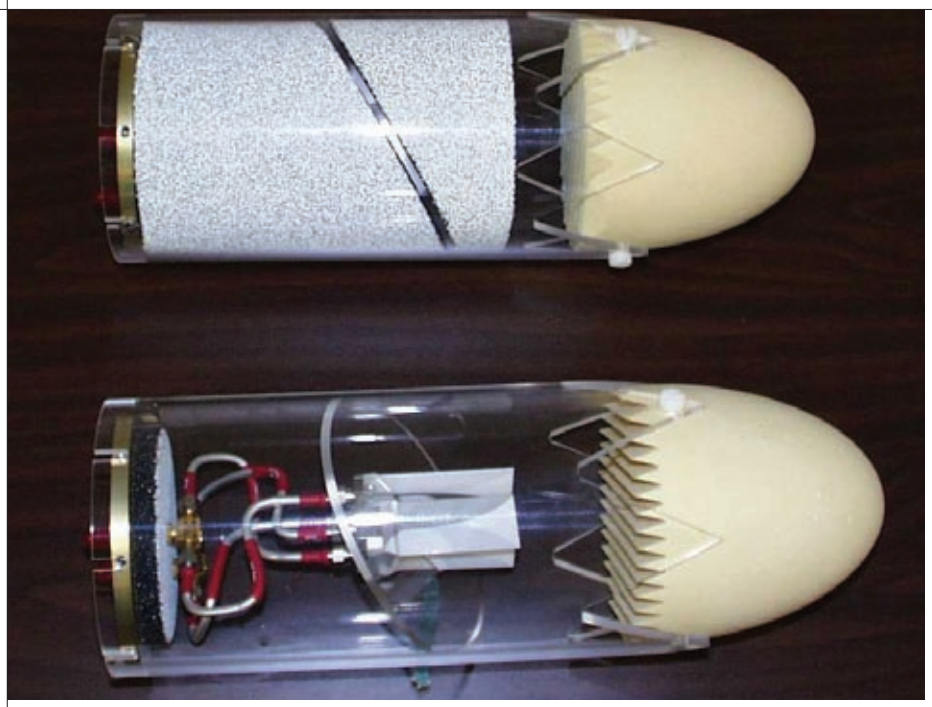

Air Force Requirements:

The Air Force requires Low RCS antennas for use in the Benefield Anechoic Facility (BAF) at Edwards Air Force Base, California. This facility is used to expose an operational aircraft to a realistic radio frequency (RF) environment. An aircraft under test must be illuminated from several directions, often simultaneously. The Radar Cross Section (RCS) of the antennas must be low to reduce the interactions between the various antennas in the chamber, as well as interactions between the antennas and the target aircraft. The cost must be low due to the anticipated number of antennas required to realistically illuminate a target.

SBIR Technology:

The Beavercreek, Ohio office of Mission Research Corporation was awarded both Phase I and Phase II Small Business Innovation Research Program (SBIR) contracts to develop Low Cost, Low Radar Cross Section (LCLRCS) Antennas for use in anechoic chambers. Three antenna designs resulted from the SBIR project.

All antennas are dual polarized (V and H with separate inputs) in order to permit radiation of arbitrary polarization. In addition to the low RCS characteristics, the antennas need to handle

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100 Watts CW. The first antenna covers the band 0.50 to 2.0 GHz. It consists of two interlaced, orthogonal 2 x 2 arrays (8 total elements) of notch radiators etched into standard FR4 printed circuit board. To achieve a low RCS, the antenna uses a tilted low pass radome that is transparent to frequencies below 6 GHz and reflective to frequencies from 7 to 13 GHz, where the major RCS concern exists. The radome is fabricated of two thin Frequency Selective Surface layers etched into 0.010" thick sheets of FR4 printed circuit board, separated by a 0.25-inch foam layer. The second antenna operates from 2 to 6 GHz. This antenna is a polyester lens antenna with a dual polarized log periodic feed. It uses the same low pass radome design as the 0.5 to 2.0 GHz antenna. The radome itself is much smaller, due to the smaller antenna size. The third antenna operates from 6 to 18 GHz. It is a lens antenna with a notch radiator array feed. The lens is made of polyurethane foam to achieve a low RCS. On beam, RCS is driven by the feed RCS. For signals off beam, the incident energy is focused on an absorbing backing.

These antennas are less expensive than conventional (higher RCS) commercially available antennas with similar antenna performance characteristics.

Company Impact:

Mission Research Corporation has sold antennas based on the SBIR effort to Raytheon Systems Company (formerly Hughes Aircraft Company) for implementation into the Electronic Combat Integrated Test (ECIT) System being installed by Raytheon at the BAF at Edwards AFB. To date, fourteen of the 2-6 GHz antennas, and nineteen of the 6-18 GHz antennas have been ordered and delivered. Also, related receive probe antennas have been delivered to Raytheon for use in the CIT System: five 2-6 Hz receive probes, and five 6-18 Hz receive probes. Due to the technology developed under the LCLRCS SBIR contract, MRC was able to provide antennas at approximately 60% of the cost quoted by other antenna suppliers for low RCS antennas. MRC is the only producer of antennas with these combined features.

Company Quote:

"This SBIR allowed us to develop a product line of general purpose high power low RCS test antennas, at a cost competitive with commercial (non-low observable) antennas. It also allowed us to develop a lens antenna design, engineering, and manufacturing capability."

Dr. Thomas Kornbau
Mission Research Corporation
Manager, Measurements Antennas Division

U.S. AIR FORCE

SBIR/STTR

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