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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: 7/23/73

Project Title: Techniques for Cross Section Reduction of Antennas

Project No.: A-1554

Project Director: Mr. F. B. Dyer

Sponsor: Applied Physics Laboratory; The Johns Hopkins University

Effective 6/21/73 Estimated to run until: 12/20/73

Type Agreement: APL Contr. No. 600023; Subcontract under Navy Prime N00017-72-C-4401 Amount: $ 19,972.00

REPORTS REQUIRED: Bimonthly Progress Letters; Monthly Fiscal Reports; Final Technical Report

SPONSOR CONTACT PERSONS:

Technical Matters	Contractual Matters
Messrs. R. Hester or R. Danchik	Mr. K. H. Taylor

The Johns Hopkins Unversity
Applied Physics Laboratory
8621 Georgia Avenee
Silver Spring, Maryland 20910

Defense Priority Rating: DX-A2 under DMS Reg. 1.

Assigned to Sensor Systems Division

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RA-62

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date April 2, 1974

PROJECT TITLE: "Techniques for Cross Section Reduction of Antennas"

PROJECT NO: A-1554

PROJECT DIRECTOR: Mr. F. B. Dyer

SPONSOR: Applied Physics Laboratory; The Johns Hopkins University

TERMINATION EFFECTIVE: February 28, 1974 (Contr. Expiration/Final Report Subm.)

CHARGES SHOULD CLEAR ACCOUNTING BY: February 28, 1974

CONTRACT CLOSEOUT ITEMS REMAINING: Final Invoice & Closing Documents
Final Report of Inventions
Government Property Inventory & Cert.
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SENSOR SYSTEMS DIVISION

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Form EES 402 (R10-62)

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

24 October 1973

Applied Physics Laboratory
The Johns Hopkins University
8621 Georgia Avenue
Silver Spring, Maryland 20910

Attention: Mr. R. Hester

Reference: APL Contract No. 600023, Subcontract under Navy Prime N00017-72-C-4401

Subject: Bi-Monthly Progress Report No. 2

Gentlemen:

This letter summarizes results of investigations under the subject contract for the period 1 August through 30 September 1973. The work has been directed in four main areas: (1) Measurement of low-frequency (i.e., 150 and 400 MHz) antenna characteristics with various types of coverings, (2) fabrication and field evaluations of selected radar cross-section reduction (RCSR) techniques, (3) comparisons of analytical predictions and laboratory results for selected, advanced reduction techniques, and (4) initiation of the design of a deliverable RCSR jacket for the antenna.

A preliminary set of measurements of the BRN antenna characteristics at 150 and 400 MHz has been completed which define the effects on performance of various types of covering which might be considered for use for RCSR. The following is a summary of the pertinent results.

(1) The basic antenna patterns at both 150 and 400 MHz for the unit tested are very similar to those published by Chu as "standard."

(2) Loss measurements on the Plessey absorber indicate that the transmission loss at frequencies below 500 MHz is less than 0.5 dB.

(3) Surrounding the antenna with absorbing material or other high dielectric jackets does change its characteristics, principally its impedance as typically the measurements produced similar beamwidth patterns as before but decreased the effective gain by 3 dB (avg) at 150 MHz and increased the effective gain at 400 MHz by 2 dB (avg).

(4) Measurements of various metallic jacket structures confirmed the possibility of surrounding the antenna with a jacket which has controlled reflectivity at selected microwave frequencies (for selected polarizations) and which has little effect on the inband performance of the antenna.

In addition to absorbing jackets, two basic approaches to shaping for minimum radar cross-section were selected for detailed analysis as candidate approaches. Test models of each approach were fabricated and evaluated during field operations at Boca Raton, Florida, early in September. Results of these evaluations are included in Memorandum Report No. 1 (MRA 1554-1) dated 25 September 1973. The results of the evaluation were encouraging in that good agreement between predictions and actual measured cross-section reductions were obtained; however, the selected implementations were not found to be optimum, especially at 3 GHz.

As a result of the field evaluations, an extensive set of laboratory measurements has been undertaken with the goal of defining optimum RCSR treatments which can be implemented in practical fashion. The overall results have been encouraging; however, performance at E/F bands in compact structures has been only marginally satisfactory. A tentative design for a RCSR jacket has been selected and laboratory measurements have been initiated on a breadboard version with the goal for further improving its performance at the lower microwave frequencies.

It is anticipated that efforts during the next report period will include the completion of laboratory measurements of the selected approach, fabrication of the final version, and initiation of final testing.

Yours truly,

Frederick B. Dyer
Senior Research Physicist

FBD/jg

A-1554 file

LIBRARY DOES NOT HAVE Bi-monthly reports 1 and 3.
Final report.

THESE REPORTS ARE CLASSIFIED.