

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: June 18, 1969

Project Title: Geodesic Luneberg Lens Scanning Antenna
Project No.: A-1185
Project Director: Mr. R. M. Goodman, Jr.
Sponsor: Harry Diamond Laboratories, U. S. Army Material Command
Effective 5 June 1969 Estimated to run until: 4 June 1970
Type Agreement: Contract No. DAAG33-69-C-0054* Amount: \$ 124,420.00

*Notice of Award received - detailed Contract to follow.

Defense Priority Rating: DO-A7 under DMC Regulation 1.

Assigned to Electronics (Sensor Sys.) Division

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date November 8, 1971

PROJECT TITLE: Geodesic Luneberg Lens Scanning Antenna

PROJECT NO: A-1185

PROJECT DIRECTOR: Mr. R. A. Moore

SPONSOR: Harry Diamond Laboratories (U.S. Army); Washington, D. C.

TERMINATION EFFECTIVE: October 12, 1971 (Contract expiration)

CHARGES SHOULD CLEAR ACCOUNTING BY: October 31, 1971

Contract Closeout Items Remaining: Final Invoice & Closing Documents
Final Report of Inventions
Government Property Inventory
Certificate of Proper Disposition-Gov't. Prop.
Classified material Certificate

Electronics (Sensor Systems)

COPIES TO:

Project Director
Director
Associate Director
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GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

25 July 1969

Commanding Officer
Harry Diamond Laboratories
ATTN: AMXDO-DBA, Mr. Sumner Taft
Washington, D. C. 20438



Subject: Monthly Status Report No. 1
Contract No. DAAG39-69-C-0054
Covering the period 1 June to 30 June 1969

Dear Sir:

This monthly status report describes the work effort on the referenced contract for the period 1 June 1969 to 30 June 1969. The work effort has been designated as Georgia Tech Project A-1185. Mr. R. M. Goodman, Jr., is the Project Director and Mr. R. A. Moore has been appointed Associate Project Director.

The official contract document did not reach this office during the referenced report period, but since the contract negotiations has been completed the technical work effort was started in accordance with the proposal.

The initial effort was to assign the goals and operating ground rules for the system. Since the radiation characteristics, i.e., beamwidths, gain, side-lobe levels and scan are not well established, the decision was made by Mr. Sumner Taft of HDL and Mr. R. M. Goodman, Jr., of Georgia Tech to allow the physical parameters of the system to govern the described rf characteristics. The determination of the physical system parameters will be obtained from the best available information.

A 30 inch hog horn has been designated and is to be fabricated for tests. The feed aperture of this hog horn will serve as a breadboard for determining the aperture configuration of an E-plane asymmetric horn, and provide beamshape and phase-center information for illuminating the parabolic cylinder reflector.

A 30 inch section of a parabolic cylinder is to be fabricated and placed in front of the hog horn feed. This reflector will have the same height and parabolic shape as the prototype model. Optimization of the far-field E-plane radiation patterns and feed horn pointing angle will be accomplished by measurements on this feed/reflector system.

Contract No. DAAG39-69-C-0054
Project A-1185
Page 2

The maximum lens configuration that may be packaged in the system has been established at 90 inches of effective lens aperture. Computer programs are being prepared and run to "fix" the other lens parameters; i.e., height, focal distance, scan limitation, radiation patterns and fabrication coordinates.


Drawings have been made on the parabolic cylinder reflector. These drawings specify the size, parabolic shape and mechanical tolerances, and were drawn primarily for the purpose of obtaining fabrication cost quotation. The drawings have been submitted to a reputable reflector manufacturing company for quotation.

It is anticipated that during the next report period the following will be accomplished: the fabrication of the hog horn will be completed and rf measurements will be started to determine the variation in E-plane phase center and beamshape as a function of the asymmetric flare length of the feed horn. Fabrication will be started early in August on the 30 inch reflector and feed horn/reflector mounting fixture. The study and computer effort for establishing lens parameters will continue.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

14 August 1969

Commanding Officer
Harry Diamond Laboratories
ATTN: AMXDO-DBA, Mr. Sumner Taft
Washington, D. C. 20438



Subject: Monthly Status Report No. 2
Contract No. DAAG39-69-C-0054
Covering the period 1 July to 31 July 1969

Dear Sir:

This status report describes the work effort on the referenced contract for the period 1 July through 31 July 1969.

The preliminary design for the 30-inch asymmetric horn is complete. A 30-inch parabolic cylinder reflector is being fabricated for use with this asymmetric horn. It is estimated the reflector and feed assembly will be ready, toward the latter part of August, for far-field E-plane radiation pattern measurement.

An H-plane sectoral horn has been designed and submitted for fabrication. Future design effort in the area of the primary feed will await the results of the RF measurements on this feed horn.

Cost quotations have been received for fabrication of the geodesic lens and parabolic cylinder reflector. The purchase order for the parabolic cylinder reflector will not be issued until evaluation of the far-field measurements on the 30-inch breadboard are complete. The purchase order for the lens spinnings will be issued as soon as design parameters and drawings are completed.

The design phase of the geodesic lens is essentially complete. The mean surface coordinates have been established and cutter surface coordinates are being calculated. A design review of these coordinates and the micro-wave performance expected will be held with HDL personnel prior to the beginning of fabrication.

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Page 2

The anticipated work effort for the next period is as follows:

The design effort in the area of system packaging will continue.


Far-field E-plane radiation pattern measurements will be started on the 30-inch reflector/feed system.

Compiling of the cutter surface coordinates and other fabrication details for the lens should be completed.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

15 September 1969

Commanding Officer
Harry Diamond Laboratories
ATTN: AMXDO-DBA, Mr. Sumner Taft
Washington, D.C. 20438



Subject: Monthly Status Report No. 3
Contract No. DAAG39-69-C-0054
Covering the period 1 August to 31 August 1969

Dear Sir:

This status report covers the work on the referenced contract for the period 1 August through 31 August 1969.

On 13 August Messrs. Bud Heinard and Jim Meek of HDL visited Georgia Tech to discuss the project status. All aspects of the program were presented in an informal meeting. Georgia Tech attendees at this presentation were R. M. Goodman, Jr., R. A. Moore, D. G. Bodnar, and L. A. Stapleton.

Work has been started on the far-field antenna pattern measurements for the breadboard asymmetric horn and parabolic cylinder reflector. Preliminary measurements indicate that the reflector, which has an effective aperture height of 10.5 inches, produces a -3dB secondary E-plane beamwidth of 7.6 degrees. A new reflector is to be fabricated to produce a wider E-plane beamwidth. The design goal on the E-plane -3dB beamwidth is 8.5 degrees.

The geodesic lens surface coordinates are still in the process of being put on punch tape. These tapes should be ready the first part of September. A design review on the expected microwave performance of the geodesic lens will be held with HDL personnel prior to letting the contract for fabrication of the lens spinnings.

The initial design H-plane primary feed horn for the lens has been fabricated. Preliminary microwave measurements on this horn have been started. The results to date are satisfactory.

The work planned for the September report period is as follows:

Tests will continue on the breadboard asymmetric horn/reflector combination. These tests will include the smaller reflector when fabrication is complete.

The geodesic lens surface coordinates will be placed on punch tapes early in September. These tapes are to be used for machine control in the fabrication of templates and machining the chucks for spinning the inner and outer shell assemblies.

The necessary drawings for fabrication of the lens spinnings will be completed early in the report period.

A request for sponsor approval to purchase the geodesic lens assemblies will be issued on or before September 10. Upon receipt of this sponsor approval, purchase orders will be issued for the lens fabrication. It is important that these purchase orders be issued during the month of September to tie in with the planned project scheduling.


Work will continue on the H-plane primary feed horn.

The design effort in the area of system packaging will continue.

Respectfully submitted,

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

6 October 1969

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438



ATTENTION: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 4
Contract No. DAAG39-69-C-0054
Covering the period 1 September to 30 September 1969

Dear Sir,

This status report covers the work on the referenced contract for the period 1 September through 30 September 1969.

The authorization to purchase the required components for the geodesic lens assembly was received on 25 September. All necessary fabrication drawings, coordinates and specifications for the lens are complete; purchase orders for the lens fabrication will be issued during the first week of October. A Georgia Tech representative will "hand carry" a set of drawings and specifications to the sub-contractor to determine if all necessary details have been provided and expedite the spinning of the lens parts.

The far-field radiation patterns of the breadboard asymmetric horn/reflector system have been completed. Measured radiation patterns obtained using the 9.5 inch aperture breadboard reflector have a 9 degree E-plane -3 dB beamwidth and 15 1/3 degree -10 dB beamwidth. The highest side-lobe level (over the frequency band 9.1 to 9.3 GHz) is 22 dB below the peak of the main beam, although slight vestigial lobes (shoulders) start developing on the main beam at a -18 dB level. This measured radiation pattern compares exceptionally well with the computer calculated pattern, even in the vestigial lobe area.

The above described E-plane radiation characteristics are representative of those that will be measured on the final system. These characteristics should provide satisfactory system performance, therefore the asymmetric horn and parabolic cylinder breadboard design may be assumed complete.

The measured amplitude and phase characteristics of the H-plane primary feed-horn for the lens are being processed through the lens computer program for prediction of the H-plane secondary pattern. Results of these data runs are not complete.

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Page 2

The work planned for the October report period is as follows:

Purchase orders will be issued for the lens fabrication the first week in October. Plans have been made for R. M. Goodman, Jr., to visit the subcontractor on 3 October. Mr. Goodman will provide the subcontractor with fabrication drawings and specifications.

Fabrication drawings for the parabolic cylinder reflector will be completed and it is anticipated a purchase order will be issued for this reflector's fabrication.

Final design drawings of the E-plane asymmetric horn will be started. This horn design will be incorporated in the continuing design effort of system packaging.

Work will continue on the computer prediction of the H-plane lens secondary pattern and also the H-plane primary feed-horn design.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

6 November 1969

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438



ATTENTION: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 5
Contract No. DAAG39-69-C-0054
Covering the period 1 October to 31 October 1969

Dear Sir:

This status report covers the work on the referenced contract for the period 1 October through 31 October 1969.

The purchase orders for the geodesic lens fabrication were issued to Ainslie Corporation of Braintree, Massachusetts on 2 October. Mr. R. M. Goodman, Jr., visited the sub-contractor on the 3rd and 23rd of October. The purpose of the first visit was to deliver the fabrication drawings and answer any detailed questions pertaining to the lens fabrication. Mr. Goodman's second visit was to discuss the set-up procedure and check the performance of the control tapes used on the numerically controlled machines.

The radiation characteristics of the initial design H-plane primary lens feed-horn have been analyzed using the lens far-field radiation pattern prediction computer program. Measured values of the radiation characteristics of the initial H-plane horn were used in the computer program and a secondary H-plane far-field radiation pattern with -20 dB sidelobes was calculated. This high sidelobe level is attributed to the amplitude illumination taper of the horn which tends to concentrate too much energy in the edge regions of the lens. A new H-plane feed-horn has been designed that has an illumination taper which concentrates the energy in the center region of the lens. Computer calculations of the secondary pattern with this new horn illumination predict a sidelobe level of -33 dB. This horn is being fabricated and will be ready for RF tests early in November.

The parabolic cylinder reflector has not been ordered. The reason for not ordering this reflector was that additional information was made

available which could affect the size of the parabolic cylinder reflector. A meeting is to be held between HDL and Georgia Tech personnel to discuss this new information early in November.

Work on the fabrication drawing of the breadboard assembly is progressing satisfactorily. This work is estimated to be 50 percent complete.

The anticipated work effort for the November report period is as follows:

The amplitude and phase characteristics, as a function of azimuth angle, of re-designed H-plane feed horn will be measured. These data will be used as inputs to the computer program to calculate the lens far field radiation pattern.

Liaison will continue between Georgia Tech and the contractor that is fabricating the lens.

The outcome of the HDL/Georgia Tech discussions will determine the action to be taken in the area of the parabolic cylinder reflector.

Work will continue on the system packaging design.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch

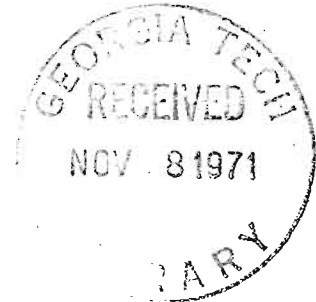


GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION

225 North Avenue, Northwest · Atlanta, Georgia 30332

4 December 1969

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438



Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 6
Contract No. DAAG39-69-C-0054
Covering the period 1 November to 30 November 1969

Gentlemen:

This status report covers the work on the referenced contract for the period 1 November through 30 November 1969.

Early in this report period additional information was made available concerning system parameters. The incorporation of this information will involve several substantial modifications in the proposed breadboard system design. These modifications will affect the overall mechanical/physical design and will require a redesign effort in the microwave primary feed-horn area. Since this new information would also effect the geodesic lens parameters, on 5 November, the Ainslie Corporation was requested to stop work on the lens spinning fabrication, except for preparing the blanks for the spinning chucks, until further notice.

Messrs. Bud Heinard and Jim Meek of Harry Diamond Laboratories visited Georgia Tech on 5 November 1969 for discussions on the effect of this additional information on the status of the project .

The work effort during this report period has been concerned primarily with the analysis of this new information and conceptual design studies incorporating this information.

The design effort will continue during the December report period, with continual up-dating as new information is made available.

Contract No. DAAG39-69-C-0054
Monthly Status Report No. 6
Page 2

It is anticipated that some project re-direction will be agreed on in the near future modifying the original design parameters for the breadboard system.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

Robert M. Goodman, Jr.
Head, Sensor Systems Branch



1 January 1970



Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 7
Contract No. DAAG39-69-C-0054
Covering the period 1 December to 31 December 1969

Gentlemen:

This status report covers the work on the referenced contract for the period 1 December through 31 December 1969.

Work has continued during this report period in the area of system conceptual design. A design has been developed which incorporates all the latest available information. This design looks very promising from both an operational and a system packaging aspect.

Presently the program is at a stage where sponsor's approval of the design parameters is required such that detailed fabrication drawings can be started. This sponsor approval is also necessary prior to commencing the work on the geodesic lens fabrication. The new system design will require a new set of NC machine control tapes for the lens tooling and checking templates, due to a change in lens focal length.

Sponsor direction is also desired in the area of system E-plane radiation characteristics. This information is necessary in order to complete the parabolic-cylinder and asymmetric feed-horn design. Since the fabrication of the parabolic-cylinder reflector will be sub-contracted, further delay in establishing the reflector parameters will effect the project scheduling and completion date.

The planned work for the January report period, after obtaining the sponsor's approval of the present design, will be the following:

1. provide the Ainslie Corporation with the modified lens NC tapes and authorize the re-start of the lens spinning fabrication,


2. Begin the detailed design drawings for the system components,
3. continue with the design phase for the scanner feed-horn, and
- (4) analysis of the parabolic-cylinder reflector/asymmetric horn design, continuing the radiation pattern measurements if necessary.

It is anticipated that the sponsor's approval and re-direction of specific phases of the system design will be obtained early in the January report period.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest - Atlanta, Georgia 30332

6 February 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438



Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 8
Contract No. DAAG39-69-C-0054
Covering the Period 1 January to 31 January 1970

Gentlemen:

This status report covers the work on the referenced contract for the period 1 January through 31 January 1970.

Early in this report Mr. R. M. Goodman, Jr., in a telephone conversation with Mr. Sumner Taft, was given approval to proceed with the geodesic lens parameters determined from the latest breadboard conceptual design study. The new lens parameters called for in the design are a 90-inch diameter and a 132-inch focal arc.

The Ainslie Corporation, which had been requested to stop work on the lens spinnings on 5 November 1969, has been authorized to proceed with the lens fabrication. New NC machine control tapes have been prepared for the new lens parameters. These control tapes were mailed to the Ainslie Corporation on 20 January 1970.

Work has been started on the preliminary fabrication drawings of the breadboard system. This work incorporates the new geodesic lens design. The preliminary design of an equal-length feed-horn for use with the new lens has been completed.

Mr. R. M. Goodman, Jr., has been invited to attend the Crossbow-S meeting to be held at the Harry Diamond Laboratories on 3 February 1970. The purpose of this meeting is to discuss re-direction of technical effort on the subject contract.

The anticipated work for the February period will be the following:

- (1) continuation of the system fabrication drawing phase,
- (2) start the fabrication drawings for construction of the equal path length primary feed-horn assembly, and

Contract No. DAAG39-69-C-0054
6 February 1970
Page 2

- (3) resume the far-field radiation pattern measurements of the parabolic-cylinder reflector/asymmetrical horn configuration. This work will determine the correct reflector size and location, to obtain the E-plane half-power beamwidth and pattern shape desired.

Liaison will continue between Georgia Tech and the Ainslie Corporation concerning the fabrication of the lens spinings.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr. ✓
Head, Sensor Systems Branch



12 March 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 9
Contract No. DAAG 39-69-C-0054
Covering the period 1 February to 28 February 1970

Gentlemen:

This status report covers the work on the referenced contract for the period 1 February through 28 February 1970.

Work this report period has been concentrated in the area of preparing preliminary fabrication drawings of the breadboard system. These drawings reflect a new design concept.

Drawings have been completed for the primary equal phase-length feed-horn. Work has been started on the fabrication of this feed system.

Measurements of the far-field radiation characteristics of the asymmetric horn/cylinder reflector have been resumed. Patterns have been taken with several surfaces which deviate from a parabolic surface to experimentally shape the E-plane radiation pattern. This work will continue.

On February 3, Mr. R. M. Goodman, Jr., attended the Crossbow-S meeting held at the Harry Diamond Laboratories. The purpose of this meeting was to discuss re-direction of technical efforts on the work being done at Georgia Tech. In this meeting it was decided that steps would be initiated to expand the "scope of work" under the subject contract to include certain additional items decided on in the meeting.

The anticipated work for the March report period will be as follows:

- (1) continuation of the system fabrication detail design phase,
- (2) complete the fabrication of the equal phase-length feed-horn,




Monthly Status Report No. 9
Contract No. DAAG 39-69-C-0054
Page 2


- (3) start RF measurements to determine phase and amplitude characteristics of the equal phase-length feed-horn, and
- (4) continue the measurements of the asymmetric horn/cylinder reflector E-plane radiation patterns.

The contract modifications, to cover the items discussed in the Crossbow-S meeting, will be prepared for submission to the sponsor upon receipt of the modified "scope of work" form Harry Diamond Laboratories.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



31 March 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 10
Contract No. DAAG39-69-C-0054
Covering the Period 1 March to 31 March 1970

Gentlemen:

This status report covers the work on the subject contract for the period 1 March through 31 March 1970.

Work this report period has continued in the area of preparing fabrication drawings of the breadboard system. These drawings are approximately 50 percent complete.

The fabrication of the primary equal phase-length feed-horn continues. This system should be ready for starting RF measurements early in the next report period.

The Ainslie Corporation reports they have completed the fabrication of the geodesic lens spinning chucks. Work has started on the fabricating of the inner and outer lens spinnings.

The document, "Modification of Contract No. P001," requesting a modification of the scope-of-work on the subject contract was received at Georgia Tech on 10 March 1970. A letter proposal has been submitted to Harry Diamond Laboratories in response to this contract modification. This proposal outlines the additional scope-of-work, time extension and budget requirements for modifying the subject contract.

The anticipated work for the April report period is as follows:

1. Continue preparation of system fabrication drawings.
2. Complete fabrications of the primary feed-horn.




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Monthly Status Report No. 10
31 March 1970
Page 2

3. Start RF measurements of aperture amplitude and phase distribution for the primary feed-horn, and
4. Continue computer calculations for designing a shaped cylinder reflector to produce a shaped E-plane secondary pattern.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

 R. M. Goodman, Jr.
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY

EXPERIMENT STATION 225 North Avenue, Northwest - Atlanta, Georgia 30332

30 April 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 11
Contract No. DAAG39-69-C-0054
Covering the Period 1 April to 30 April 1970

Gentlemen:

This status report covers the work on the subject contract for the period 1 April through 30 April 1970.

Mr. R. M. Goodman, Jr., visited the Ainslie Corporation on 15 April. The purpose of this visit was to inspect the finished geodesic lens spinning chucks. Mr. Goodman also discussed, with Ainslie personnel, the possibility of their doing some further fabrication on the lens assembly.

Work has continued in the area of preparing fabrication drawings of the breadboard system. This work will continue.

Fabrication of the equal phase-length primary feed-horn is complete. RF measurements to determine the horn's amplitude and phase characteristics have been started. Preliminary data obtained using this feed horn indicate expected performance. A more thorough analysis of the feed horn will be conducted upon completion of the phase and amplitude measurements.

The contract modification document is expected but at the close of this report period has not been received at Georgia Tech.

The theoretical analysis to determine the cylindrical reflector shape necessary to produce the desired vertical (E-plane) radiation pattern is continuing. Results of this study are expected early in the May report period.

The anticipated work effort for the May report period is as follows:

- (1) complete the measurement phase of the breadboard equal phase-length primary feed-horn,





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30 April 1970
Page 2

- (2) continue with the analysis and tests on the shaped cylindrical-reflector,
- (3) continue preparation of the breadboard antenna fabrication drawings, and
- (4) provide the necessary liaison to the Ainslie Corporation.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY

EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

29 May 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 12
Contract No. DAAG39-69-C-0054
Covering the Period 1 May to 31 May 1970



Gentlemen:

This status report covers the work on the subject contract for the period 1 May through 31 May 1970.

The Contract Modification No. P002 was received at Georgia Tech early in this report period. Project scheduling has been altered to reflect the modified Statement of Work.

Measurements of RF amplitude and phase have been completed for the breadboard equal phase-length primary feed-horn. Analysis of the measured data indicates expected performance. Measured primary feed-horn data was used to calculate the H-plane aperture distribution produced at the secondary feed-horn. The H-plane secondary radiation pattern computed using this aperture distribution predicts satisfactory performance in half-power beamwidth and side-lobe level. It is anticipated that this primary feed-horn hardware will be used as part of the final breadboard system.

A shaped cylinder reflector has been fabricated and tested. This shaped reflector configuration is based on a theoretical computer-aided design which produces the desired E-plane radiation pattern. Measured E-plane radiation patterns indicate satisfactory performance over the desired frequency band.

Fabrication drawings for this new design of the shaped reflector have been started. It is anticipated that fabrication of the reflector will be started during the June report period.

Far-field E-plane radiation patterns for the asymmetric feed-horn/shaped reflector combination with a mock-up of the adjacent metal surfaces indicate that reflections from the adjacent surfaces enter the feed horn, thereby increasing the wide angle side-lobe level. Experimentation has shown that a slight modification to the asymmetric feed-horn reduces the level of these reflections and enhances the overall system performance. Work has begun on this modification.

A request was submitted to the Contracting Officer, Harry Diamond Laboratories, to allow Georgia Tech to issue a labor-hour type purchase order to Ainslie Corporation of Braintree, Massachusetts. This request has been granted.

The anticipated work effort for the June report period is as follows:

- (1) Complete the fabrication drawings for the shaped cylinder reflector and initiate a purchase order to fabricate this breadboard reflector.
- (2) Complete the design modification to the asymmetric feed-horn.
- (3) Continue preparation of the breadboard antenna fabrication drawings.
- (4) Provide the necessary liaison to the Ainslie Corporation.

Respectfully submitted:

R. A. Moore
Associate Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch



2 July 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 13
Contract No. DAAG39-69-C-0054
Covering the Period 1 June to 30 June 1970



Gentlemen:

This status report covers the work on the subject contract for the period 1 June through 30 June 1970.

On 4 June, Mr. R. M. Goodman, Jr. attended the Crossbow-S meeting held at the Harry Diamond Laboratories. The purpose of this meeting included discussion of the technical effort on the subject contract being conducted at Georgia Tech.

Mr. Goodman visited the Ainslie Corporation over the period 11 through 13 June. During this visit Mr. Goodman performed the desired liaison with Ainslie Corporation on the geodesic lens fabrication. Mr. Goodman also discussed the contract between Ainslie and Georgia Tech. It is emphasized in this labor-hour subcontract that all basic engineering design will be conducted at Georgia Tech. Ainslie personnel will assist in the drafting and fabrication detail phases under the supervision of Georgia Tech personnel.

While at the Ainslie Corporation, Mr. Goodman also discussed the fabrication details for the shaped-cylindrical reflector. A purchase order has been issued to the Ainslie Corporation for fabrication of this reflector.

A letter request was received on 17 June for engineering layout drawings, systems calculations, measured antenna patterns, etc., on the antenna system of the subject contract. The reply to this request with all available material enclosed was air mailed 26 June.


The design modification to the asymmetric feed-horn is complete. This modification entails the addition of choke-blinders to the lower side of the asymmetric feed-horn aperture to reduce the side-lobe level of this feed-horn. The measured far-field E-plane radiation patterns of the modified asymmetric feed-horn, shaped-cylindrical reflector and metal antenna structure mock-up have acceptable side-lobe level and beam shape over the desired frequency band.


The anticipated work effort for the July report period is as follows:

1. Continue with the preparation of the antenna system fabrication drawings.
2. Continue RF test on a design improvement for the primary equal-phase length feed-horn.
3. Provide the necessary liaison with the Ainslie Corporation.

Respectfully submitted,

R. A. Moore
Associate Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



3 August 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 14
Contract No. DAAG39-69-C-0054
Covering the Period 1 July to 31 July 1970



Gentlemen:

This status report covers the work on the subject contract for the period 1 July through 31 July 1970.

The addition layout drawings asked for in the 15 June "letter of request" but not included in our 26 June reply have been completed. Copies of these drawings were airmailed to Harry Diamond Laboratories on 14 July.

Mr. R. M. Goodman, Jr. visited the Ainslie Corporation twice during this report period. The first visit, 14 and 15 July, was to discuss the fabrication of additional system components on the subject contract and general liaison on the systems under fabrication. On the second visit, 28 and 29 July, Mr. Goodman discussed with Ainslie price quotations on the various systems to be fabricated.

Fabrication drawings for the antenna system are complete. Final assembly detail procedures and drawings are being prepared.


A request for approval to purchase the 45 degree reflector, inner and outer fillet rings and inner and outer cone assemblies, on fixed-price subcontracts, was submitted to Harry Diamond Laboratories on 28 July. Purchase orders for these component assemblies will be issued upon receipt of this approval.


The anticipated work for the August report period is as follows:

1. Continue preparation of system final assembly procedures.
2. Continue the necessary liaison and supervision of the subcontract work being conducted at the Ainslie Corporation.

Respectfully submitted,

R. A. Moore
Associate Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



31 August 1970



Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 15
Contract No. DAAG39-69-C-0054
Covering the Period 1 August to 31 August 1970

Gentlemen:

This status report covers the work on the subject contract for the period 1 August through 31 August 1970.

Purchase orders have been issued to the Ainslie Corporation for fabrication on fixed-price subcontract, the following system subassemblies:

- (1) 45 degree reflector.
- (2) Inner and outer lens fillet rings.
- (3) Inner and outer cone structures.

Authorization from the Contracting Officer at Harry Diamond Laboratories for the purchase of these subassemblies was received at Georgia Tech on August 3.

Detailed assembly procedures and system assembly drawings are approximately 80% complete. Some of this drafting work is being done at the Ainslie Corporation under the labor-hour subcontract.

The fabrication is complete on the geodesic lens spinnings. Fabrication of the other subassemblies is progressing very well. The system mechanical design and assembly procedures have been completed.

The Ainslie Corporation underwent their normal two week plant shut-down for employee vacations the first two weeks in August. A minimal crew remained at work during this period.

Contract No. DAAG39-69-C-0054

31 August 1970


Page 2


The anticipated work for the September report period is as follows:

- (1) Start the machining of the lens 45 degree reflector surface. This work will be done through Ainslie under direct supervision by Georgia Tech personnel.
- (2) Begin preparation of an RF measurement test procedure.
- (3) Continue with the system assembly drawings and assembly procedures.
- (4) Continue the required liaison with Ainslie on the system fabrication.

Respectfully submitted:

R. A. Moore
Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

30 September 1970



Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 16
Contract No. DAAG39-69-C-0054
Covering the Period 1 September to 30 September 1970

Gentlemen:

This status report covers the work on the subject research and development contract for the period 1 September through 30 September 1970.

The design phase of the system is essentially complete and development of the antenna component parts are progressing very well. Assembly of these parts will begin early in the next reporting period.

Several trips have been made to Ainslie Corporation this reporting period for liaison and supervision purposes. On September 15 Mr. Goodman visited Ainslie to discuss component fabrication.

Messrs. Goodman, Moore and Novak visited Ainslie during the week of September 21. Messrs. Jim Meek and Bud Heinard of Harry Diamond Laboratories also visited Ainslie on September 23 to inspect the system fabrication and discuss project status. During the week Mr. Novak assisted and supervised the machining of the lens 45° reflector. This piece of hardware is complete. The assembly of the system components has been started.

R.F. testing of the assembled system was discussed with HDL and Ainslie personnel. It has been tentatively agreed upon to perform these tests using the Ainslie antenna range. Acceptance tests by HDL will also be conducted on the Ainslie facility.

The anticipated work effort for the October report period will be as follows:


- (1) Spinning of the inner and outer cone surfaces will be started.
- (2) Assembly of the lens 45° reflector to the finished lens spinnings will be completed.


Monthly Status Report No. 16
Contract No. DAAG39-69-C-0054
30 September 1970
Page 2

- (3) Work will be started on the line-source feed horn fabrication.
- (4) The line-source cylinder-reflector fabrication will be completed.
- (5) Test procedures will be prepared for electrical testing of the assembled breadboard model.
- (6) Close liaison and supervision will be maintained between Georgia Tech and Ainslie.

Respectfully submitted:

Robert A. Moore
Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch

3 November 1970

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: AMXDO, Mr. Sumner Taft

Subject: Monthly Status Report No. 17
Contract No. DAAG39-69-C-0054
Covering the period 1 October to 31 October 1970



Gentlemen:

This status report covers the work on the subject research and development contract for the period 1 October through 31 October 1970.

Requests were submitted to Harry Diamond Laboratories on 12 October for approval to issue material and labor-hour subcontracts to the Ainslie Corporation. These subcontracts will provide for the continued fabrication and assembly of the breadboard scanner antenna being developed on the subject contract. This approval was received at Georgia Tech by TWX on 23 October. The subcontracts were issued to the Ainslie Corporation on 26 October.

A request was also made to Harry Diamond Laboratories on 12 October for a two (2) months extension to the subject contract. This additional time is necessary for completing the fabrication and testing of the breadboard scanner antenna. No additional funds will be required as a result of this time extension, which will provide for submission of the Final Report by 4 February 1971.

The approval for the two (2) month no-cost time extension was received at Georgia Tech on 30 October.

Mr. Goodman visited the Ainslie Corporation on 29 October for the purpose of liaison and inspection of the system being developed. The status of the fabrication work at that time was as follows:

- (1) The box structure which will house the lens assembly is partially complete.
- (2) The ribs for the line-source feed have been fabricated and inspected, and assembly of the feed structure has been started.
- (3) The spinning chuck (funded on associated contract) for the cone spinnings is complete; and spinning of inner and outer cones is to start shortly.

- (4) Work on the shaped-cylinder reflector is complete except for attachment to the box structure.
- (5) Fabrication of the cone bulkheads has been started.
- (6) The lens spinnings are ready to be fitted and then cut in half, also the 45° reflector is complete. A greater than anticipated delay in the fabrication of the fillet rings has affected the assembly of these geodesic lens components. The status of these fillet rings is: one is 75% complete, the other is ready for contouring to start. Both rings should be complete in approximately one week.
- (7) The feed horn for the cone assembly is complete.

Mr. Goodman and Ainslie personnel estimate the breadboard scanner antenna should be ready for rf testing some time in January. It is estimated that a period of two weeks will be required to complete the rf testing phase of the program.


Rough draft preparation of the final report has begun. This report will include a section of the measurement phase when this work is completed.

The anticipated work for the November report period will be as follows:

- (1) The cone spinnings will be completed and the inner cone subassembly will be shipped to Georgia Tech for machining of the spline reflector.
- (2) Fillet rings will be completed and assembly of the lens spinning, 45° reflector and fillet rings will be started.
- (3) Work will continue on the rough draft of the final report.
- (4) Several trips will be made to Ainslie to perform liaison and supervise the fabrication and assembly of the system.

Respectfully submitted:

Robert A. Moore
Project Director

Approved: 

R. M. Goodman, Jr.
Head, Sensor Systems Branch



GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

7 December 1970



Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Monthly Status Report No. 18
Contract No. DAAG39-69-C-0054
Covering the period 1 November to 30 November 1970

Gentlemen:

This status report covers the work on the subject research and development contract for the period 1 November through 30 November 1970.

The primary area of work this report period has been the liaison with the Ainslie Corporation on the development of the breadboard scanning antenna. Fabrication of the breadboard antenna is progressing well. The status of this work at the time of Mr. Goodman's visit to Ainslie, 30 November is as follows:

1. A preliminary assembly of the inner lens part of the geodesic lens (consisting of 45° reflector, the fillet rings and cut inner lens spinings) has been completed and measurements were taken to determine mechanical errors. This assembly was determined to be dimensionally accurate to 0.015 of an inch. Final assembly of the geodesic lens is now in progress.
2. Cone spinings and cone bulkheads are complete. Mechanical inspection and preassembly of these component parts indicate that they are satisfactory.
3. The splice bar has been attached to the inner cone structure. This inner cone subassembly is being prepared for shipment to Georgia Tech for the final machining of the spline mirror surface.
4. The tooling that is funded by associate contracts but is to be used in the final assembly of the cone and line-source feedhorn sub-assemblies on the subject contract is nearing completion. All tooling for the subject contract is complete and property labels attached.

Preparation of the preliminary rough draft of the final report is continuing. All sections of this report, with the exception of a section on the rf testing phase, will be completed early in the December reporting period.


The anticipated work on the subject contract for the December reporting period is the following:


1. The preliminary rough draft report will be completed early in the report period. A copy of this report will be sent to Mr. J. Meek for his approval and use.
2. The lens assembly, consisting of the 45° reflector, inner and outer halves of the lens spinnings, inner and outer fillet rings and portions of the box housing structure will be 85% complete.
3. Work on the line-source feedhorn assembly is progressing well. The rib-structure assembly and metal skin surfaces for both the upper and lower portions of the feedhorn will be complete.
4. The line-source cylinder-reflector will be essentially complete, except for mounting the box structure. Fabrication of mounting brackets for the reflector have not been started, but will require very little time.
5. The inner cone subassembly will be shipped to Georgia Tech for final machining of the spline mirror surface.
6. Liaison between Ainslie Corporation personnel and Georgia Tech personnel will continue. This liaison will presumably be at an increased level during the remainder of the project due to the assembly phase now in progress and the testing phase that is forth coming. Several trips to Ainslie are scheduled this reporting period.

The date of completion of the fabrication of the breadboard scanner antenna is still scheduled for the middle to later part of January. This date is pending that no difficulties arise in the assembly phase.

Respectfully submitted:

R. A. Moore
Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



11 January 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Monthly Status Report No. 19
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers the work on the subject research and development contract for the period 1 December through 31 December 1970.

The fabrication and assembly of the breadboard scanning antenna is progressing well. As of the last week in December the status of this work is as follows:

1. The line-source cylinder reflector is complete. Mechanical checks on the reflector surface indicate a maximum error, relative to the desired surface, of ± 0.011 inches was achieved, with an rms error of approximately 0.004 inches.
2. The line-source feedhorn fabrication is progressing well. Both the inner and outer rib structure assemblies are complete. The inner and outer metal skin surfaces have been formed and are in the process of being installed on the rib structures.
3. The inner lens assembly is complete and checks out very well mechanically. The outer lens assembly is 70% complete and mechanical checks on this assembly are in progress. Preparations are being made to assemble these two lens assemblies. The box structure is ready for installing the geodesic lens assembly.
4. The inner cone assembly and outer cone spinning was shipped to Georgia Tech from Ainslie on 22 December. These units were received at Georgia Tech on 7 January. Preparations are ready at Georgia Tech for machining the spline and assembly of the outer cone spinning to the inner cone structure.

The preliminary rough draft report was completed and mailed to Mr. James Meek. This report will in essence be the same as the rough draft of the final

Monthly Status Report No. 19
Contract No. DAAG39-69-C-0054
Page 2

report when the mechanical design and fabrication section and the antenna measurement sections are included. These two sections of the report will not be completed until the final mechanical and electrical testing has been accomplished.

It is anticipated that the breadboard antenna will be assembled and ready for testing early in February, assuming no assembly delays occur. The assembly phase is quite time consuming but delays are not foreseen in this assembly.

Liaison will continue between Georgia Tech and Ainslie this reporting period. Mr. Goodman has a trip to Ainslie scheduled for 11 and 12 of January.

Respectfully submitted:

R. A. Moore
Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch

A-1185



GEORGIA INSTITUTE OF TECHNOLOGY

EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

5 February 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D.C. 20438

Attention: Mr. James Meek

Subject: Monthly Status Report 20
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject research and development contract for the period 1 January through 31 January 1971.

Fabrication of the breadboard scanning antenna is progressing very well. The lens system is complete and installed in the box structure. Fabrication of the primary line-source feed assembly is continuing; and is estimated to be 90 percent complete.

Machining on the cone assembly at Georgia Tech is progressing well. The work that remains is the installation of the cylindrical transition and outer cone spinning. It is anticipated that this work at Georgia Tech will be completed late in February. This cone assembly with the geodesic feedhorn attached will then be shipped to Ainslie for assembly to the rest of the system.

Several liaison trips were made to Ainslie this reporting period. Mr. Goodman made one visit on 11 January to supervise the assembly of the upper lens structure. Mechanical checks on this assembly indicate it is well within the specified fabrication tolerances. Mr. Goodman and several mechanical engineers also visited Ainslie the week of 25 January to supervise and aid in the assembly of the lens and line-source feed.

Assembly of the breadboard antenna has taken longer than anticipated, necessitating submission of another request to extend the time interval of the contract. A request has been submitted to extend the contract on a no-additional-cost basis to enable completion of fabrication and testing. This extension will call for assembly, testing, and rough-draft report to be completed by 12 March 1971 and the approved Final Report completed by 12 April 1971. These conditions were agreed to in a telephone conversation with Mr. James Meek but no written approval has been received:

The anticipated work effort for the February report period is the following:

- 1) The breadboard scanning antenna will be completely assembled.

2) All mechanical checks will be completed.

3) Electrical tests will presumably start about the first week in March. Approximately two weeks will be required for these tests.

HDL will be contacted as to the desired time (during the testing phase) that demonstration of operation and acceptance tests can be performed. These tests will be performed at the Ainslie Corporation antenna range in Braintree, Mass.

Liaison will continue with Ainslie this month, with several Georgia Tech personnel traveling to Ainslie to supervise and assist in the electrical testing of the antenna.

Respectfully submitted,

R. A. Moore

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch



EXPERIMENT STATION 225 North Avenue, Northwest - Atlanta, Georgia 30332

1 March 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Status Report No. 21
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 February through 28 February 1971.

The cone assembly was completed and shipped by air freight to Ainslie on 1 March. Mechanical checks on this assembly indicate the desired fabrication tolerances were achieved. Mr. Goodman and Mr. Novak made several liaison visits to Ainslie for the purpose of supervising the final assembly of the antenna.

Assembly of the antenna is complete, with the exception of attaching the cone assembly. Preparations are being made to install the antenna on the Ainslie test range, weather permitting, as soon as the assembly is completed.

It is anticipated that the rf measurements will require approximately two weeks to complete. After completion of these measurements, results will be documented and a completed rough-draft report will be submitted for approval. A project review presentation will be requested following submittal of this rough-draft report.

Respectfully submitted:

R. A. Moore
Project Director

Approved:

)

R. M. Goodman, Jr.
Head, Sensor Systems Branch



EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

1 April 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Status Report No. 22
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 March through 31 March 1971.

The breadboard antenna was completed the weekend of 6 March and installed on the Ainslie test range 8 March. Tests of the antenna radiation characteristics were conducted for the remainder of the week. Results of these tests indicate the following

- (1) the scan sector is as predicted;
- (2) the scan is linear, with no scalloping;
- (3) half-power beamwidth is as predicted;
- (4) operation over the desired frequency bandwidth is above the predicted value; and
- (5) measured gain is above the predicted value.

The sidelobe performance is not as good as expected. The sidelobes over the frequency band are nominally below -23dB, except for one small area (approximately 2°) of the scan sector, located where the secondary beam is normal to the antenna aperture. In this area, the sidelobe structure is frequency sensitive and has a worst-case sidelobe level of -17dB below the main-beam peak. Swept-frequency VSWR tests, performed after the radiation pattern tests, indicate that the VSWR in the scan area where unexpected sidelobe performance occurs is also very frequency sensitive. Calculations indicate that, in this type of antenna system, VSWR of the magnitude measured can account for the below-expectation sidelobe performance.

A project technical review was held on 31 March at Harry Diamond Laboratories. At this meeting, Georgia Tech personnel (Mr. R. M. Goodman, Jr., and Mr. R. A. Moore) presented to HDL technical personnel the results of tests performed on the breadboard antenna. Although the results showed that the antenna performance

Status Report No. 22
1 April 1971
Page 2

had satisfied contractual requirements, it was felt that in order to satisfy the design philosophy of this development program, further work should be conducted to improve sidelobe levels.


Several problem areas which could account for the observed sidelobe structure were discussed at the meeting. A proposed plan for study, modification, and further testing of the breadboard antenna was outlined, and an estimate of the time and funding required to carry out this proposed plan was presented.

As a result of the project review, it was considered mutually beneficial that Georgia Tech request a three-month, no-cost extension to the subject contract and submit a proposal for additional funding to improve sidelobe performance. A request for the above extension is being prepared. This request, if approved, will change the contract expiration date from 12 April 1971 to 12 July 1971. An unsolicited proposal for modification of the antenna is in preparation and will be submitted early in April.

Respectfully submitted:

R. A. Moore
Project Director

Approved:)

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



EXPERIMENT STATION 225 North Avenue, Northwest Atlanta, Georgia 30332

A-1185

10 May 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Status Report No. 23
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 April through 30 April 1971.

Work has continued on the final report during this report period.

A request for a no-cost contract extension was submitted early in April. No written reply has been received from HDL, but verbal confirmation that the extension request is being processed was indicated in a telephone conversation on 28 April with Mr. Meek.

The proposal entitled, "Modification of Breadboard Geodesic Luneberg Lens Scanning Antenna Developed Under Contract DAAG39-69-C-0054" was submitted to HDL in April. This proposal outlines the procedure to be followed in investigating the unusual broadside sidelobe structure of the breadboard antenna. It is understood that this proposal is presently being reviewed.

Respectfully submitted,

R. A. Moore
Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch



2 June 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Status Report No. 24
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 May through 31 May 1971.

The written approval for a three-month, no-cost extension was received early this report period. This extension provides for the final report to be due 12 July 1971.

A TWX authorizing Georgia Tech to proceed on Phase I of the breadboard modification work was received 18 May. Documentation authorizing this work had not been received at Georgia Tech at the end of this report period. Work has been started on Phase I of the modification.

D. G. Bodnar and R. A. Moore went to Ainslie Corporation on 17 May to perform tests on the breadboard antenna. These tests were concerned primarily with investigation of the unusual VSWR occurring at the boresight position. It was found that the cyclic variation of VSWR as a function of frequency is caused by interaction of relatively small mismatches at the throat of the E-plane flare of the line-source feed and the aperture of the rotating feedhorn. A preliminary matching iris was positioned in the throat on the line-source feed. This iris reduced the overall system VSWR to a nominal peak value of 1.2:1 across the frequency band, but the cyclic variation is still present. The mismatch at the rotating feedhorn is presently being investigated. Elimination of either of the mentioned mismatch areas will further reduce the VSWR and remove the cyclic variation.

The anticipated work for the June report period will be:

1. Disassembly of the breadboard antenna and complete mechanical inspection.
2. Installation of fabricated dragons teeth in designated area.

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Contract No. DAAG39-69-C-0054
2 June 1971
Page 2

3. Reassembly of the breadboard antenna.
4. Improvement of VSWR of the rotating feed horn.
5. Remeasurement of the swept VSWR of the system, and performance of further matching if required.
6. Installation of the breadboard antenna on the Ainslie antenna range and measurement of radiation patterns.

Respectfully submitted:

R. A. Moore
Project Director

Approved:

R. M. Goodman, Jr.
Head, Sensor Systems Branch



EXPERIMENT STATION 225 North Avenue, Northwest - Atlanta, Georgia 30332

6 July 1971

A-1185

Commanding Officer
Harry Diamond Laboratories
Washington, D. C. 20438

Attention: Mr. James Meek

Subject: Monthly Status Report No. 25
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 June through 30 June 1971.

The modifications covered under Phase I of the contract extension have been completed, and are summarized below.

The primary geodesic feedhorn, which had been brought back to Georgia Tech, was modified so that the choke grooves around the aperture would operate at a lower center frequency. This modification increased the choke depth from 0.250 inches to 0.290 inches, and brought about a slight improvement in the VSWR of the geodesic feedhorn. The maximum VSWR over the frequency band of interest is 1.08:1.

The lens section of the breadboard antenna was disassembled at Ainslie and a thorough mechanical inspection performed. A set of metallic dragons teeth was installed in the flat-plate spacer region, after which the antenna was reassembled and readied for the antenna range. Prior to the antenna range tests swept VSWR measurements were repeated; results were essentially the same as in the May tests.

The antenna was placed on the range and antenna patterns measured. The initial pattern measurements indicated that the unusual sidelobe structure around the boresight was still present. The cause of this sidelobe structure had been predetermined and a modification to the external aperture of the primary geodesic feedhorn quickly reduced these sidelobe structures to a level below -27 dB. The far-out sidelobe structure was reduced below -30 dB by modification to the region where the metallic dragons teeth were installed. A complete set of antenna measurements was taken, and the antenna removed from the antenna range.

Phase I of the contract modification has been completed, and results

Monthly Status Report No. 25
Contract No. DAAG39-69-C-0054
Page 2

of the rf measurements on the breadboard antenna indicate that the design goals of Contract JHU/APL 271845 and Contract F08635-70-C-0102 have been achieved.


Mr. R. M. Goodman, Jr., attended the Crossbow S meeting, held 24 June at Eglin Air Force Base. At this meeting Mr. Goodman reported on the results of Phase I of the contract modification.


The anticipated work for the July reporting period is:

1. Conduct a technical presentation at HDL.
2. If no further work is deemed necessary, the final rough-draft report will be submitted to HDL for approval.

Respectfully submitted,

Robert A. Moore
Project Director

Approved: 

R. M. Goodman, Jr. 
Head, Sensor Systems Branch



10 August 1971

Commanding Officer
Harry Diamond Laboratories
Washington, D.C. 20438

Attention: Mr. James Meek, AMXDO-DBA

Subject: Monthly Status Report No. 26
Contract No. DAAG39-69-C-0054



Gentlemen:

This status report covers work on the subject contract for the period 1 July through 31 July 1971.


A technical presentation was held at Harry Diamond Laboratories on 1 July. At this presentation, Mr. R. M. Goodman, Jr., and Mr. R. A. Moore reported to HDL personnel the results of Phase I of the contract modification. The conclusions reached at this presentation were that the requirements of the subject contract had been reached with the work performed under Phase I and that further work under Phase II was not necessary.

Work has continued this report period in preparation of the final rough-draft report. This report is approximately 90 per cent complete. It is anticipated that this report will be submitted to HDL for approval the later part of the August report period.

Respectfully submitted,

R. A. Moore
Project Director

Approved: _____

R. M. Goodman, Jr. 
Head, Sensor Systems Branch