GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. ____

Project No. E-25-M12 R6173-0A0 GTRC/GIT DATE 8 / 8 / 86

Project Director: Dr. Jerry H. Ginsberg School/~~Dept~~ ME

Sponsor: Office of Naval Research, Arlington, VA

Type Agreement: Grant No. N00014-86-G-0151

Award Period: From 7/7/86 To 9/30/87 (Performance) 11/30/87 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated: $		$ 99,050
Funded: $		$ 47,250

Cost Sharing Amount: $ 33,017 Cost Sharing No: E-25-334 F6173-0A0

Title: Radiation, Scattering and Structural Dynamics Problems in Underwater Acoustics

ADMINISTRATIVE DATA OCA Contact E. Faith Gleason X-4820

1) Sponsor Technical Contact:

Dr. R. M. Fitzgerald, Code 1125 UA
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2) Sponsor Admin/Contractual Matters:

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206 O'Keefe Bldg.
Georgia Institute of Technology
Atlanta, GA 30332-0490

Defense Priority Rating: N/A Military Security Classification: N/A

(or) Company/Industrial Proprietary: ____

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with GIT

COMMENTS:

Issued under DoD University Research Instrumentation Program

SPONSOR'S I. D. NO. 02.103.000.86.035

COPIES TO:

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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 11/17/88

Project No. E-25-M12/R6173-0A0 School/Lab ME
N00014-86-G-0151

Includes Subproject No.(s) N/A

Project Director(s) J.N. Ginsberg GTRC/GIT

Sponsor Office of Naval Research (ONR), Arlington, VA

Title Radiation, Scattering and Structural Dynamics Problems in Underwater Acoustics

Effective Completion Date: 9/30/87 (Performance) 11/30/87 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [ ] Final Invoice or Copy of Last Invoice Serving as Final (Already Submitted)
- [XX] Release and Assignment
- [ ] Final Report of Inventions and/or Subcontract: (Already Submitted)
  Patent and Subcontract Questionnaire sent to Project Director [ ]
- [XX] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Continues Project No. _____ Continued by Project No. _____

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E-25-M12

FINAL REPORT

DoD-UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM

grant to support

RADIATION, SCATTERING, AND

STRUCTURAL DYNAMICS PROBLEMS

IN UNDERWATER ACOUSTICS

SPONSORED BY

THE OFFICE OF NAVAL RESEARCH

ENVIRONMENTAL SCIENCES DIRECTORATE - CODE 1125 UA

GEOPHYSICAL SCIENCES DIVISION

CONTRACT NO. N00014-86-G-0151

PRINCIPAL INVESTIGATOR:

JERRY H. GINSBERG

PROFESSOR OF MECHANICAL ENGINEERING

GEORGIA INSTITUTE OF TECHNOLOGY

ATLANTA, GEORGIA 30332

The purpose of this project was to enhance the experimental resource available to the numerous acoustics activies underway in the School of Mechanical Engineering at the Georgia Institute of Technology. A special need was to improve the versatility of the Acoustic Tank Facility. Research projects benefiting from the equipment acquired under the auspices of the instrumentation program are concerned with propagation phenomena for finite amplitude (nonlinear) acoustic beams, improved algorithms for modeling acoustics problems concerned with fluid-structure interaction, wave-vector filtering for modeling and data reduction in structural vibration, and the biomechanics of hearing in fish, and ultrasonic detection of underwater vibration.

The equipment purchased under the sponsorship of this project is listed as follows:

1. Bruel & Kjaer model 8101 and 8103 measurement hydrophones utilized for underwater acoustic measurements and transducer calibration covering the frequency ranges of 1 Hz to 120 kHz and 0.1 Hz to 180 kHz respectively.

2. Wavetek programmable, brickwall filter for signal conditioning and frequency discrimination in the frequency range of 1 Hz to 100 kHz. The filter is utilized in conjunction with a computerized acoustic measurement system to provide programmable adjustment of high/low cutoff frequencies, up to 40 dB of pre-filter gain and 20 dB of post-filter gain to accomodate signal conditioning requirements.

3. Naval Underwater Systems Center Rho-C microprobe hydrophone used as a transducer for the measurement of high frequency acoustic signals resulting from experimental measurements associated with propagation phenomena for finite amplitude (nonlinear) acoustic beams.

4. Wavetek Model 275 programmable arbitrary function generator used as the signal generator in the computerized measurement system. The instrument is capable of generating precise sine, triangle, square and user-defined arbitrary waveforms from 0.01 to 10 Vp-p with 12 bit amplitude resolution.

5. Krohn-Hite 75 watt power amplifier and matching transformers used as a power source for an F-33 underwater acoustic projector.

6. Instruments, Inc. 14 kilowatt power amplifier used as a power source for a multiple element, multiple ring underwater acoustic projector utilized in the nonlinear acoustic research program.

7. Fisher Scientific air pump and vacuum chamber for potting of electrical components in Rho-C polymeric coatings to ensure water resistivity when submerged in the tank facility. Specifically, the vacuum chamber de-gasses the Rho-C mixture prior to potting.

8. Bruel & Kjaer BNC connectors utilized for interconnection of measurement system component equipment.

9. Kepro processing equipment utilized for the physical fabrication of printed circuit boards. This equipment is used in conjunction with all of

the aforementioned projects requiring the exposure and development of photosensitive printed circuit boards.

10. OrCad Systems Corp. schematic capture board software used for logically designing printed circuit boards. This software was instrumental in designing the motor controllers for the acoustic tank facility and has applicability to a variety of current research projects requiring design of electrical components.

11. Tektronix Model 2230 dual time base digital storage oscilloscope which provides a storage bandwidth of 100 MHz for acquisition of acoustic signals. The oscilloscope is used in conjunction with the tank measurement system to isolate and time average electrical signals. The scope provides post-acquisition signal expansion, compression and positioning.

12. Digital Equipment Corp. G&H floating point microcode which provides computational data reduction capability for a VAX 11/750 minicomputer. The microcode accelerates mathematical operations involving double precision complex numbers by a factor of 200.

13. Nemonix, Inc. 1 MB memory boards for VAX 11/750 which provides the capability of executing larger computational job streams on the VAX with less page-swapping. This enhancement increases the speed at which the VAX computes and reduces data relevant to the individual research project requirements.

14. Ariel Corp. FFT-532 coprocessor board for the Hewlett-Packard model 9836 computer data acquisition system utilized to convert time domain data to frequency domain data. Specifically, the coprocessor can perform an FFT on 1024 discrete points in 9.2 milliseconds as opposed to 256 msec on a VAX 11/780 executing the IMSL FFT routine. In addition, the coprocessor eliminates the time required to transport the data from the 9836 to the VAX prior to data reduction.

15. Emerson, Inc. 5 KVA UPS power conditioning system for VAX 11/750 and Microvax II computer systems. The UPS provides protection to the computers from power surges and RF interference thereby increasing the reliability and availibility of the referenced systems.

16. IBM PS/2 model 80 desktop computer utilized for code development and computational requirements associated with the wave-vector filtering research program.

17. Hewlett-Packard Laserjet Series II printer for data output and graphical representation of calculated and reduced data.

18. Ariel Corp. Hamming filter firmware for the FFT-532 coprocessor board provides windowing capability for Fast Fourier analysis.

19. Edo-Western Corp. broad-band hydrophone used in the nonlinear research program to discriminate high frequency acoustic signals.

20. Physical Acoustics Corp. preamplifier for the Rho-C hydrophone utilized in the nonlinear acoustics research program.

21. Wavetek Corp. Option 004 GPIB interface between the Model 275 programmable arbitrary function generator and the HP 9836 computer provides electrical compatability between the referenced equipment for the function of programmability.

All of this equipment has been installed and is available for use by faculty involved in acoustics and vibrations research.