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SONAR TEST AND TEST INSTRUMENTATION SUPPORT

Quarterly Progress Report No. 5 under Contract N00140-76-C-6487

Dudley D. Baker et al.

APPLIED RESEARCH LABORATORIES
THE UNIVERSITY OF TEXAS AT AUSTIN
POST OFFICE BOX 8029, AUSTIN, TEXAS 78712

3 October 1977

Quarterly Progress Report

1 June - 31 August 1977

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Prepared for:

NAVAL UNDERWATER SYSTEMS CENTER
NEW LONDON LABORATORY
NEW LONDON, CONNECTICUT 06320



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- (U) N000140-76-C-6487. Section headings in this report correspond to the six task areas. Additional sections are included on documentation support, procurement of AN/WQM-5 components and field change kits, and AN/BQQ-5 power supply development.

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I. INTRODUCTION

Applied Research Laboratories, The University of Texas at Austin (ARL:UT), was awarded Contract NO0140-76-C-6487, sponsored by the Naval Underwater Systems Center, New London Laboratory (NUSC/NL), effective 1 June 1976. Some of the work under this contract represents a follow-on effort to previous work sponsored by NUSC/NL under Contract NO0140-74-C-6316.

The work under Contract NO0140-76-C-6487 is divided into six task areas that focus on technical support in areas of sonar technology:

- I. AN/FQM-10(V) Sonar Test Set Field Support
- II. Transducer Repair Facility Test Site Field Support
- III. AN/WQM-5 Sonar Test Set Field Support
- IV. Special Purpose Passive Sonar Systems Support
- V. Sonar Instrumentation Test and Evaluation
- VI. Study of Towed Line Array Acoustical Testing at Transducer Repair Facilities

This report is Quarterly Progress Report No. 5 under Contract NO0140-76-C-6487. Section headings in this report correspond to the six task areas. Additional sections are included on documentation support, procurement of AN/WQM-5 components and field change kits, and AN/BQM-5 power supply development.

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II. TRF, AN/FQM-10(V), AND AN/WQM-5 FIELD SUPPORT

All funds under this contract designated to the technical and material support of Transducer Repair Facility (TRF) test sites, AN/FQM-10(V) Sonar Test Sets, and AN/WQM-5 Sonar Test Sets were expended before 1 March 1977. Follow-on support is now being provided under Contracts N00104-76-A-A022 and N00024-77-C-6035.

III. SPECIAL PURPOSE PASSIVE SONAR SYSTEMS SUPPORT

Because of a funding limitation, no progress can be reported under this task for the report period. A technical memorandum (ARL-TM-77-12) describing work on a signal and noise analysis of frequency domain equalizers (as reported in Quarterly Progress Report (QPR) No. 4¹) is being prepared and will be distributed during the next report period.

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IV. SONAR INSTRUMENTATION TEST AND EVALUATION

A. Introduction

Progress on the design of a replacement for the outdated AN/SQM-5 Sonar Noise Recorder is described in the following sections.

B. Data Acquisition and Synchro Control Unit

As stated in QPR No. 4, incorporating a microcomputer in the AN/SQM-5 replacement will substantially reduce the size, weight, and cost of the unit. Current plans are to use the Digital Equipment Corporation LSI-11 microcomputer as the control element for the unit. The LSI-11 is a low cost, mass produced microcomputer that has more than ample capability to perform the necessary control and computational operations.

Many of the solid state synchro functions that were hardwired in the engineering model can be programmed into the microcomputer, thus eliminating a considerable amount of hardware. In addition, with the use of multiplexers, the present number of synchro-to-digital channels can be easily and inexpensively expanded to as many as 16 channels. Measurement algorithms for the synchro conversions have been written and tested to ensure that the required accuracies can be attained.

The interfacing of the unit to an external calculator or plotter will be accomplished using standard interface cards. Interfaces that are compatible with both the 1975 IEEE-488 standard and the EIA RS-232-C data communications standard are commercially available and should require little modification.

C. Hardware Acquisition

Many of the long lead-time hardware items that will be incorporated in the AN/SQM-5 replacement have been ordered. The LSI-11 microcomputer has been received and should become operational in the near future. At that time, interfacing of the various system elements and the development of the internal software will begin.

V. ASSISTANCE WITH EXPANSION OF TRF CAPABILITIES
TO INCLUDE NEW TRANSDUCERS

ARL:UT originally worked under Contract N00024-75-C-6070 to technically assist Naval Sea Systems Command (NAVSEA) with expanding the capabilities of the Navy's three TRFs to encompass several new kinds of transducers, most of which are towed line hydrophone arrays. NAVSEA's plan is to equip the TRFs by FY 79 for repairing and testing the towed line arrays used with the following sonar systems: AN/BQQ-5, AN/BQQ-6, AN/SQR-18 (IETAS), AN/SQR-19 (ETAS), and AN/BQR-25 (STASS). In addition to these towed arrays, the plan includes equipping the TRFs to repair the transducers associated with the AN/WQM-6 Standard Acoustic Target Source (SATS) and the AN/WQM-7 equipment.

Funds were expended prior to this report period; therefore, no progress can be reported under this task. It is anticipated that additional funds will be received and work will resume during the next report period.

A concurrent effort on this project was begun on 1 June 1977 under Contract N00024-77-C-6035.

VI. DOCUMENTATION SUPPORT

The final updating of data and revision of text for the "Sonar Dome Handbook, Volume II, AN/SQS-26 Steel and Rubber Sonar Domes," NAVSEA C967-IP-412-3020, was received from NAVSECNORDIV on 22 July 1977. These changes were incorporated and the document was released for photographic work and duplication; however, duplication could not be started until the week of 29 August 1977 because of priorities in ARL:UT's Technical Reports Office.

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VII. AN/WQM-5 PROCUREMENT AND FIELD CHANGE PROGRAM

A. AN/WQM-5 Series Field Change Kits

Delivery of the field change units has been delayed because the vendors have been delayed in delivering the front panels of unit No. 3. Virtually all hardware required for the construction of the units has been received and numerous subassemblies have been built. With the exception of the front panel wiring for unit No. 3, assembly of the units was well under way by 31 August 1977. Testing of the first unit is now expected to begin by mid-October 1977.

ARL:UT has obtained on schedule all the off-the-shelf items from Hewlett-Packard, Inc. By 31 August 1977, all of the calculators, plotters, interfaces, and carrying cases required for the field change had either been received or were on order. These items are expected to be delivered well in advance of the receipt of the remaining kit components being built by C-Tech, Inc.

The technical manual changes that are part of the field change kit are currently being written and assembled. Sections of the manuals corresponding to the original units that will remain in the test set are being acquired from the original manufacturers. Only minor modifications are expected to be necessary before these sections are incorporated in the manuals. Photographic reductions of most of the schematics required for the assembly of the manuals have been completed. The preliminary manuals should be completed following first article testing and after the manufacturer's parts lists have been delivered.

B. Procurement of the AN/WQM-5A Sonar Test Set for Spain

Delivery of the AN/WQM-5A Sonar Test Set to the Spanish Navy has been delayed until late October or early November 1977 as a result of slippage in the delivery dates for units No. 3 and 12. The test set is expected to be completely assembled by mid-October 1977 and the "burning in" of the units should be well under way by the end of October.

VIII. AN/BQQ-5 SWITCHING POWER SUPPLY

A. Introduction

ARL:UT was tasked under Contract N00024-74-C-1069 by NAVSEA Code 660F to perform a study of the current switching power supply (built by IBM) which is used in the AN/BQQ-5 sonar system. This basic study has progressed to a new design proposed by ARL:UT that should make the feasibility requirement of 100,000 h MTBF a reality.

The work under Contract N00140-76-C-6487, a follow-on task to the original study, requires ARL:UT to fabricate and demonstrate a model of the proposed new supply.

B. Current Progress

During this report period final adjustments were made on the ARL:UT Modular Power Supply Type 4B(MPS-4B), which was then tested at the IBM plant in Manassas, Virginia, on 27 July 1977. Preparations were also made to begin the production of five type 9 (ARL:UT MPS-9) prototype power supplies to be delivered in March 1978.

The testing of the ARL:UT MPS-4B at IBM in Manassas was conducted by Messrs. B. Daney of NAVSEA; B. Singleton, B. Mesick, P. Combs of IBM; and D. Monteith, K. Butler, and B. Shaw of ARL:UT. The ARL:UT/MPS-4B worked properly in the test jig; however, when it was placed in an operating system, it would not operate at the proper voltage. IBM stated that they had seen this problem before and that it was caused by a reverse bias on one of the regulators; this, in turn, caused the regulator to latch when

the power supply was turned on. Plans called for the problem to be corrected at ARL:UT and for the unit to be returned to IBM at some later time (approximately September 1977) for an extensive burn-in and testing in a working AN/BQQ-5 system.

Soon after the test at IBM, however, ARL:UT determined that the problem was caused by a main loop shutdown mode under reverse bias conditions. The solution was to insert a diode in the error amplifier, which forced the main loop to send approximately 2 A into a shorted output.

The basic mechanical layout for the ARL:UT MPS-9 power supplies to be built has been determined. The dimensions of the module have been chosen to allow for maximum compatibility with all 13 types of MPS supplies. All plug-in modules without "soft" wiring will be used, as in the ARL:UT MPS-4B. The ordering of electrical and mechanical parts was begun along with long lead-time items. The circuits and signal flow diagrams will be available during the next report period.

REFERENCES

1. D. D. Baker et al., Quarterly Progress Report No. 4,
1 March-31 May 1977, Applied Research Laboratories, The University
of Texas at Austin, 22 June 1977.

3 October 1977

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