

# Appendix A



DEPARTMENT OF THE NAVY  
COMMANDER SUBMARINE FORCE  
U.S. ATLANTIC FLEET  
7956 BLANDY RD.  
NORFOLK, VA 23551-2482

9470  
N8/0833  
20 MAR 1996

**From:** Commander Submarine Force U.S. Atlantic Fleet  
**To:** Chief of Naval Operations (N87)

**Subj:** UPGRADE OF THE AN/BQH7 BATHYTHERMOGRAPH DATA RECORDER

1. COMSUBLANT strongly endorses a low cost upgrade developed by PMO415 for the AN/BQH7. This is because the cost of continuing to support the archaic electro-mechanical system and obsolete 8088-based processor is increasing exponentially.

2. During the past 2 years, 22 Engineering Changes (ECs) costing over \$250K have been required to support obsolete technology. Over the past 10 years, 44 ECs were generated at a cost of more than \$0.4M. The upgrade would provide significant savings by replacing the contents of the monitor/recorder with PC-based hardware costing \$15K per installation.

3. The ability to generate effective sonar search plans and to determine appropriate weapons presets via the Submarine Force Mission Program Library (SFMPL) hinges on an accurate depiction of the vertical sound speed structure of the environment. A high quality sound speed profile is also required to determine the tactical posture needed for effective prosecution or avoidance. The AN/BQH7 system installed on most SSNs and all SSBNs currently provides this capability.

4. The upgrade is also needed to support requirements to operate in the highly variable littoral environment. Several features of the upgrade are especially desirable. These include:

a. The capability to deploy XCTD, XSV, shallow water (slow descent) and under-ice probes. The system can now only use XBTs and XSVs. Tactical and ballasting considerations in the littoral and near the ice require the capability to deploy a wider variety of probes.

b. On screen display with zoom capability. The current

system's paper trace is inadequate for resolving tactically significant features in the littoral and near ocean fronts and eddies.

c. Increased storage capacity. The extreme spatial and temporal variability of the littoral environment demands this capability. The current system stores 2 profiles on a tape. Depending on the electronic medium, the capacity of the upgraded system is virtually limitless.

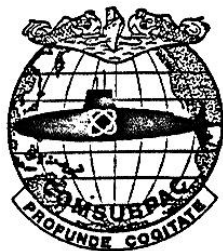
d. The reduced maintenance and easy upgrade of software as opposed to an electro-mechanical system. This is the smart way to ensure the continuation of a low cost, but essential program.

T. W. HACK  
Assistant Chief of Staff  
for Requirements, Planning,  
Programming and Assessment

Copy to:  
CNO (N96)  
CINCLANTFLT (N37)  
COMSUBPAC (N73)  
ONR NSAP  
COMSUBDEVRON 12 (N71)  
PEO(USW) PMO415 (Code 415G)  
NAVUNDSEAWARCEN DET, New London (Code 432)

## **Appendix B**

# COMMANDER SUBMARINE FORCE



## U. S. PACIFIC FLEET

### SONAR

### NEWSLETTER

Volume 43, Number 1

March 1996

The **COMSUBPAC SONAR NEWSLETTER** is published quarterly to provide maintenance and logistics information to the fleet. Topics will include system problems, supply support, engineering changes, new developments, and other timely information. If you have seen a problem or think you have a better way of doing business - share it! Your input can make a difference, so use the form provided at the end of the newsletter or send you ideas to:

**COMSUBPAC**  
**PEARL HARBOR, HAWAII**  
**96860-6550**  
**ATTN: CODE N421**

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#### SONAR/SOUND SILENCING STAFF

LT Darrell Griffin.....	Force Sonar Officer
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**PROGRAMS OF IMPROVEMENT**

AN/UNQ-9 TACTICAL DATA REC..... PG 2  
AN/BQS-15 (EC-17)..... PG 6  
AN/BQR-22A MULTIBEAM..... PG 6  
MANTIS..... PG 8  
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ECI OA-9070-001/002..... PG 10  
TB-16F..... PG 10  
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ACOUSTICS-RAPID COTS INSERTION.....PG 13

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**AN/BQH-7/7A UPGRADES**

The AN/BQH-7/7A is normally used in deep water with deep water expendable probes, and it's display (strip chart recording) is set up to provide recording of a full Expendable Bathythermograph profile on a 7 inch chart. In shallow water launches, the display is reduced to less than 1 inch of chart and is very difficult to interpret when used for acoustic propagation prediction. It has been determined that the mechanical components of both recorders are becoming increasingly difficult to purchase, are more expensive, and/or require a long time to repair.

PECP SI-BQH-7-P0003R1 proposed a ruggedized COTS/NDI upgrade to extend the service life of the AN/BQH-7/7A Data Recorders, in which the strip chart recorder, printed circuit card chassis, and magnetic tape recorder are replaced by a high resolution color monitor, INTEL Pentium Microprocessor (if available), 3.5" 1.44 megabyte floppy disk drive, 1.2 gigabyte hard disk drive, Sippican's Mk-12 data acquisition system, and a keyboard and pointer (COTS).

The upgraded recorder will have excellent growth capability, whereas the present recorders have none. It's programmable data acquisition system, the Mk-12, can interface with future expendable probes (such as those which measure bottom characteristics for improved acoustic predictions in littoral areas). The system will provide a zoom capability for data recorder from probes launched in shallow water.

The Mk-12 is capable of acquiring data from most types of expendable probes; and when interfaced with a Pentium processor (or 486 DX-100) and an NTDS interface card, the Mk-12 provides the same functions as an AN/BQH-7/7A recorder.

The upgraded recorder will require just two or three circuit cards (present recorders have 11) and will utilize the existing footprint, power supply, and interface cables/connectors. A data acquisition card, which performs a variety of self tests covering every function, will not require any operator adjustments because it will validate and automatically calibrate it's XBT interface function prior to every acquisition.

## **Appendix C**

N00024-92-C-6216  
Ser PMS415D2/215  
12 November 1996

From: Program Manager, Submarine Regional Warfare System  
To: Sippican Incorporated (Mr. Larry Hall), 7 Barnabas Road,  
Marion, MA 02738-1499

Subj: ENGINEERING SERVICES AUTHORIZATION UNDER CONTRACT  
N00024-92-C-6216

Encl: (1) Statement of Work (SOW) for AN/BQH-7/7A Service  
Life Extension Program (SLEP) Engineering Change  
Proposal (ECP)

Sippican, Incorporated is authorized to expend a total of 1,324 hours (NTE \$164,983.64) under Contract Line Item Number (CLIN) 0033 for Engineering Services, 243 hours (NTE \$17.824.05) under CLIN 0038 for Consulting, and a NTE of \$27,202.92 for Support, Subsistence, and Incidental Materials under CLINs 0034 - 0037 on the subject contract toward developing a AN/BQH-7/7A Service Life Extension Program (SLEP) Engineering Change Proposal (ECP) from the approved Preliminary Engineering Change Proposal (PECP) SI-BQH7-P0003-R1. This ECP will document a cost effective solution to the problem of component obsolescence currently affecting the operation, maintenance, and support of the AN/BQH-7/7A bathythermograph recorders in the Fleet.

All work is to be performed in accordance with the enclosure (1) Statement of Work and using the Systems Engineering Interim Commercial Standard (EIA/IS-632), ISO-9001 procedures and processes, and other best commercial practices as guidance.

The PEO(USW) point of contact for this subject is Mr. Larry R. Moss, PMS415D2, telephone commercial (703) 602-7047/8, extension 604, or DSN 332-7047/8, extension 604.

MANUEL A. TAMARGO  
By direction

Copy to:  
COMNAVSEASYS COM, Washington, DC (Code 02612V, J. Lusardi,  
V. Mosqueira)  
NAVUNSEAWARCEN DET, New London, CT (Code 432, J. J. Maher;  
Code 2122, M. S. Quinn)  
NAVICP, Mechanicsburg, PA (Code 84222B, J. E. Darhower)  
DCMC, Boston, MA (Code GFOE, G. D. Bianculli)  
Sippican, Incorporated, Marion, MA (R. Leverone)  
Techmatics, Incorporated, Arlington, VA (G. M. Sutton)



**STATEMENT OF WORK  
FOR AN/BQH-7/7A  
SERVICE LIFE EXTENSION PROGRAM  
ENGINEERING CHANGE PROPOSAL**

**1.0 REQUIREMENTS**

The contractor shall provide engineering services in accordance with (IAW) this Statement of Work (SOW). The purpose of this effort is to document a cost effective COTS/NDI solution, in Engineering Change Proposal (ECP) format, to the AN/BQH-7/7A parts obsolescence problem currently affecting the operation, maintenance, and support of the AN/BQH-7/7A bathythermograph recorders in the Fleet. The ECP will present HW/SW configuration(s) that will, when implemented, extend the service life of the recorder. The ECP will be formatted IAW Contract Line Item Number (CLIN) 10, Contract Data Requirements List (CDRL) B009, and Task Number 2.7 of this SOW. Specific SOW tasking is as follows;

**2.0 TASK DESCRIPTIONS**

2.1 Support Integrated Product and Process Development (IPPD) Integrated Product Team (IPT) Meetings - Sippican, Incorporated will support the IPPD IPT meetings to be held bimonthly (every two months) starting with the formal kickoff meeting scheduled for the week of 18 November 1996. The purpose of these meetings will be to communicate status and to offer guidance on the taskings and deliverables required for this effort. The guidance forthcoming from the IPTs will refine the efforts as they mature without changing the contractual scope. The core IPT team members will consist of (but not limited to) representatives from PMS415 (chair), NAVUNSEAWARCENDIV Newport, COMTRACENPAC and other Fleet personnel, and NAVICP Mechanicsburg. Sippican, Incorporated will be a contributing player and participant but not a voting member of the IPT.

Sippican, Incorporated will present a Preliminary "DRAFT" PIDS and an updated program schedule, based on the following tasking, at the November IPPD IPT kickoff meeting. In the January IPT meeting, Sippican, Incorporated will present the "DRAFT" of the PIDS and PDD.

2.2 Submit Prime Item Development Specification (PIDS) - IAW CLIN 10, CDRL Number B009; the AN/BQH-7/7A SLEP PIDS shall document the performance and functional requirements of the AN/BQH-7/7A SLEP recorder as proposed in PECP SI-BQH7-P0003-R1 and shall be capable of interfacing with the probes listed in

Enclosure 1, Page 6 of the Preliminary Engineering Change Proposal (PECP). An Acceptance Test Procedure (ATP) for the AN/BQH-7/7A SLEP will be included in the PIDS as an Appendix.

The PIDS shall be updated following the completion of environmental testing and will incorporate final IPT comments from this testing.

2.3 Submit AN/BQH-7/7A SLEP Program Design Document (PDD) - The AN/BQH-7/7A SLEP PDD shall document the COTS/NDI mechanical and electrical component's parts selection process used in meeting the PIDS functional and performance requirements IAW CLINs 9 and 10, CDRL numbers A001, A003, A004, A005, A006, A007, A008, A009, A010, A011, A012, B002, B004, B005, B007, B008, B009, B010, and B011. The PDD shall include the following:

2.3.1 A section which updates the Sippican, Incorporated Programmatic Environmental Analysis (PEA) (which was submitted as part of PECP SI-BQH7-P0003-R1). A section including a Programmatic Environmental, Safety and Health Analysis (PESHA) will be added to or be an Appendix to the PEA. Guidance will be provided by PMS415.

2.3.2 A section containing a functional block diagram and an Operational Sequence Flow Diagram of the SLEP recorder's basic functions and subfunctions.

2.3.3 A section documenting the reliability of the mechanical and electrical components selected and a Failure Modes Effects and Criticality Analysis (FMECA). The FMECA shall document Sippican's engineering trade off analysis/studies performed for final parts selection (i.e., color monitor trade off analysis used in the monitor/screen selection, plans to minimize electromagnetic interference (EMI) emissions, etc.). The end of this section will document the electronic packaging and structural integrity design analysis performed and all steps used to ruggedize and package the components in the existing recorder enclosure to ensure proper operation in the Fleet environment (according to the environmental test parameters in section 2.5 below). This section will end with an overall ruggedized assessment of the design.

2.3.4 A top level breakdown (using reference designators) of the Bill of Materials (BOM) will be documented to the sub-assembly level and when practical to the component level (see note at end of this section). The information in the BOM will include, at the least, a reference designation, component name, component quantity, part number, vendor's name and telephone number, vendor's manufacturing projected end date, and component/subassembly price (fully loaded cost) for all purchased components. The projected final unit cost will be provided.

2.3.5 A Maintenance Flow Diagram (MFD) and a Mean Time Between Failure (MTBF) calculation of the full up recorder easily traceable by performing a bottoms-up analysis.

2.3.6 The maintenance philosophy will remain the same as the current Fleet recorder which is to "remove and replace to the LRU" at either the organizational or depot levels. The PDD shall contain a section with recommendations for sparing candidates based on this philosophy. This section will complement and will become the foundation for the tailored LSA 036 report and Provisioning Technical Documentation (PTD).

2.3.7 The PDD shall include a section containing a recommended Mean Time To Repair (MTTR) Plan (i.e., M-Demo Plan). This section will include the step by step procedures for conducting an M-Demo. The intent will be to ensure that any unscheduled maintenance performed on board ship will require the same amount of time, or less, to repair than that required currently in the AN/BQH-7/7A specification.

2.3.8 Include a software description to document the baseline AN/BQH-7/7A SLEP compiled software code to include only version descriptions and revision level data as changes are made to the baseline (Example - "The current software is Version X.X, Revision X.X dated XX month XXXX, Check Sum Number is XX). Only compiled software code will be provided (source code will not). This information will be used for configuration control purposes.

2.3.9 The last section of the PDD will document any AN/BQH-7/7A SLEP hull specific or hull unique variants as directed by the IPT. The data in this section will include a shortened version (the HW/SW delta's) of the PDD studies and analysis described above.

2.3.10 An Appendix containing the top level assembly drawing and subassembly drawing illustrations along with a complete (full up) assembly drawing list.

**NOTE:** If parts are procured at the mechanical component level (i.e. monitor, hard disk, disk drive, track pad, etc.) or Circuit Card Assembly (CCA) level (i.e., MK 12 CCA, NTDS CCA, RS-232 CCA, etc.), then the above analysis and BOM documentation is required only to that level.

The PDD will be a "living document" and will be periodically updated as required to support PMS415's Configuration Review Board (CRB) and the Configuration Control Board (CCB) requirements and comments.

2.4 Submit Provisioning Technical Documentation (PTD) - IAW CLIN 9, CDRL numbers A001, A003, A004, A005, A006, A007, A008, A009, A010, A011, A012, along with the PDD information and the data output of the LSA 036 report, submit provisioning technical documentation (PTD) as required. Provisioning guidance conferences will be held, as side meetings to the IPTs, to assist in the development of any required PTD. This task shall be concurrent with the development of the "recommended sparing candidates" section of the PDD. This task will begin after the ECP is approved by the PMS415 CCB and an EC is formally established. The IPT will provide guidance at that time.

2.5 Environmental Testing - IAW CLIN 10, CDRL number B009; support the following environmental tests (proposed) to be performed by the TDA and ISEA at NUWC Newport as required.

- (a) High and low temperature per MIL-STD-810E Methods 501.3, Procedure II (operating), and 502.3, Procedure II (operating), range 0 to 50°C
- (b) Humidity per MIL-STD-810E, induced variable-high humidity, cycle 5, except at maximum temperature of 50°C
- (c) Vibration per MIL-STD-167, Section I, Type I
- (d) Shock per MIL-S-901, Grade B, Type A
- (e) Airborne and structure-borne noise per ANSI Standard 13-1971 (A-weighted) with noise not to exceed 55 dB
- (f) Inclination while operating up to 60° off vertical line

The AN/BQH-7/7A SLEP design may be modified depending on the results of environmental testing and final IPT evaluation of test results.

2.6 Support Configuration Validation and Functional Verification - Perform a simulation and stimulation of the design to the IPT team to ensure functional and performance conformance to the PIDS. Support configuration validation reviews of the PDD against the PIDS.

2.7 Submit Engineering Change Proposal (ECP) - IAW CLIN 10, CDRL number B009; submit ECP for processing through PMS415's Configuration Review Board (CRB) and Configuration Control Board (CCB) process IAW PMS415's Configuration Management Plan of 31 January 1995.

2.8 Submit a Product Specification Description - Submit a product description summary with a color picture of the proposed AN/BQH-7/7A SLEP recorder with technical attributes/specifications on the flip side. An example will be provided to Sippican for guidance.

2.9 Submit AN/BQH-7/7A SLEP Technical Manual - IAW CLIN 9, CDRL Number A004. Technical Manual Contract Requirement (TMCR) No. NDMS-820291-000 of 21 September 1982 will be revised for a commercial manual application and will be provided to Sippican, Incorporated by PMS415D2. Based on the tailored TMCR and using the Sippican, Incorporated MK 12 Technical Manual as guidance, develop a SLEP technical manual to include as a minimum;

- (a) General information
- (b) Operation and Maintenance
- (c) Troubleshooting and Repair
- (d) COTS/NDI vendor and/or component manuals as appendices

The technical manual must be designed to easily facilitate the insertion of change pages, if and when they are required.

2.10 Submit Training Material Documents (TMD) - IAW CLINs 9 and 10, CDRL numbers A004 and B009; update existing training material, incorporating comments from PMS415, the TDA, the ISEA, NAVICP-M, and the training command.

### **3.0 REPORTING REQUIREMENTS**

3.1 As per CLIN 10, CDRL Numbers B001, B002, and B003; Sippican, Incorporated shall submit a monthly report which will be used to prioritize, plan, and schedule remaining work. The report will be due on the 15th of each month beginning 15 December 1996. The report will include a manloading plan and schedule. The manloading plan and schedule will be updated monthly. The monthly reports shall include as a minimum;

- (1) The technical status and programmatic summary of the AN/BQH-7/7A SLEP efforts to date and those planned for the near term and distant future.
- (2) Total expenditures, by task and subtask (in the case of the PDD), against engineering services, consulting, and support for the month and to date and the projected/proposed spend rate.
- (3) Milestone projections for technical progress.

Copies of the monthly report shall be submitted to Mr. Larry R. Moss, PEO(USW) PMS415D2 with copies to the following individuals:

- PEO(USW), Arlington, VA (PMS415F, Ms. M. Margo Heit)
- NAVUNSEAWARCENDIV, Newport, RI (Code 432, Mr. Joseph J. Maher; Code 2122, Mr. Michael S. Quinn)
- Techmatics, Incorporated, Arlington, VA (Mr. Gary M. Sutton)

**4.0 BILLING REQUIREMENTS**

IAW P00008 on subject contract under Section G - CONTRACT ADMINISTRATION AND DATA, the following has been added for invoice purposes.

"For the payment of contractor billings under this contract, Defense Finance and Accounting Service (DFAS) Columbus should utilize funded obligations from the oldest appropriate ACRN first.

Specifically:	Proj. Unit	ACRN	Hull	OWLD
	21940AQ	DDG-65	1/97	
	21923AN	DDG-64	2/97	
	21936AG	MHC-55	5/97	
	21881AE	MHC-54	7/97	
	21833AS	DDG-66	8/97	

**NOTE:** Sippican, Incorporated will mark their invoices accordingly starting with Project Unit 21940, ACRN AQ and working downward to assist DFAS and the DCMAO ACO in meeting this requirement.

**5.0 DELIVERABLES**

Sippican, Incorporated shall provide the following deliverables in MicroSoft Word. PEO(USW) PMS415D2 will be the approval authority for each deliverable. The dates listed below are the scheduled deliverable due dates.

<b>NUMBER</b>	<b>TITLE</b>	<b>DUE DATE</b>
0001	<u>Prime Item Development Specification (PIDS)</u>	
	- Preliminary "DRAFT" PIDS .....	18 Nov 1996
	- "DRAFT" PIDS .....	18 Jan 1997
	- Final "DRAFT" PIDS .....	18 Feb 1997
0002	<u>AN/BQH-7/7A SLEP Program Design Document (PDD)</u>	
	- "DRAFT" PDD (Sections 2.3.2, 2.3.3, 2.3.4) ..	18 Jan 1997
	- "DRAFT" PDD (All Sections) .....	18 Feb 1997
	- Final "DRAFT" PDD .....	18 Mar 1997
0003	<u>Product Specification Description (PSD)</u>	
	- Draft PSD .....	18 Mar 1997
	- Final PSD .....	18 Apr 1997
0004	<u>AN/BQH-7/7A SLEP Technical Manual (TM)</u>	
	- Draft TM .....	18 Apr 1997
	- Final TM .....	18 Jun 1997

0005    Training Material Documents (TMD)  
      - Draft TMD ..... 18 May 1997  
      - Final TMD ..... 18 Jul 1997

0006    Engineering Change Proposal (ECP)  
      - Draft ECP ..... 18 Mar 1997  
      - Final ECP ..... 18 Jul 1997

0007    Reports - Due 15th of each month IAW Section 3.0