A MARINE BIOLOGICAL SAMPLING DEVICE

(MBSD)

HARBOR BRANCH FOUNDATION

TECHNICAL REPORT #57

This document was prepared by Harbor Branch Foundation, Inc. in partial fulfillment of Prime Contract No. DE-AC12-76SN00052, Purchase Order No. NPD 84-3663-AB for GENERAL ELECTRIC COMPANY/Knolls Atomic Power Laboratory.

Submitted to:

GENERAL ELECTRIC COMPANY
Knolls Atomic Power Laboratory
P.O. Box 1072
Schenectady, NY 12301

Attn: R.B. Sheldon/Z3

Submitted by:

Andrew M. Clark
October 28, 1985

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1.0 SCOPE

This document provides details of a Marine Biological Sampling Device (MBSD) built by Harbor Branch Foundation, Inc. (HBF) under Prime Contract No. DE-AC12-76SN00052 (Purchase Order NO. NPD 84-3663-AB) from Knolls Atomic Power Laboratory (KAPL). The contract was awarded to HBF as the result of their response to RFP No. 30162A-AB. The MBSD described herein represents a second generation unit, hereafter referred to as MOD II. MOD II is a follow-on to a system (MOD I) built by HBF for KAPL in response to RFP 07990-AB, NPD 83-2119-AB.

The MOD II MBSD was built in accordance with KAPL Technical Specification MR30162A. Included in this document are a description of the system, sketches, photographs and a description and the results of testing performed on the system in compliance with Technical Specification MR30162A.

2.0 SUMMARY OF COMPLIANCE WITH CONTRACT

2.1 TECHNICAL SPECIFICATION MR 30162A

The contract is included in its entirety in the APPENDIX. A portion of the contract, KAPL Technical Specification MR30162A is included in this section, along with citings of the section in this report pertinent to each item.

1. Seller shall modify his multiple bin biological sampling system to reduce total weight and overall dimensions by approximately 50% thus facilitating use of the sampler in conjunction with other submersible or ROV operations during the same dive.

   - See TABLE II and TABLE III, Section 3.4

2. Seller shall upgrade the current hydraulic gear motors to positive displacement hydraulic motors on both the multiple bin sampler and the brush collector.

   - See Section 3.0

3. Seller shall modify the pump impeller design on the single and multiple bin samplers to increase suction by at least 25%.

   - See TABLE IV, Section 4.3

4. Seller shall modify the brush collector to improve collection efficiency by a minimum of 25%.

- See TABLE IV, Section 4.3

5. All of the above modifications to the seller's marine biological sampling devices shall be accomplished in such a manner that the samplers will be compatible for operation using the Deep Submergence Research Vehicle ALVIN operated by Woods Hole Oceanographic Institution, the JOHNSON-SEA-LINK, and an ROV.

- See TABLE I, Section 3.0

6. Tests of the equipment shall be conducted at the seller's laboratory by operation of the samplers in a test tank and on an ROV in the laboratory. A formal report documenting the above modifications and testing results shall be submitted to General Electric - KAPL within one month of completion of all work.

- See Section 4.0 and Section 2.2.2

2.2 MATERIAL/SERVICES PROVIDED

2.2.1 In reference to Item 1, Section I of Contract DE-AC12-76SN00052 (included in APPENDIX) all modifications and testing of the MBSD were performed (see Section 2.1) in accordance with Technical Specification MR 30162A, on or before September 30, 1985.

2.2.2 This document, "A MARINE BIOLOGICAL SAMPLING DEVICE", Harbor Branch Foundation Technical Report #57, fulfills the requirement of Item 2 of the aforementioned contract.

2.2.3 In reference to Items A, B, and C, SECTION II

- This document has been submitted before October 31, 1985 to:

  GENERAL ELECTRIC COMPANY
  Knolls Atomic Power Laboratory
  P.O. Box 1072
  Schenectady, NY 12301
  Attn: R.B. Sheldon/Z3

2.2.4 In accordance with Section V, the MBSD is available for use during the 1986 oceanographic monitoring expedition tentatively scheduled for the third or fourth quarter, 1986.

3.0 SYSTEM DESCRIPTION

The MBSD system comprises three major subsystems:

1. BRUSH SAMPLER
2. MULTI-BIN COLLECTOR
3. SUCTION IMPELLER

These subsystems are indicated in the illustration of Figure 1.

All the materials and construction methods employed represent current good practice in submersible tool technology. The two hydraulic motors used in the system are identical SPERRY-VICKERS MF10-711-30, thereby enabling interchangeability and a reduced spare parts list. These positive displacement motors replace the gear motors of MOD I, providing increased torque and efficiency.

The hydraulic circuitry of the MBSD has been designed purposefully simple, in order that it may offer compatibility with virtually any submersible. The three hydraulic components, two positive displacement motors and a double acting cylinder (CYLINDERS & VALVES, INC. DC500-1), were selected to operate satisfactorily over a wide range of hydraulic input parameters.

TABLE I lists the pressure and flow characteristics of three "target" submersibles, upon which the MBSD system may be operated.

TABLE I

HYDRAULIC SYSTEM CHARACTERISTICS OF TARGET SUBMERSIBLES

		PRESSURE (psi)	FLOW (GPM)
JOHNSON-SEA-LINK I & II		900	2.2
CORD II	H.P. SYSTEM	1600	2.0
	L.P. SYSTEM	900	1.0
ALVIN[i]		1200	1.5

i - DSV ALVIN's hydraulic system is currently undergoing extensive modification.

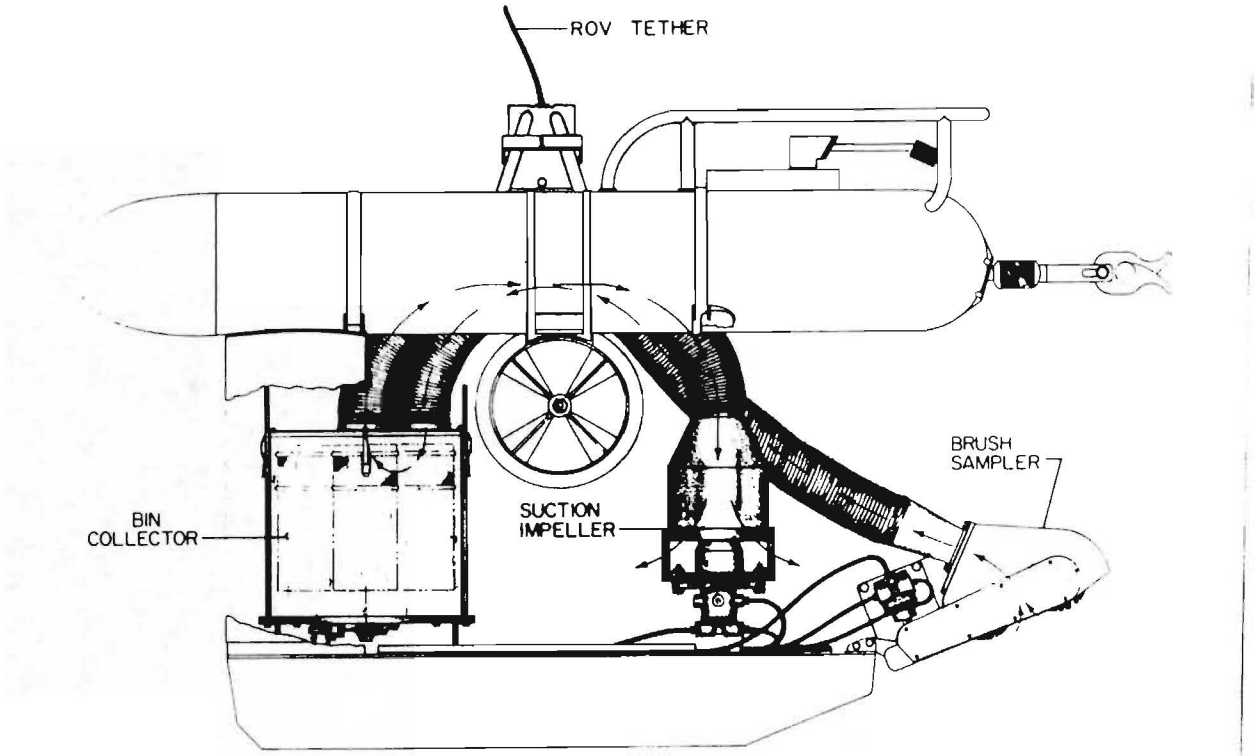


FIGURE 1. MBSD SYSTEM

3.1. BRUSH SAMPLER

Details of the BRUSH SAMPLER are provided in the illustration of Figure 2. The 6061-T6 aluminum box structure of the BRUSH SAMPLER houses two counter-rotating synthetic brushes. As illustrated in Figure 2, these brushes rotate toward each other. Thus, as biological matter is scrubbed free of a surface, it is directed up between the two brushes. Suction provided by the SUCTION IMPELLER draws the suspended biological matter through the transport hose leading to the BIN COLLECTOR. The brushes are chain driven by means of a plastic coated cable-chain and a series of five stainless steel sprockets. Rotation is provided by a SPERRY-VICKERS MF10-711-30 hydraulic motor.

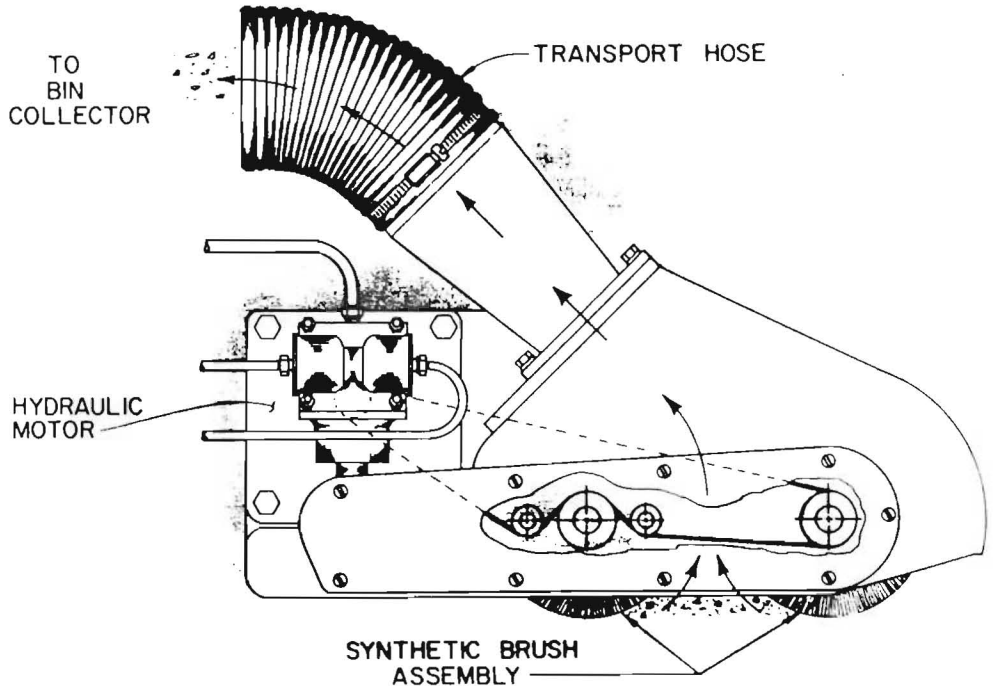


FIGURE 2. BRUSH SAMPLER DETAILS

3.2 MULTI-BIN COLLECTOR

The MULTI-BIN COLLECTOR is basically a large (15" diameter) acrylic tube within which five smaller (.785 gallon) acrylic cylinders (bins) index and rotate. The large anular tube serves as a suction plenum, whereby each of the five bins, when positioned beneath the sampling location, is filled with sea water (and suspended biological matter) by means of a suction created in the large tube by the SUCTION IMPELLER. This water makes egress through the mesh screen affixed to each of the five bins (see Figure 3). The screen acts to retain the biological matter in the bin. The mesh is easily interchanged, enabling sampling of various sized specimens. Upon completion of one sample, another bin is indexed to the sampling location. This indexing and rotation is accomplished by a double acting hydraulic cylinder mounted beneath the MULTI-BIN COLLECTOR base plate. In order to index a new bin the (ROV/submersible) pilot simply cycles the proper hydraulic function switch.

3.3 SUCTION IMPELLER

The SUCTION IMPELLER subsystem, also shown in Figure 3, includes the impeller itself, the shroud nozzle, bracket and a SPERRY-VICKERS MF-10-711-30 hydraulic motor. The impeller, shroud nozzle and bracket are machined from 6061-T6 aluminum. The vanes of the impeller were first formed, then welded to the hub using the GTMAW process. The bolts and hardware associated with the SUCTION IMPELLER are 316 stainless steel.

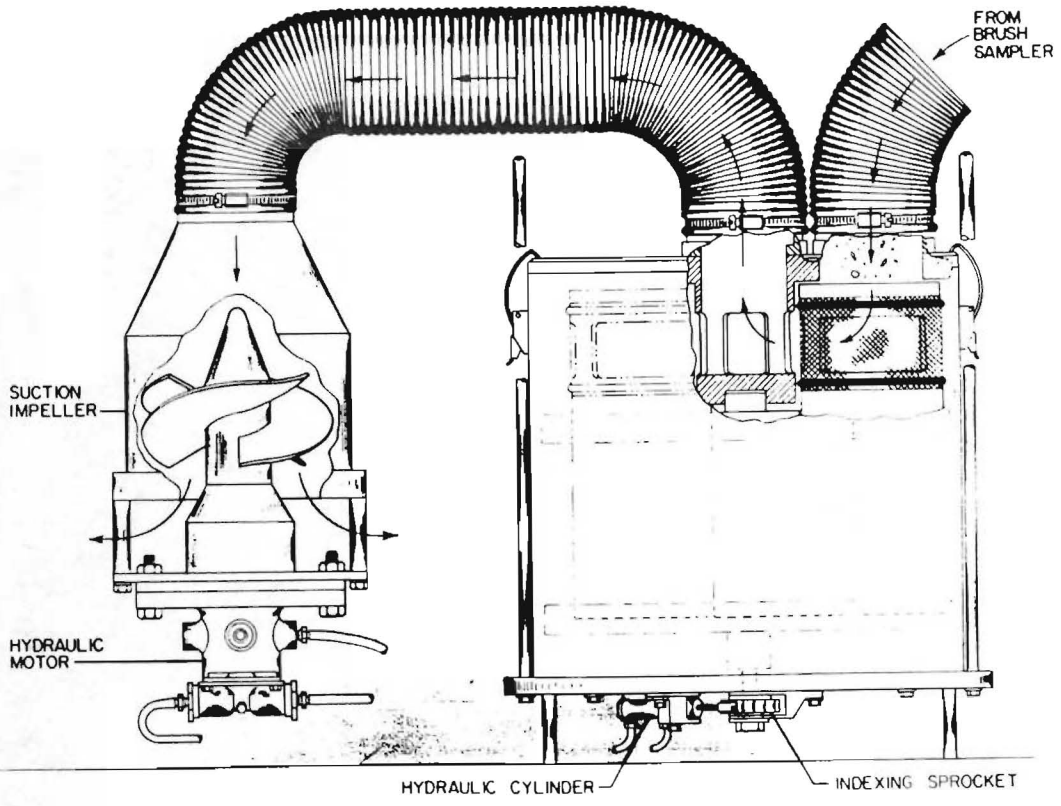


FIGURE 3. MULTI-BIN COLLECTOR and SUCTION IMPELLER

3.4 SYSTEM WEIGHT AND DIMENSIONS

TABLE II

MBSD DIMENSIONS - MOD I VS. MOD II

	SIZE (inches)		
	MOD I	MOD II	% DIFFERENCE
BRUSH SAMPLER	23 x 11 x 11	15 x 9 x 6.25	70
MULTI-BIN COLLECTOR	25.5 x 11 x 58	15 dia x 15	102
SUCTION IMPELLER	6 x 8 x 9	7 dia x 14	20*
TOTAL	19,484 in^3	1559 in^3	92

* Indicates MOD II component larger than MOD I

TABLE III

MBSD WEIGHTS - MOD I VS. MOD II

	WEIGHT (lbs in air)		
	MOD I	MOD II	% DIFFERENCE
BRUSH SAMPLER	25	17	32
MULTI-BIN COLLECTOR	135	46.5	66
SUCTION IMPELLER	6	9	33*
TOTAL	166	72.5	56

*Indicates MOD II component heavier than MOD I

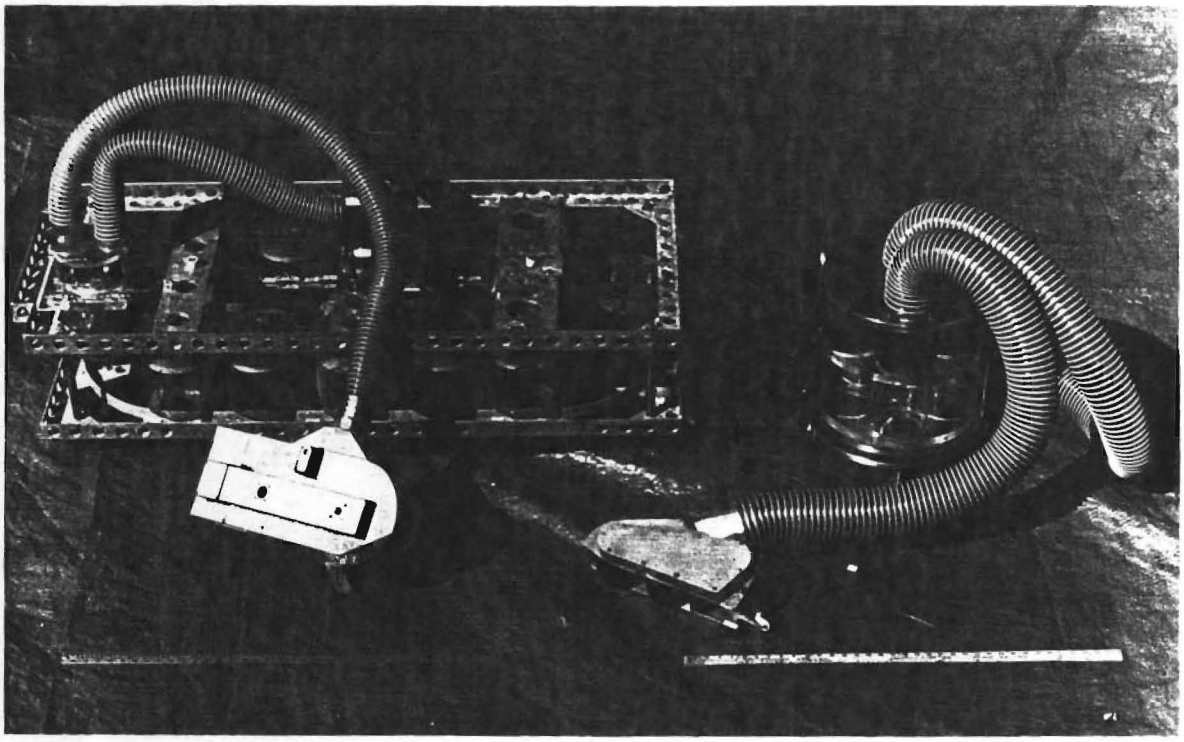


FIGURE 4. MBSD MOD I (L) AND MBSD MOD II (R)

4.0 TEST PROGRAM

In accordance with KAPL Technical Specification MR 30162A (APPENDIX), testing of the MBSD was carried out in two phases:

1. In a laboratory test tank
2. Mounted on an ROV in the laboratory

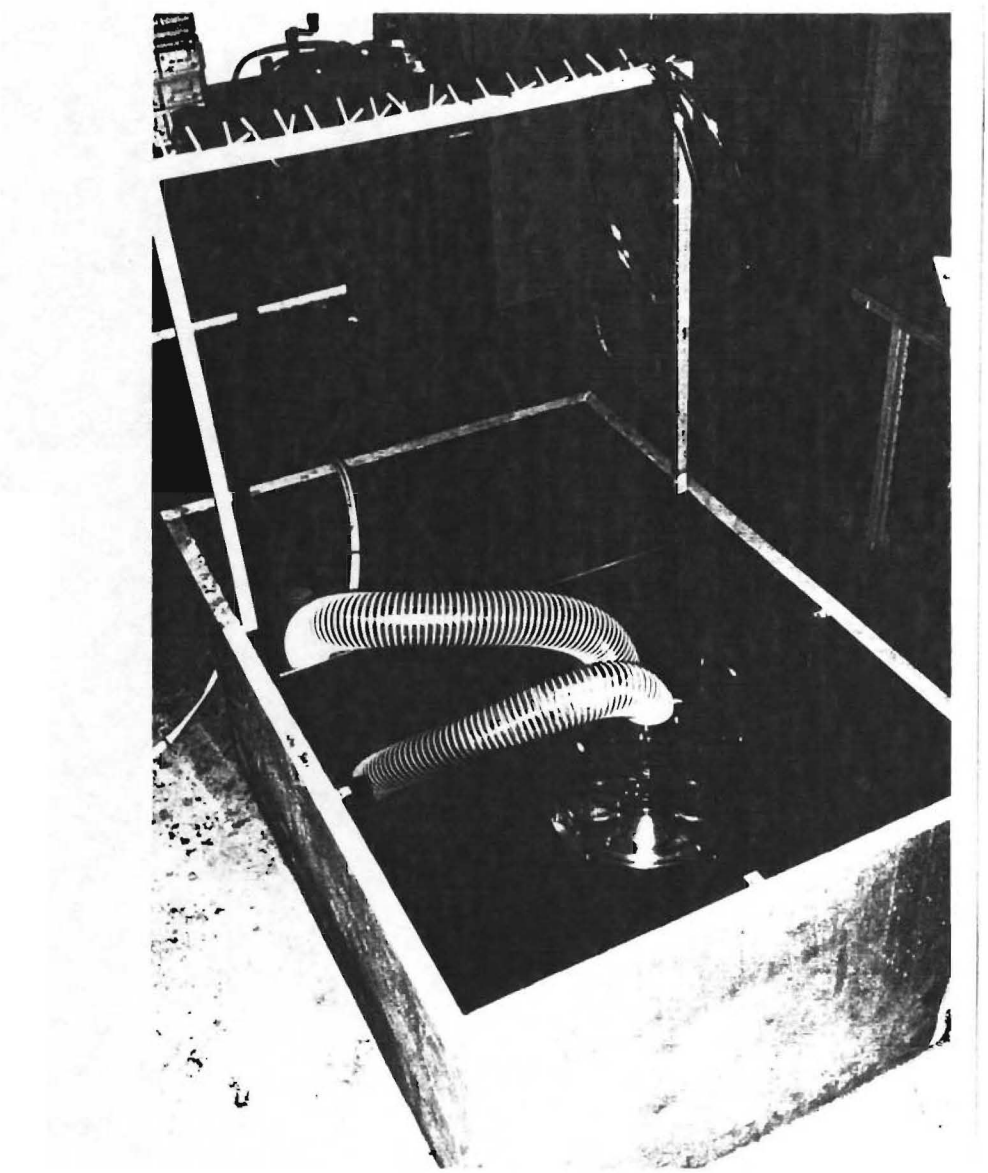


FIGURE 5. MBSD IN LABORATORY TEST TANK

4.1 TANK TESTS

In order to ensure that Items 3 and 4 of MR 30162A had been satisfied, the laboratory tank tests were constructed in a manner to compare MBSD MOD I against MBSD MOD II on a component by component basis. A hydraulic test bench in HBF's Engineering Laboratory was used to provide specified hydraulic pressure and flow rate to each component. These parameters were also adjusted to simulate the hydraulic systems of the targeted submersibles (see TABLE I). The rotation speed of both BRUSH SAMPLERS (MOD I and MOD II) were measured using a stroboscopic tachometer through a viewport in the test tank. The test tank was filled with fresh water, and fitted with a weir (Figure 5). The weir segmented the test tank, providing two chambers from which to pump water back and forth, thus enabling an assessment of the relative performance of the two SUCTION IMPELLERS.

FIGURE 6. INSTALLING BIN IN MULTI-BIN COLLECTOR

FIGURE 7. TANK TEST OF BRUSH SAMPLER

4.2 ROV TESTS

The MBSD was mounted on HBF's ROV CORD II as shown in Figures 8 and 9. While the ROV was not in submerged operation, the MBSD was powered by the ROV's onboard hydraulic system and controlled by the ROV operator from its control console in the same manner as if the ROV were at depth. The BRUSH SAMPLER was fixed to one lower pod of the ROV.

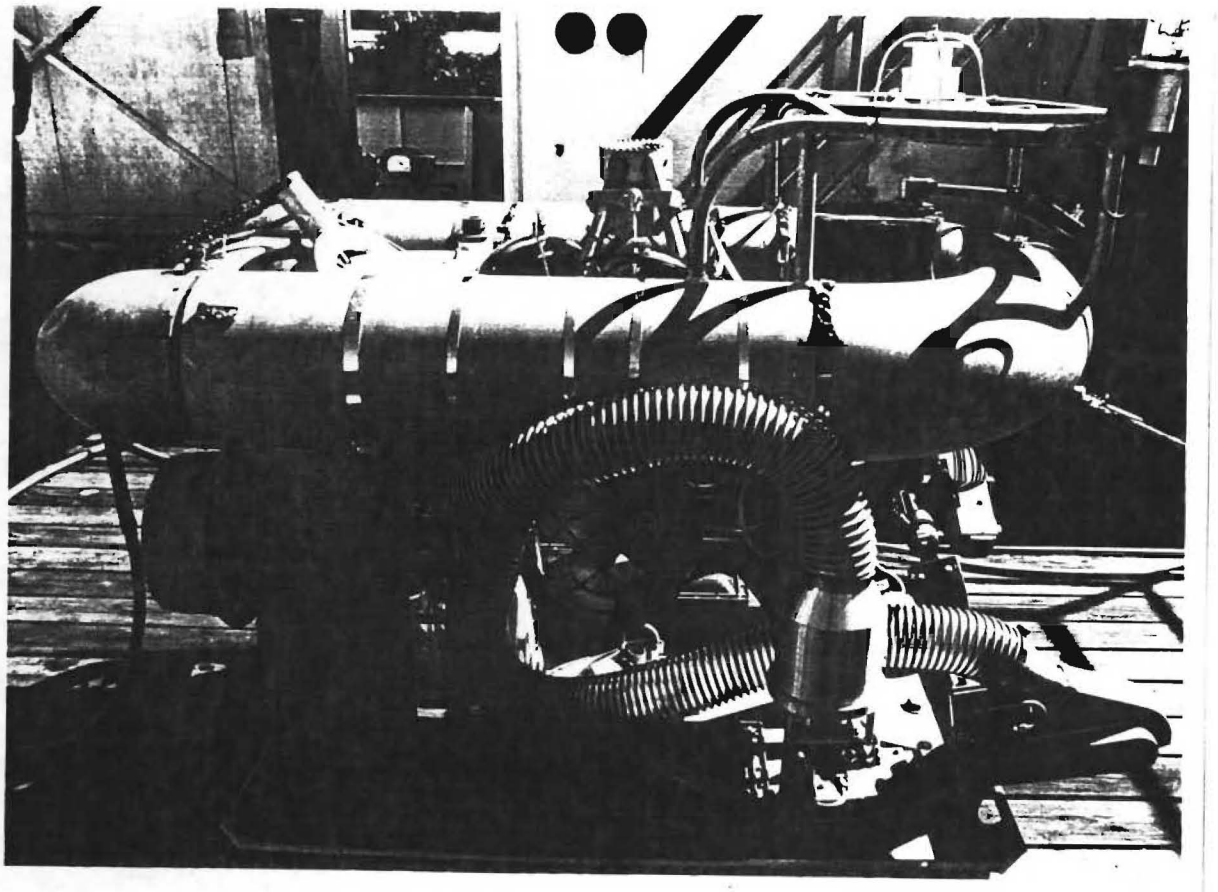


FIGURE 8. MBSD MOUNTED ON ROV CORD II

4.3 TEST RESULTS

Results of the tests are presented in TABLE IV. It is tabulated in a manner intended to make convenient comparisons between MOD I and MOD II.

TABLE IV

MBSD PERFORMANCE - MOD I VS. MOD II

COMPONENT	SPEED (RPM)		
	MOD I[i]	MOD II[ii]	% IMPROVEMENT
BRUSH SAMPLER	175	620	254
	FLOW (GPM)		
	MOD I[iii]		MOD II[iv]
SUCTION IMPELLER	75	266	255

i - Hydraulic flow and pressure: 1 gpm, 1000 psi

ii - Hydraulic flow and pressure: 1 gpm, 450 psi

iii - Hydraulic flow and pressure: 2 gpm, 1500 psi

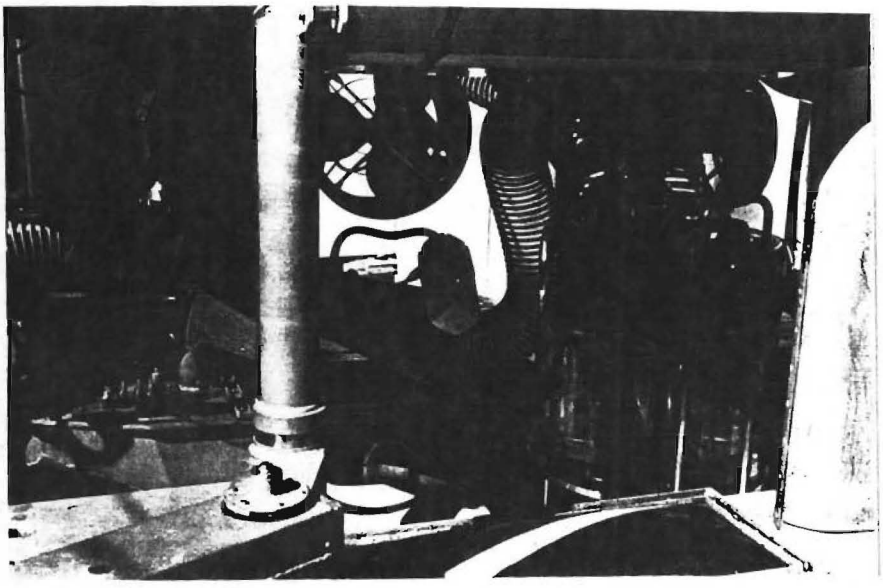
iv - Hydraulic flow and pressure: 2 gpm, 900 psi

5.0 INSTALLATION AND OPERATION

5.1 INSTALLATION

As described in the previous section, the MBSD has been installed and operated on board HBF's unmanned submersible ROV CORD II. The SUCTION IMPELLER and MULTI-BIN COLLECTOR were affixed to the vehicle by means of stainless steel band clamps. In order that samples be retained upon surfacing and recovery of the submersible upon which the MBSD is mounted, it is required that the MULTI-BIN COLLECTOR be mounted upright as depicted in Figure 1. The orientation of the SUCTION IMPELLER is of no consequence to the system.

During the MBSD tests conducted on ROV CORD II, the BRUSH SAMPLER was bolted to one of the vehicle's lower hydraulic pods. In this mode, the ROV is maneuvered to contact the brushes with the surface to be sampled. The other intended mode of operation is one where the BRUSH SAMPLER is mounted directly to the manipulator of the host submersible. Hence, full advantage of the manipulator arm's dexterity is available for placement of the BRUSH SAMPLER.



5.2 OPERATION

As mentioned, the MBSD can be operated over a wide range of hydraulic input parameters. The system requires the dedication of three "on-off" hydraulic function controls, typically three auxiliary functions provided on most submersible hydraulic systems.

The three dedicated functions control:

1. BRUSH SAMPLER rotation,
2. SUCTION IMPELLER rotation,
3. BIN indexing.

Operation of the system is as follows:

1. Position BRUSH SAMPLER near surface to be sampled
2. Turn "on" BRUSH SAMPLER rotation
3. Turn "on" SUCTION IMPELLER rotation
4. Lower BRUSH SAMPLER on surface
5. Upon completion of sampling, remove BRUSH SAMPLER from surface
6. Turn "off" BRUSH SAMPLER rotation
7. Turn "off" SUCTION IMPELLER rotation
8. Cycle "BIN INDEX", bringing new bin to sampling location
9. REPEAT

APPENDIX

PURCHASING

KNOLLS ATOMIC POWER LABORATORY

SCHENECTADY, NEW YORK 12301

Phone: 518 – 393-6611
TWX: 710 – 442-2979

REQUEST FOR PROPOSAL

(NOT A PURCHASE ORDER)

N.Y. STATE TAX EXEMPTION No. 14.0689340

Harbor Branch Foundation
Link Port
Attn: William Czvekus
RR #1 Box 196
Fort Pierce, FL 33450

Rights Reserved by KAPL -

a. KAPL reserves the right to set aside any proposal, even though it may be acceptable in all other respects, if KAPL has reasonable doubt as to Offeror's ability to perform successfully should a purchase order be awarded as a result of this Request For Proposal.

b. KAPL reserves the right to reject Offeror's proposal if any exception is taken to the requirements of this Request For Proposal.

c. KAPL reserves the right to procure all or any part of the quantities specified from any one offeror.

d. KAPL reserves the right to award a purchase order on the basis of the proposals received without negotiation.

e. KAPL and/or the Government reserves the right to conduct an initial pricing survey to determine the reasonableness of any price proposal.

f. KAPL reserves the right to include consideration of other factors such as delivery, technical and administrative responsiveness, option pricing, potential put-in or take-out changes, development of new suppliers in addition to pricing as a basis of award to a successful offeror.

g. General Electric reserves the right to retain copies of all proposals received, including those from any unsuccessful offeror, to properly document the procurement action.

REQUEST For Proposal (RFP) No. 30162A-AB Prime Contract No. DE-AC12-76SN00052 Date 8/22/84

Your (Fixed-Price, ~~XXXXXX~~) Proposal, SUBJECT TO THE FOLLOWING, is Required At KAPL in Triplicate

Copies By 8/30/84

1. Terms and Conditions of Request For Proposal as set forth in this Request For Proposal, including the reverse side of this Page.
2. Proposal Preparation Instructions & Certifications, KAPL Form PO-01-273 must be returned with your proposal
3. Draft Purchase Order – Specific Proposal Requirements and such other Provisions and Specifications attached or referenced.
4. General Terms and Conditions of Purchase including any Referenced Modifications.
5. Order to be awarded as a Result of this Request For Proposal shall be assigned a DO rating under the provisions of DMS Reg. 1 and/or applicable Regulations and Orders of BDC.

Signed Proposals Shall Be Enclosed In a Sealed Envelope With The Name And Address Of The Offeror, The Proposal Due Date And The RFP No. On The Face Of The Envelope (USE ENCLOSED MAILING LABEL).

The Sealed Proposal Shall Be Mailed
TO: Knolls Atomic Power Laboratory
P. O. Box 1072
Schenectady, NY 12301
Attn: PM Begbie/Purchasing (518 393-6611 Ext 4485)

PM Begbie

PM Begbie/clm
CONTRACT ADMINISTRATOR

GENERAL ELECTRIC COMPANY

TERMS & CONDITIONS OF REQUEST FOR PROPOSAL

1. **Definitions** –

   KAPL – The Knolls Atomic Power Laboratory, [illegible] the Company operated by General [illegible] the United States Department of Energy (DOE).

2. **Proprietary Information** – Any knowledge or information which Offeror may disclose to General Electric in his Proposal, or has heretofore or may hereafter disclose in any negotiations [illegible] the subject of the Proposal up to and including the placement of any order resulting from [illegible] specified, be deemed by General Electric to be confidential or proprietary information and accordingly will be [illegible] other than restrictions which may result from a claim for patent infringement).

3. **Security**

   a. Classified information received or generated [illegible] Department of in accordance with DOE security requirements.

   b. If Offeror declines to propose or is advised [illegible] destroy all classified information received or generated for use with this Request for Proposal. Offeror shall within 30 days after his declining to propose or receiving notice of award to another, furnish written Certificate of Non-Possession (KAPL Form PO-01-040).

   c. Any classified documents generated as a result of Offeror's proposal shall be transmitted to:

      Knolls Atomic Power Laboratory
      PO Box 1072
      Schenectady, New York 12301
      Attention: Document Control/_____
      (Contract Administrator)

   d. Only U.S. citizens will be admitted to any KAPL site or any area where KAPL has a classified interest for work of any nature including routine services. Offerors shall plan their work accordingly to ensure that all work performed at any area where DOE/KAPL has a classified interest will be done by U.S. citizens.

4. **Release of Information** – Offeror shall not release [illegible] information, data, photographs, sketches, advertising, etc. relating to this Request For Proposal.

5. **Proposal Validity Period** – Prices quoted by Offeror shall be [illegible] for a period of ninety days.

6. **Control of Release of Naval Nuclear Propulsion Information** – The importance of naval nuclear propulsion information to national security requires that disclosures to persons and organizations not [illegible] contract, directly or indirectly, with a Supplier be made with extreme care. Unapproved release of such information is prohibited. Accordingly:

   a. Extreme care shall be exercised by Offeror personnel involved in any formal or informal technical exchanges that involve naval nuclear propulsion information. Particular attention shall be directed to minimizing the release of any technical details. In addition, Offeror personnel shall caution the intended recipient of any [illegible] propulsion information against release of this information to the public, to foreign nationals, or to any other foreign interests.

   b. Whenever such exchanges involve the release of [illegible] documents, the following statement must be displayed on the front sheet or page:

      > This document may not be further [illegible] (name of recipient, either individual or company) without the prior written approval of (name of Offeror). Disclosure to [illegible] nationals representing foreign interests, foreign nationals, foreign governments, foreign companies and foreign subsidiaries or foreign [illegible] divisions of U.S. companies is specifically prohibited.

      Prior to authorizing the release of information [illegible] Offeror shall obtain the written approval for such release from General Electric Company, Knolls Atomic Power Laboratory.

7. **Capabilities Survey** – KAPL reserves the right [illegible] survey of Offeror's facility(ies), quality control system, production and production control system to determine Offeror's [illegible] meeting the quality control, production and production control requirements of the proposed work.

   KAPL may require submission of Quality Control (or other) Manual and Procedures. If Offeror previously submitted such required documents, Offeror shall identify his previous submission. Offeror's failure or refusal to permit such a survey or submit requested manuals may be cause for rejection of Offeror's proposal.

8. **Certificate of Current Cost or Pricing Data** – Offeror agrees that whenever cost data is submitted he will execute a Certificate of Current Cost or Pricing Data as close as practicable to the date of agreement on the negotiated price of the Order.

9. **Modifications to any Resulting Order** – Offeror agrees to accept the following statement in all modifications to any resulting Order:

   "Seller agrees that the Order as modified to date includes all types of adjustments to which he is entitled, including but not limited to adjustments arising out of delays or disruptions or both, as full and complete consideration for his performance of the work contained herein".

10. **Proposals from Lower-Tier Suppliers** – Offeror shall require for each procurement action anticipated to exceed $100,000 that all proposals be submitted as sealed proposals. All such sealed proposals for the same procurement action shall be opened at the same time. In addition, the conditions set forth in 11 and 12, below shall also apply.

11. **Late Proposals, Modifications of Proposals, Withdrawal of Proposals**

    a. Any proposal received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and (1) it was sent by registered or certified mail not later than the fifth calendar day prior to the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th or earlier) (2) it was sent by mail (or telegram if authorized) and it is determined by KAPL that the late receipt was due solely to mishandling after receipt at KAPL, or (3) it is the only proposal received.

    b. Any modification of a proposal, except a modification resulting from KAPL's request for "best and final" offer, is subject to the same conditions as in a (1) and (2) above.

    c. A modification resulting from KAPL's request for "best and final" offer received after the time and date specified in the request will not be considered unless received before award and the late receipt is due solely to mishandling after receipt at KAPL.

    d. The only acceptable evidence to establish (1) the date of mailing of a late proposal or modification sent either by registered or certified mail is the U.S. Postal Service postmark on the wrapper or on the original receipt from the U.S. Postal Service. If neither postmark shows a legible date, the proposal or modification of proposal shall be deemed to have been mailed late. (2) the time of receipt at KAPL is the time/date stamp on the proposal wrapper or other documentary evidence of receipt maintained by KAPL.

    e. Notwithstanding the above, a late modification of an otherwise successful proposal which makes its terms more favorable to KAPL will be considered at any time it is received and may be accepted.

    f. Proposals may be withdrawn by written or telegraphic notice received at any time prior to date for receipt of Proposals. Proposal may be withdrawn in person by Offeror or his authorized representative, provided his identity is made known and he signs a receipt for the Proposal.

12. **Proposal Preparation Instructions & Certifications** – The executed Form PO-01-273 "Proposal Preparation Instructions & Certifications" (attached) shall be considered a part of any resulting Order, and Offeror shall check and sign Form PO-01-273 and return with his Proposal.

13. **Proposal shall be based on FOB destination.**

PU05185A

GENERAL ELECTRIC

KNOLLS ATOMIC POWER LABORATORY
P. O. BOX 1072 SCHENECTADY, NEW YORK 12301

AREA CODE 518 TWX 710-442-2979 TELEPHONE 393-6611

PURCHASE ORDER

OPERATED BY THE GENERAL ELECTRIC COMPANY UNDER GOVERNMENT CONTRACT DE-AC12-76SN00052

SHOW NPD NO. ON ALL PACKAGES AND CORRESPONDENCE — PURCHASE ORDER NO. NPD

SHOP ORDER NO | M R NO | DATE ORDERED | VENDOR ORDER CODE | AMENDMENT DATE | AMEND

TO

LAB SURP CODE

SHIP TO: KNOLLS ATOMIC POWER LABORATORY
WAREHOUSE BLDG M 2
SCHENECTADY NEW YORK 12309

BILL TO: KNOLLS ATOMIC POWER LABORATORY
P O BOX 1072
SCHENECTADY, NEW YORK 12301
ATTN: ACCOUNTS PAYABLE

ON PREPAID SHIPMENTS F O B SHIPPING POINT ATTACH ORIGINAL TRANSPORTATION BILL

SHIP VIA | F O B | TERMS | DO ☐ E-2 Certified under ☐ A-3 DMS Reg. 1 | QC CODE

DELIVERY DATE | ORDERED FOR | BLDG | BUYER CONTRACT ADMINISTRATOR

THIS ORDER SUBJECT TO GENERAL TERMS AND CONDITIONS OF ATTACHED PURCHASE SUPPLEMENT NO ____

THIS ORDER IS ☐ DOE ☐ NAVY ☐ DUAL FUNDED. PRIME CONTRACT NO(s) ____

ITEM	QUANTITY	UNIT	DELIVER TO (BUILDING) (ROOM)	UNIT PRICE	DISCOUNT	NET TOTAL
			Provide the following items in accordance with the instructions listed herein. The specifications, standards, drawings, and documents listed and referred to in these instructions are incorporated by reference and made a part hereof.			
			I. Material and/or Services Required			
1	1	lot	Perform modifications and testing of marine biological sampling devices in accordance with Technical Specification MR 30162A.			
2	2	cc	Report documenting results of Item 1 in accordance with Technical Specification MR 30162A.			
			FIRM FIXED PRICE OF ORDER			$24,370.00

NEW YORK TAX EXEMPTION NUMBER 14-0689340

THIS ORDER CONSISTS OF 3 PAGES.

GENERAL ELECTRIC

SELLER SHALL FOLLOW THE RULES, REGULATIONS, AND PROCEDURES OF THE DEFENSE PRIORITIES SYSTEM AND THE DEFENSE MATERIALS SYSTEM, REGULATION 1, AND ALL OTHER APPLICABLE REGULATIONS AND ORDERS OF THE INTERNATIONAL TRADE ADMINISTRATION, DEPARTMENT OF COMMERCE, IN OBTAINING CONTROLLED MATERIAL AND OTHER PRODUCTS AND MATERIALS NEEDED TO FILL THIS ORDER.

II. Delivery Requirements/Term

General Electric requires and it is essential that delivery be made as set forth below:

A. Item 1 - On or before September 30, 1985.

B. Item 2 - On or before October 31, 1985.

C. Item 2 - At completion of all work to:

General Electric Company
Knolls Atomic Power Laboratory
P. O. Box 1072
Schenectady, New York 12301
Attn: RB Sheldon/Z3

III. Applicable Documents

The following documents with all documents referenced therein form a part of this order:

A. Purchase Order Supplement, General Terms and Conditions of Purchase DOE-879 and Modification to DOE-879 dated 1/84.

B. Technical Specification MR 30162A dated August 3, 1984.

C. Supplement B - The IV System

IV. Modifications to Section III

Purchase Order Supplement, General Terms and Conditions of Purchase DOE-879 and Modification to DOE-879 dated 1/84 is hereby further modified as follows:

A. With respect to the "Changes" Article, only the individuals identified below are authorized to issue and sign change orders and amendments for General Electric. You will be notified in writing by the Manager, Purchasing Operation of any changes of named individuals:

POSITION	NAME
Manager, Purchasing Operation	J. P. O'Donnell
Manager, Component & Equipment Purchasing	R. J. Panico
Lead Contract Administrator	A. R. Fairbanks
Contract Administrator	P. M.Begbie

B. Delete Article 42 "Fraud or Falsification".

V. Availability

In consideration of this purchase order Seller shall make available to General Electric/KAPL the modified marine biological sampling devices for use during the 1986 oceanographic monitoring expedition tentatively scheduled for the third or fourth quarter 1986.

Seller agrees that the scope of work required is understood by the Seller; that there are no informal commitments between the Seller and General Electric or between the Seller and the Government that in any way affect the work under this Order; that there are no open or unresolved issues related to this Order except as explicitly stated herein; and that Seller therefore understands and agrees that this Purchase Order states the complete agreement of the parties.

TECHNICAL SPECIFICATION - MR3016.2A
August 3, 1984

Objective

The purpose of this work is to modify and test biological sampling devices for use by submersibles or remotely operated vehicles (ROVs) in the deep ocean.

Work To Be Performed

1. Seller shall modify his multiple bin biological sampling system to reduce total weight and overall dimensions by approximately 50% thus facilitating use of the sampler in conjunction with other submersible or ROV operations during the same dive.

2. Seller shall upgrade the current hydraulic gear motors to positive displacement hydraulic motors on both the multiple bin sampler and the brush collector.

3. Seller shall modify the pump impeller design on the single and multiple bin samplers to increase suction by at least 25%.

4. Seller shall modify the brush collector to improve collection efficiency by a minimum of 25%.

5. All of the above modifications to the seller's marine biological sampling devices shall be accomplished in such a manner that the samplers will be compatible for operation using the Deep Submergence Research Vehicle ALVIN operated by Woods Hole Oceanographic Institution, the Johnson-Sea-Link, and an ROV.

6. Tests of the equipment shall be conducted at the seller's laboratory by operation of the samplers in a test tank and on an ROV in the laboratory. A formal report documenting the above modifications and testing results shall be submitted to General Electric - KAPL within one month of completion of all work.