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DRYDOCK EXTENSION

A 1980 Underwater Technology Survey for Extension of Time Between Drydockings

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16. Abstract

The results are presented of a feasibility study to extend the time between drydocking of commercial vessels under U.S. Coast Guard jurisdiction. The existing drydock inspection requirements are documented and then compared to underwater technology. It is demonstrated that with trained divers, underwater closed circuit television, and color photography, the Coast Guard inspector can be provided with the visual information be needs. Problems with water turbidity can be alleviated by careful selection of the sea port and matching the camera and light sources. Use of blanking flanges and listing and tipping of a vessel allow for a complete inspection. Underwater preservation, maintenance, and repair are all possible with existing underwater technology.

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PREFACE

This report was prepared by Engineering Systems Company, Damascus, Md., under U.S. Coast Guard contract DTCG23-80-C-20009. It was administered under the technical direction of the United States Coast Guard, Office of Research and Development (G-DMT-1/TP54), with LT Mark Noll acting as Technical Project Officer and Mr. Donald Poczik representing the Contracting Officer. This final report documents work performed during the period April to December 1980.

ACKNOWLEDGEMENTS

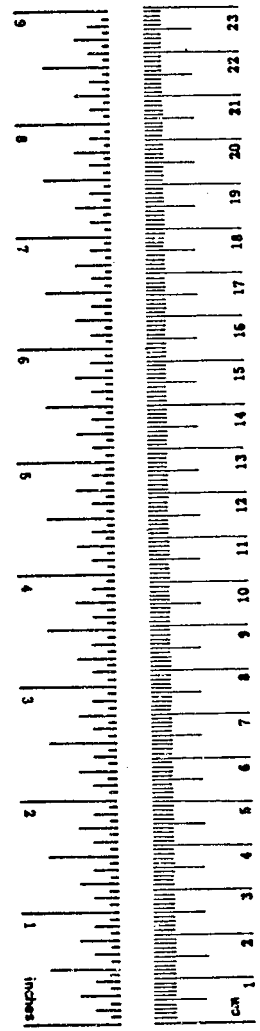
The assistance and cooperation of the Marine Inspection Office and the Reserve Training Center is acknowledged with gratitude. Contributions by the American Bureau of Shipping were greatly appreciated. The hospitality of commercial firms and U.S. Navy facilities visited is also acknowledged.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

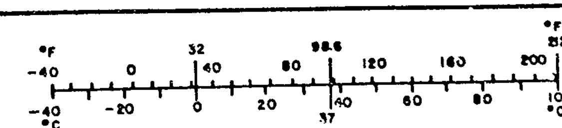
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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SECTION 1 - INTRODUCTION

Objectives

The objective of this study was to determine the feasibility of extending the two-year interval of vessel drydocking for the U.S. Coast Guard inspection. The increasing costs associated with drydocking commercial vessels and the difficulty of drydocking ultra-large crude oil carriers and offshore oil rigs has prompted a review of the need for a biannual drydocking. To allow such a policy review, information was needed on the existing inspection requirements and procedures, and a comparison of the requirements with available underwater inspection techniques and equipment. This comparison was to indicate how well the existing requirements could be satisfied should the inspection take place while the vessel remained afloat. Furthermore, it was necessary to determine the status of underwater preservation, maintenance, and repair techniques. For if inspection should disclose some deficiency that could not be repaired without drydocking, then the benefit of the underwater inspection would be lost.

Since the greatest amount of tonnage under U.S. Coast Guard jurisdiction is found in freighters and tankers plying ocean routes, the study was directed at this part of the shipping population. The benefits of an extended drydocking interval would have the greatest impact on these ships but such ships would also represent the most difficult case of satisfying the inspection requirements

Background

The U.S. Coast Guard Certificate of Inspection can presently be reissued only after a vessel has undergone a thorough inspection for Certification. Among other items, this requires that a vessel be drydocked, hull cleaned, and that sea grates and other enclosures be removed or opened to permit the inspector to examine all surfaces normally submerged. The inspector then visually examines the hull, propeller, rudder, sea chests, sea valves, and other hull appurtenances. He measures wear, clearances, alignment, and reviews the results of nondestructive testing of plate corrosion and cracks, and weld erosion and defects. He then applies pass/notify/fail criteria based on published regulations and his own marine engineering judgement to determine the seriousness of any deficiencies. When the necessary repairs have passed inspection, the Officer in Charge of Marine Inspection (OCMI) then issues the Certificate of Inspection.

The present inspection policy has evolved over many years and the resulting inspection requirements are accepted by classification societies, insurance companies, and the federal government as sound evidence for the issuance of the Certificate of Inspection. Before a new policy can be adopted, it must be demonstrated that underwater inspection techniques will satisfy all requirements to a degree that will engender the same confidence in the Certificate of Inspection. For the last few years many commercial vessels not under Coast Guard jurisdiction have been relying on underwater inspection, preservation, maintenance, and repairs to allow them to reduce operating costs and yet remain seaworthy. Classification societies have issued guidelines for underwater inspections (in-water surveys), which if followed are an acceptable alternative to a drydock inspection. The positive experience of these underwater practices made it reasonable for the U.S. Coast Guard to consider changing its policy.

Methodology

To attain the objective of this project it was necessary that information be gathered on the drydock inspection requirements and on applicable underwater technology. Information on the inspection requirements was obtained from U. S. Coast Guard offices while federal laboratories and commercial firms yielded information on underwater technology. The Basic Information Documents (BIDs) took the form of questionnaires, government publications, trip reports, articles in professional and trade journals, commercial publications, and advertising. The information was identified and gathered by telephone conversations, correspondence, computer data bank searches, interview visits, and site trips. All BIDs were initially screened using a form which extracted information important to the project and permitted an evaluation of the BID. If the BID was accepted, the evaluation form was assigned a coded number which identified the inspection requirements and/or underwater technology addressed by that particular BID.

During the initial part of the project the emphasis was on acquiring a complete understanding of the drydock inspection requirements. Since these requirements will have to be satisfied by any underwater inspection policy, it was important that the inspection information or data be identified as well as the pass/notify/fail criteria. The method of acquiring information on the inspection requirements and the resulting narrative descriptions is presented in Section 2. An analysis of these narratives identified the type of underwater technology necessary for satisfying the inspection requirements.

The major effort of the project was to identify state-of-the-art underwater technology applicable to the underwater inspection. An effort was also made to identify ongoing research which would soon yield improvements and/or additions to underwater technology. The underwater technology information was organized into categories that pertained to the inspection itself, and into categories that pertained to the preservation, maintenance, and repair of a vessel. The inspection requirements were compared to the underwater technology and this material is presented in Section 3. The underwater technology was also compared to the preservation, maintenance, and repair tasks, and this material is presented in Section 4. On the basis of these two comparisons, it was then possible to arrive at some conclusions and recommendations pertinent to the objective of this project.

Summary

Present drydock inspection requirements can be met with underwater inspection procedures. Furthermore, satisfactory preservation, maintenance, and repair work can also be completed while the vessel remains afloat. The inspection requirements do require a certain degree of quantitative measured data, but rely primarily on the visual examination of an experienced inspector. By careful selection of underwater inspection equipment and specific training of divers and inspectors, it should be possible to present the inspector with sufficient information on which he can pass judgement. Should the underwater inspection identify serious deficiencies which must be corrected, existing underwater technology can be relied upon to make permanent type repairs. The availability of underwater methods of preserving and maintaining a ship will result in less deterioration of a ship's underwater body. The underwater inspection policy should be adopted on a trial basis and allowed on carefully selected ships so that information and experience can be obtained without endangering any vessels or crewmen. At the end of the trial period the policy should be reviewed and if justified, adopted with specific guidelines for inspectors, diving contractors, and ship owners/operators.

SECTION 2 - INSPECTION REQUIREMENT NARRATIVES

The drydock inspection requirements were first identified through a questionnaire submitted to U.S. Coast Guard marine inspection offices. The questionnaire information was verified and expanded through visits and interviews to several Marine Inspection Offices (MIO) /Marine Safety Offices (MSO) and to the U.S. Coast Guard Reserve Training Center. Four trips were also taken to accompany the inspector during a typical drydock inspection for credit. Photographic illustrations from one of these drydock inspections are shown in the figures included at the end of this section.

The personnel at each MIO/MSO and the Reserve Training Center were asked to identify publications containing information on the inspection requirements. Such documents and the completed questionnaires and interview notes became the basis for organizing the inspection requirements and developing the descriptive narratives. Table 2-1 lists the seven inspection areas, their assigned code number and those BIDs which pertained to each area.

The inspection requirements for each of these areas of drydock inspection are described in the following narratives. An inspection manual type format is used to present this information. These narratives were completed during Task 1 of the project and have since been revised to reflect review comments from experienced U.S. Coast Guard inspectors. Each narrative identifies the inspection requirement, describes the surface to be inspected and the method of inspection, provides a time estimate and describes the procedure at the drydock. The Pass/Notify/Fail criteria is then specified and finally, preliminary considerations for an underwater inspection are discussed. As these narratives will disclose, much of the drydock inspection is simply a visual one, relying on the experienced judgement of the inspector to recognize serious deficiencies as well as acceptable wear and tear.

TABLE 2-1. TABULATION OF INSPECTION REQUIREMENTS BID NOs

INSPECTION REQUIREMENTS Code No./Description		BID Nos. (APPENDIX B)	Pg.#
01	Hull Plating	1, 37, 66, 72, 76, 233	6
02	Welds & Rivets	1, 66	7
03	Sea Chests & Overboard Discharge Pipes	37, 84	8
04	Spcol Pieces & Sea Valves	84	8
05	Rudder Assembly	61	9
06	Propeller	171	10
07	Tailshaft	61, 67, 106, 171, 188	11
99	Includes All Codes	6, 91, 92, 93, 94, 95, 96, 121, 129, 140	

INSPECTION REQUIREMENT NARRATIVES

CAUTIONS AND WARNINGS: The inspector should wear a hard hat, safety glasses and safety shoes. When walking on the drydock floor he should be aware of any overhead work and when climbing up to scaffolding he should first check that platforms are stable. The inspector shou'd be familiar with manufacturers safety recommendations while observing or checking any NDT work.

1. **Code No./Descriptor:** 01/Hull Plating

2. **Area or surface preparation:** The entire hull surface below the water line is to be cleaned of any fouling. Abrasive blasting is required if paint touch up or renewal is planned.

3. **Tools/Instruments:** Visual examination is aided by a metal hammer and scraper. Ultrasonic and radiographic devices and hole drills are used to measure plate thickness.

4. **Estimated Time:** 3/4 hr for initial haul out, 3/4 hr for walk around, and 3/4 hr for bottom survey.

5. **Procedure at Drydock:**

   a. During initial haul out inspector moves about ship hull, examining bottom and sides to identify dents, depressions, gouges or tears, and leaks from rivets or seams.

   b. During the walk around, the inspector moves about ship hull discussing required work with representatives of owner/operator, shipyard, and ABS. He identifies serious problems requiring thickness measurements, crack detection, welding and replacement. The locations of such items are marked on the hull and recorded in the Drydock Inspection Book.

   c. During the bottom survey, the inspector carefully examines any damaged areas, previous repairs of the hull, areas of general surface corrosion and pitting corrosion, corroded and or eroded weld seams, corroded or loose rivets, sacrificial zinc anodes or impressed current anodes, and the areas on the keel covered by keel blocks at the previous drydocking. At the inspector's discretion he may also observe the measurement of hull plate thickness and request repeat or additional measurements.

6. **Pass/Notify/Fail Criteria:** The allowable reduction in hull plate thickness is 25% of the original new construction thickness except that in the midships half length only a 20% reduction is allowable. Both of these values are the average for the area inspected. This criteria applies to general surface corrosion and pitting corrosion. However, repairs may be requested

of pitting corrosion within the 25% thickness criteria if in the inspector's judgement the rate of corrosion would exceed this criteria before the next drydocking. The watertight integrity of the hull must be restored by repair of leaks or cracks which might result in a leak. Weld seams whose bead is below the plate surface must be repaired. Hull plate damage which may affect or has affected primary structural members such as the flat keel, web frames, or bulkheads must be repaired. The inspector relies on his experience and training in naval architecture and marine engineering to formulate his decision on such damage areas.

7. **Considerations for Underwater Inspection**: Water turbidity and lighting conditions may reduce visibility of hull surface even after the hull has been cleaned of fouling. Hull leaks cannot be detected in the usual manner unless air pressure can be raised inside the hull. The inspector will observe the hull on a Closed Circuit Television (CCTV) monitor while a diver or submersible vehicle operates an underwater camera. In water repairs that require cutting or welding will necessitate special procedures to make areas inside hull safe for "hot work".

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1. **Code No./Descriptor**: 02/Welds and Rivets

2. **Area or surface preparation**: Rivetted crack arrest plates and weld seams must be cleaned of fouling and any corrosion deposits.

3. **Tools/Instruments**: Visual examination is aided by a metal hammer and scraper. NDT techniques are employed when cracks are suspected or need measuring.

4. **Estimated Time**: 1/2 hour

5. **Procedure at Drydock**:

a. The inspector examines weld seams and removes any corrosion deposits with his hammer or scraper. He then determines the relative distance from the adjoining hull plate to the top of the weld bead.

b. The inspector taps rivets which show signs of leaking or appear to be deeply corroded or loose.

c. Any welds or rivets which need repair are marked on the hull and recorded in the Drydock Inspection Book. When the inspector suspects or observes cracks he may request eddy current, dye penetrant, or magnetic particle inspection to define the crack and locate the tip.

6. **Pass/Notify/Fail Criteria**: Weld seams with beads below the plate surface require repair while loose, weeping or corroded rivets require replacement.

7. **Considerations for Underwater Inspection**: Water turbidity and lighting conditions may reduce visibility of weld seams and rivets. Leaking or loose

rivets will be difficult to detect and the mapping of any cracks will require divers with special training in the use of underwater magnetic particle inspection techniques. In water repairs that require cutting or welding will necessitate special procedures to make areas inside hull safe for "hot work".

1. **Code No./Descriptor:** 03/Sea Chests and Overboard Discharge Pipes

2. **Area or surface preparation:** Remove the strainers after exterior fouling is cleaned off. Clean out the interior of the sea chests and discharge pipes.

3. **Tools/Instruments:** Visual examination is aided by NDT techniques when welds are suspected of having cracks.

4. **Estimated Time:** 3/4 hour

5. **Procedure at Drydock:**

   a. The inspector examines the strainers and their fastening hardware after they are abrasive blasted clean.

   b. The inspector enters the sea chest or examines it closely for signs of corrosion, defective welds, or fractures in all connections of the chest to sea valve mounting nozzles and to the shell of the ship.

   c. The inspector examines the overboard discharge pipes for signs of corrosion, defective welds, or fractures in all connections to the shell of the ship. He does the same for any shell reinforcing doublers or collars.

6. **Pass/Notify/Fail Criteria:** Damaged or corroded strainers and fasteners must be repaired or replaced. Weld seam beads must be even with adjacent plates. The 25% corrosion allowance is observed and all visible cracks are repaired.

7. **Considerations for Underwater Inspection:** Fasteners for strainers may require use of underwater ratchets or cutting torches. Tether lines or floatation devices may be needed when removing strainer. Interior of sea chest and strainer will require cleaning with high pressure water jets or cavitating nozzles.

1. **Code No./Descriptor:** 04/Spool Pieces and Sea Valves

2. **Area or surface preparation:** Clean off any fouling or corrosion deposits on spool piece and disassemble sea valve.

3. **Tools/Instruments:** Visual examination is aided by NDT techniques if weld seams or valve components are suspected of containing cracks.

4. **Estimated Time:** 1/4 hour for each pair of spool piece and valve.

5. **Procedure at Drydock:**

   a. Inspector examines the spool piece and parts of sea valve visible from sea chest opening.

   b. Inspector examines the spool piece and disassembled sea valve components, looking for signs of corrosion, erosion and wear.

6. **Pass/Notify/Fail Criteria:** Any cracks or leaks in the spool piece or reinforcing collar must be repaired. The 25% corrosion allowance applies to these components. The sea valves must be made tight and excessive wastage or damage of valve disc, seat or internals will require that repairs be made. The waster sleeve, if fitted, is routinely replaced.

7. **Considerations for Underwater Inspection:** From the sea chest side only the spool piece will be available for inspection by divers. If necessary clear water can be pumped into sea chest to displace turbid water. The sea chest or spool piece must be blanked off before the sea valve can be disassembled for inspection.

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1. **Code No./Descriptor:** 05/Rudder Assembly

2. **Area or surface preparation:** Clean off any fouling or corrosion deposits on rudder skeg, rudder post or horn, and the rudder palm and palm nut. If necessary remove inspection plates to permit access to pintles.

3. **Tools/Instruments:** Visual examination is aided by feeler gages and if required NDT techniques.

4. **Estimated Time:** 1/2 hour

5. **Procedure at Drydock:**

   a. Inspector examines the rudder for damage, cracks, corrosion, erosion, and leaks.

   b. Inspector examines the rudder post, or horn, skeg and the rudder palm and palm nut for evidence of damage, corrosion, erosion or cracks.

   c. Inspector checks the pintle clearances and gudgeon bushing.

   d. Inspector examines the condition of passive sacrificial anodes or impressed current anodes.

6. **Pass/Notify/Fail Criteria:** The watertight integrity of double walled rudders is required by ABS. Minor dents or pitting is acceptable, but cracks or severe corrosion or erosion must be repaired. Damage or

corrosion of pintles or gudgeon bushings also must be repaired. The wall thickness of the gudgeons is to be no less than 50% of the diameter of the pintles for new construction and is the guideline for inspection.

7. **Considerations for Underwater Inspection**: The same underwater considerations discussed for Hull Plating apply to the rudder assembly. However, with certain vessels it is possible to list the hull forward to bring the rudder out of the water. This would facilitate any repair work required.

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1. **Code No./Descriptor**: 06/Propeller

2. **Area or surface preparation**: Clean off any fouling or debris, remove the rope guard, and if necessary, the propeller fairwater.

3. **Tools/Instruments**: Visual examination is aided by NDT crack inspection techniques.

4. **Estimated Time**: 1/4 hour

5. **Procedure at Drydock**:

   a. During the initial haul out, the inspector verifies any suspected damage to the propeller reported by the operator. He also notes the condition of the rope guards and observes whether or not the fairwater shows signs of leaking.

   b. When scaffolding or a portable platform are available, the inspector closely examines the propeller hub seal ring and stern tube bushing retainer. If the fairwater leaks it is removed and the end of the shaft and propeller nut are checked for corrosion.

   c. The inspector evaluates the extent of any propeller damage, erosion and checks for the presence of cracks. He may request a dye penetrant or eddy current examination of cracks.

6. **Pass/Notify/Fail Criteria**: A severely damaged propeller may require replacement, otherwise repairs are required of tears, cracks and bends. Rope guards must be repaired or replaced. Damaged or leaking hub and fairwater seals are replaced.

7. **Considerations for Underwater Inspection**: Turbid water will reduce the visibility of hub seal and fine cracks in propeller. As for the rudder, some vessels may be able to list forward enough to bring the propeller out of the water. This would permit removal of the fairwater, seal replacement, and refilling with propeller compound.

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1. **Code No./Descriptor:** 07/Tailshaft

2. **Area or surface preparation:** Clean fouling and debris from stern tube and rope guards. If bearing clearance is to be checked with feeler gages or wedges the rope guards must be removed. Propeller will be pulled back to expose tailshaft taper.

3. **Tools/Instruments:** Visual examination, wooden wedges or feeler gages, and permanently installed micrometers. Crack detection on shaft keyway and taper may require use of dye penetrant or eddy current NDT device.

4. **Estimated Time:** 1/2 hour

5. **Procedure at Drydock:**

   a. The inspector examines the exposed part of the tailshaft and then checks the bearing clearance using installed micrometer on oil sealed bearings. For wood or rubber bearings he inserts a wedge or feeler gage and notes the clearance so determined.

   b. The tailshaft keyway and taper are examined closely for signs of cracks. The inspector may request dye penetrant or eddy current NDT examination of these areas.

   c. The inspector examines the sterntube, bearing surface, including grooves in rubber bearing, and the liner surface. The groove depth is measured and NDT inspection of the bearing surface may be requested.

6. **Pass/Notify/Fail Criteria:** Any cracks in the tailshaft body, taper, or keyway must be repaired. If the grooves between the staves of wood, micarta, or rubber (cutlass) bearings have worn below 50% of original depth the bearings must be renewed. Oil sealed bearings with a clearance in excess of manuracturer's recommendations will require rebuilding of the tailshaft and/or repair of the bearing. Any extensive corrosion or other damage in the taper, keyway or bearing journal must be repaired. A loose bearing liner or leaking seals must also be repaired.

7. **Considerations for Underwater Inspection:** Underwater inspection of a tailshaft will pose problems of accessability. To examine the taper the propeller will have to be pulled back and supported. To expose the bearing surface the propeller will have to be removed and supported, the tailshaft decoupled and pulled into the shaft alleyway, using a blanking flange to seal off the stern tube opening.

Figure 2-1   Sea Chest Strainers in place, before cleaning

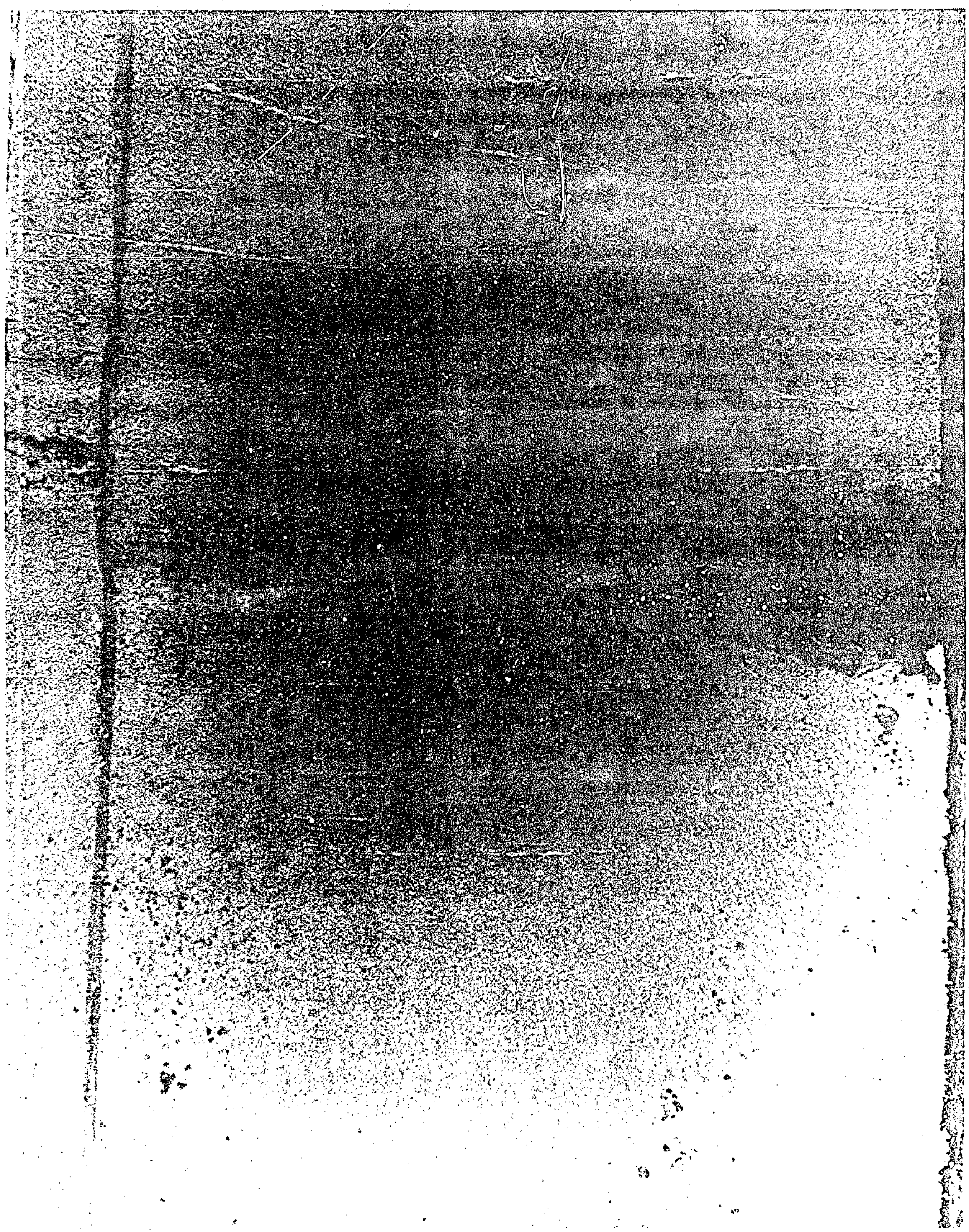


Figure 2-2 Starboard bilge keel amidships, cracked full width, repair required

Figure 2-3 Inspection of main condenser scoop injection

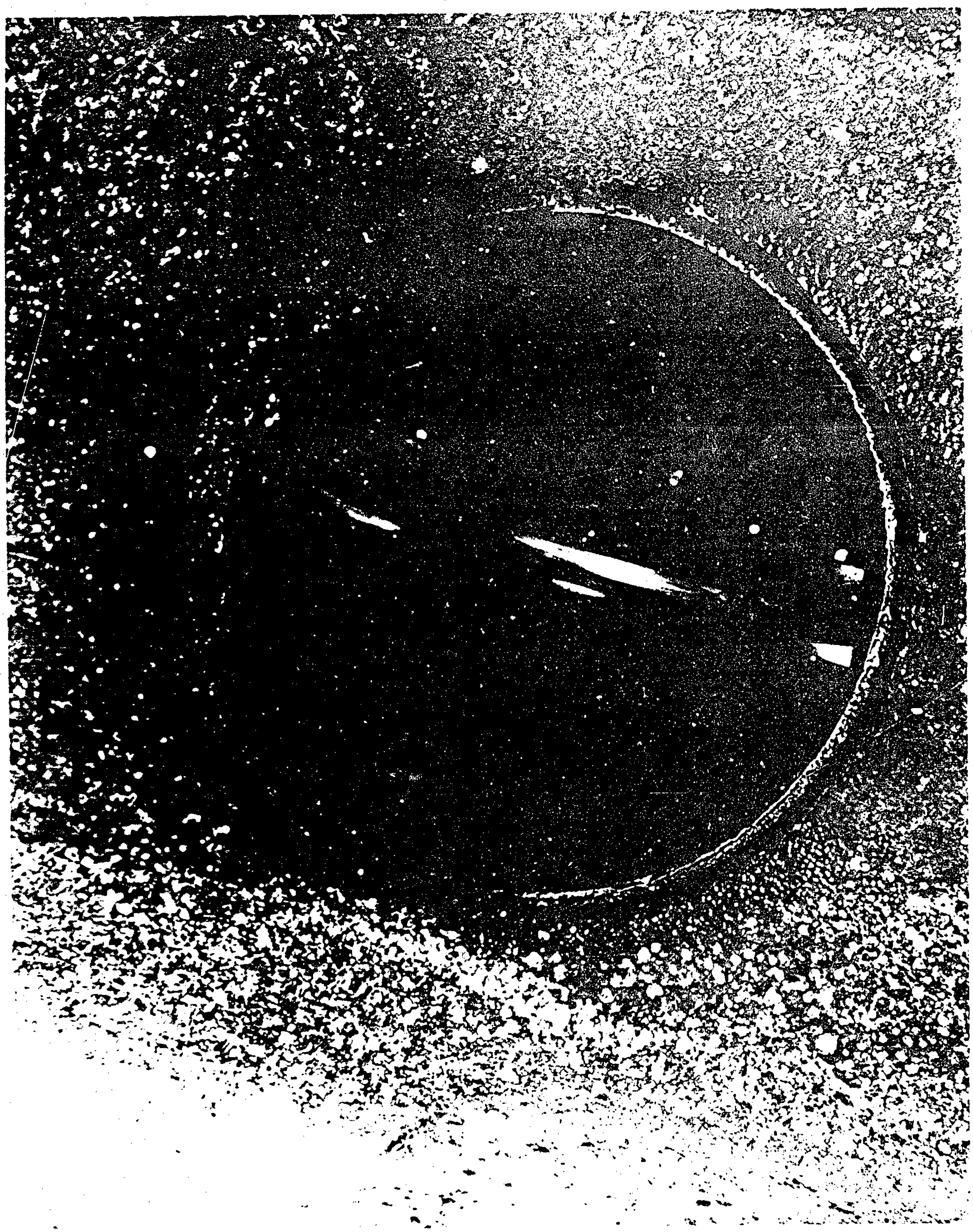


Figure 2-4   Sea Chest pump suction

Figure 2-5 Propeller after cleaning. No repairs.

SECTION 3 - COMPARISON OF UNDERWATER TECHNOLOGY WITH INSPECTION REQUIREMENTS

The inspection requirements described in the previous section must be satisfied by any procedures adopted for the underwater inspection (in-water survey). Underwater technology now available or very near commercial development was examined to determine its applicability to the vessel inspection. The information was gathered and organized into categories which were expanded, changed or eliminated as the evaluation proceeded. The final sixteen groups, or underwater technology codes, are shown in Table 3-1, along with a descriptor and the numbers of BIDs discussing the technology. The first eight underwater technology areas listed are directly applicable to the vessel inspection. The remaining eight areas are concerned with the preservation, maintenance and repair of a vessel, an important consideration for ship owners who would elect to have an underwater inspection in lieu of a drydock inspection.

Using a standard and easily followed format, the first eight underwater technology areas are compared to the inspection requirements. The status of each technology is discussed and related to the inspection requirements. The advantages, disadvantages, problems, and remedies of each technology are described, followed by an opinion on if and how the pass/notify/fail criteria may be affected. Some thoughts on additional training required by inspectors and divers are presented as well as cost estimates associated with the particular technology. Finally, recommendations are made for adopting the technology for underwater vessel inspection.

This comparison of underwater technology and inspection requirements demonstrates that the drydock extension concept is feasible. Actual demonstration of the underwater inspection techniques will be necessary and the training curriculum of U.S.C.G. inspectors will have to be augmented to include those training requirements identified here. Still to be established is the accuracy and reliability of tools used to make inspection measurements or equipment used to improve the conditions under which the inspector monitors and observes the underwater activity of the diver. Underwater inspections of ships, barges and offshore platforms are currently being conducted both in the United States and overseas. Although the procedures and techniques are not exactly what would be required for U.S.C.G. certification, they do support the contention that underwater inspections are indeed feasible.

TABLE 3-1. TABULATION OF UNDERWATER TECHNOLOGY BID NOs.

Page No.	Code No.	Descriptor	BID Nos. (APPENDIX C)
19	01	Diver	8, 18, 60, 77, 87, 91, 110, 111, 115, 119, 126, 156, 172, 175, 176
21	02	Television, Movie & Photography	12, 16, 19, 22, 36, 39, 41, 45, 48, 49, 57, 58, 88, 91, 110, 111, 115, 125, 126, 127, 131, 134, 138, 157, 158, 162, 163, 168, 174, 175, 176, 194, 213, 227, 229
33	03	Light Sources	16, 36, 39, 41, 48, 49, 138, 157, 175, 176, 228, 230
37	04	Communications	18, 36, 58, 66, 88, 91, 138, 157, 176, 208
39	05	Submersibles, Manned & Remote Controlled	10, 39, 41, 42d, 48, 58, 59, 60, 110, 118, 125, 131, 134, 156, 157, 158, 172, 173, 175, 178, 179, 192, 213, 227, 229, 231
42	06	Ultrasonic Gaging	17, 22, 27, 36, 55, 57, 58, 60, 66, 115, 118, 126, 127, 136, 148, 156, 175
46	07	Magnetic Particle Inspection	27, 60, 115, 118, 126, 127, 148, 149, 156, 174, 191
49	08	Radiographic Inspection	27, 55, 60, 66, 148, 156
54	09	Brush Scrubbing	13, 14, 23, 25, 26, 31b, 56, 58, 66, 86, 111, 116, 117, 131, 154, 173, 195, 201
60	10	Hydroblasting	21, 40, 43c, 59, 111, 116, 118, 131, 134, 152, 160, 172, 175, 178, 179
63	11	Cathodic Protection	31, 80, 114, 177, 189, 205
65	12	Marine Coatings	15, 24, 29, 31, 31c, 32, 35, 38, 46, 47, 58, 59, 62, 82, 86, 107, 111, 131, 133, 134, 146, 150, 151, 155, 161, 165, 166, 167, 178, 183, 184, 187, 190, 193, 199
68	13	Tailshaft Maintenance	59, 67, 87, 90, 132, 139, 153, 172, 192, 223
70	14	Work Tools	26, 62, 80, 162, 176, 236
73	15	Welding	55, 58, 62, 63, 64, 66, 114, 143, 147, 164, 175, 186, 192, 233
76	16	Marine Engineering	57, 58, 112, 117, 141, 232

General Technology: Diver Code: 01

Specific Description: Divers equipped with umbilicals for air and hard wire communication gather data needed by the USCG inspector for passing judgement on the seaworthiness of a ship or offshore structure.

Applied to Inspection Requirement(s): All

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: The extensive use of divers by the offshore oil industry in all phases of its work: exploration, construction, and operation, has resulted in a rapid development of this underwater technology. Although SCUBA diving allows greater mobility and ease of operation it is not commonly used commercially because of the limited air supply, inability to communicate, and the risk of having a diver become lost (BID 8). Surface supplied diving is more common, providing a secure tether for the diver, good communication, and electric power for inspection gear such as an ultrasonic transducer or television camera (BID 77). Because of the previous lack of good audio and visual communications links between the diver and the topside supervisor/inspector, the diver was trained to perform underwater work as well as make decisions. Commercial diving firms use divers who are certified welders and who often are certified NDT technicians (BID 175). For ship inspection divers will be expected to prepare surfaces and move inspection equipment to desired locations, but decision making will be left to the USCG inspector.

C. Research Underway for Advancing Technology: Research to improve a diver's abilities underwater is now concentrated in deep, saturation diving settings with extremely cold water. At the shallow depths of interest in this study the research is directed at simplifying the duties of the diver (BID 127).

D. Application to Inspection Requirements: The diver's role in satisfying the inspection requirements is to collect data for the inspector by taking measurements and photographing surfaces of interest. He also provides a detailed description of what he is observing and answers questions for the inspector. The diver does not interpret the data or make judgements about the data unless he happens to also be certified in that aspect of the inspection. The thoroughness and pace of the inspection is controlled by the diving supervisor in conjunction with requests from the USCG inspector (BID 60). To permit inboard inspection of sea valves, the diver will install blanking flanges on sea chests and other through hull fittings.

E. Advantages of Technology: The use of trained divers in performing underwater ship inspection is the method most akin to having the USCG inspector becoming a diver. An experienced diver is not easily intimidated by his work environment and can focus his attention on collecting data. This allows the inspector to remain safely topside to evaluate the data.

Disadvantages: Since the inspector has been accustomed to obtain visual data directly, there will be required some adjustment in the inspector's method of analyzing the data. A further disadvantage is the response time between the inspector's desire to know something and the diver's reaction to the request.

F. Problem Areas & Anticipated Difficulties: The diver will have to contend with poor visibility, strong currents, cold water, and equipment limitations. The diver's ability to locate himself and stay oriented is also an anticipated difficulty. Since the experience and training of divers is diverse, there will be difficulty in obtaining consistent and reliable performance from the diving community. To ensure the diver's safety, special precautions will have to be taken by the ship's crew and diver support personnel.

G. Proposed Remedies: Underwater ship inspections should be conducted in sheltered ports that provide good visibility, and with the best available equipment. Before the diver enters the water he should be briefed by the diving supervisor and USCG inspector. The ship's plans and color photographs should be studied by these personnel as they discuss the sequence of activities planned for the inspection (BID 87). Good, two-way, hard wire communications should be checked before and immediately upon the diver entering the water. If the ship does not have a grid painted on the hull, then acoustic beacons should be used to maintain the actual location of the diver. Only qualified divers should be used, and whenever possible the same team of diver, diving supervisor, and USCG inspector ought to be used. The ship's crew will have to be alerted that a diver is in the water and that the following restrictions are to be strictly observed: no overboard discharges, no opening of suction inlets, no movement of the rudder or propeller, and no fishing (BID 111).

H. Impact on Pass/Notify/Fail Criteria: The impact of the diver on the application of the inspection criteria should be minimal. By using good communications, color closed circuit television (CCTV), and still photography, the confidence in and reliability of the data gathered by the diver ought to increase. The USCG inspector's confidence in the data he receives will obviously bias his application of the inspection criteria.

I. Additional Training:

USCG Inspector: The inspector must learn to coordinate his requests through the diving supervisor and understand the diver's audio transmissions. He must learn what he can ask a diver to do and be able to pace his requests so as not to cause the diver confusion. The inspector will have to learn how to view a CCTV monitor so that he remains oriented and also recognizes details and color.

Operator/Diver: The entire diving team composed of the divers, diving supervisor, and diver support personnel will need to train together and learn the usual expectations of the USCG inspector. Only experienced and qualified divers should be used so that they can concentrate on learning how to use inspection tools such as ultrasonic transducers, CCTV cameras, still photography cameras, and underwater lights.

J. Estimated Cost: Commercial divers performing underwater hull cleaning and inspection earn $25/hr. A diving supervisor can expect to earn $40/hr. while diver support personnel earn $10/hr.

K. Recommendations: The use of divers in underwater inspection of ships is recommended. The commercial experience has been positive and the degree of development of this technology is more than adequate for an inspection. Although the diver will primarily collect the data, he can be called upon for an opinion if he also happens to be a certified welder or NDT technician. Careful planning of the inspection by the USCG inspector, diving supervisor, and divers will avoid delays, lost data, and accidents. Internal guidance for minimum standards should be established for the competency of the diving team, and for the inspection equipment to be used. Above all, the inspection site proposed must be carefully considered.

General Technology: Television, Movie & Photography **Code: 02**

Specific Description: Closed Circuit Television (CCTV), movie film and still photography are useful in monitoring an underwater inspection and making a permanent record of visual information. Typical CCTV and photography systems are shown in Figures 3-1, 3-2, 3-3, and 3-4.

Applied to Inspection Requirements: All

A. Status: X **Operational (see par. B)** X **Under Development (see par. C)**

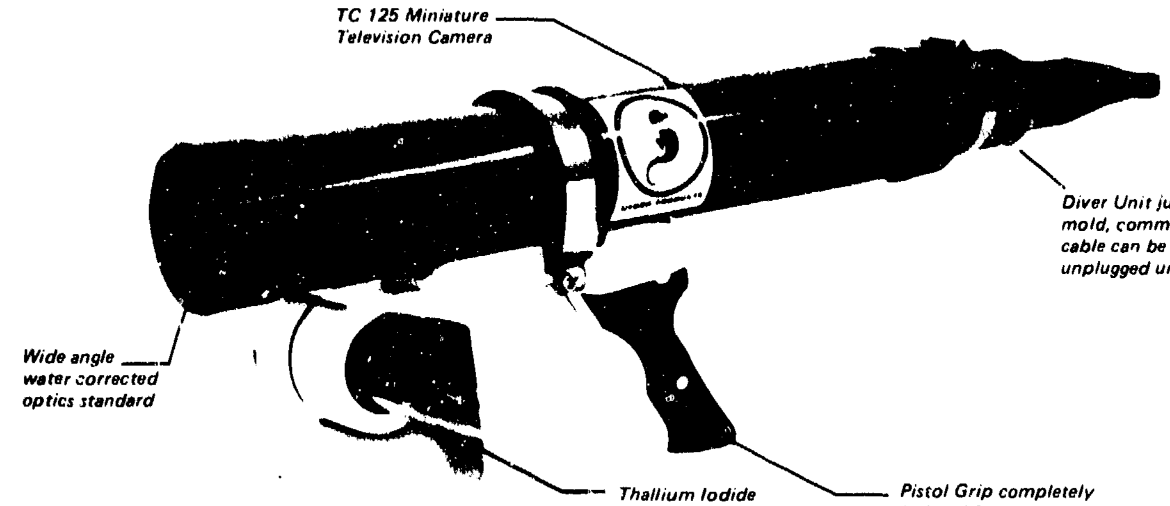
B. Present 1980 State-of-the-Art: Generally, the state-of-the-art performance is good. Second generation underwater CCTV units are definite improvements over earlier models. Closed Circuit Television (CCTV) is available in both black and white (B&W) and color. Three camera sensor types are most commonly available (BID 157):

1. The vidicon is the most common and all-purpose sensor.

2. The silicon intensified target (SIT) sensor is 2000 times more sensitive than the vidicon and is used under low-light conditions. The SIT can essentially double the viewing distance; however, the quality of the picture is not as sharp as from a vidicon. The SIT is mounted in the cameras on Hydro Product's remote controlled vehicles used for inspection in turbid waters (BID 229).

3. The silicon diode array (SDA) is similar to the vidicon except that the light sensing surface is an array of silicon diodes which are relatively immune to burns from bright light. These sensors are mounted on cameras which are used for photographing welding or other bright-light work. The salient features of several underwater CCTV systems on the market are compared in Tables 3-2 and 3-3.

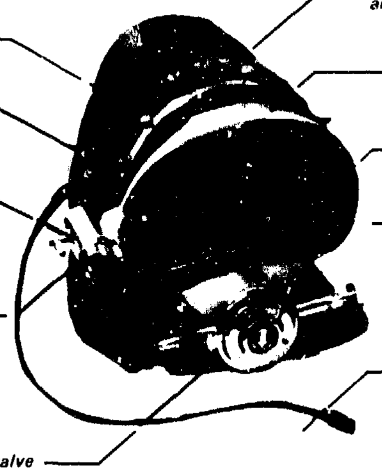
DIVER UNIT



The diver unit consists of Hydro Products' Model TC-125 Miniature Television Camera and LT-8 Diver Light shown above. The camera is completely self-contained, less than three inches in diameter and 18 inches long. It can be remotely focused from three inches to infinity by the operator at the surface control unit. The thallium iodide lamp and camera are mounted on a pistol grip handle and can be carried in one hand. Weight of the complete diver unit underwater is less than 5 lbs.

One of the most unique aspects of the system is the ability to produce good video pictures in low light level environments and dirty water. This visibility is due to the use of a thallium iodide gas discharge light source. The 250-watt lamp emits its light energy in the region of maximum transmission in water, and which also falls within the maximum response region of the television camera's vidicon. The result is underwater viewing greater than that of a diver under identical conditions.

COMMUNICATIONS MASK



The Kirby Morgan Model KMB-10 Band Mask was designed for use by a diver receiving air or mixed gas supply through a hose from the surface, or a scuba tank. It is an extremely comfortable mask allowing long duration dives. Included in this unit are components for full two-way communications to the surface through the system cable.

The main body of the mask is fabricated of fiberglass which is non-corrosive, durable, and non-conductive. There are two breathing systems – demand and steady flow. The demand system is adjustable over a range from 40 to 200 psi over depth pressure. All metal components are brass or stainless steel.

Figure 3-1 Low light level underwater closed circuit television

SURVEYOR

DUAL PURPOSE WORK TV SYSTEM

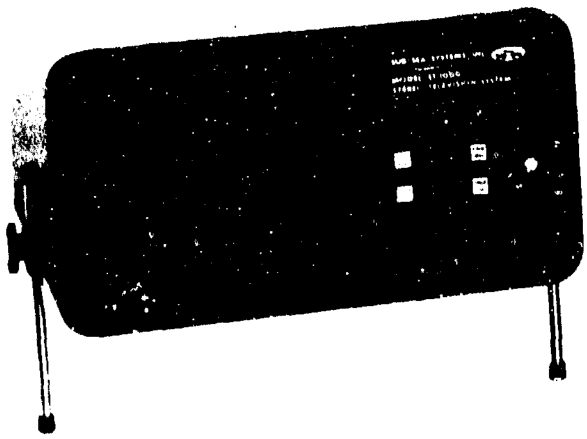
Hydro Products

A TETRA TECH COMPANY

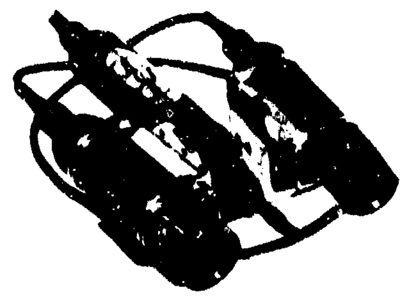
Figure 3-2 Closed circuit underwater television

STEREOSCOPE TELEVISION SYSTEM

MODEL ST—1000



MODEL ST-1000
CONTROL MODULE



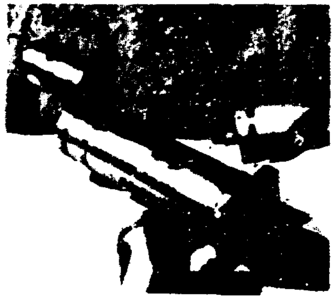
STEREO CAMERA ASSEMBLY
FOR SINGLE COAX OPERATION

STEREO CAMERA ASSEMBLY
FOR DUAL COAX OPERATION

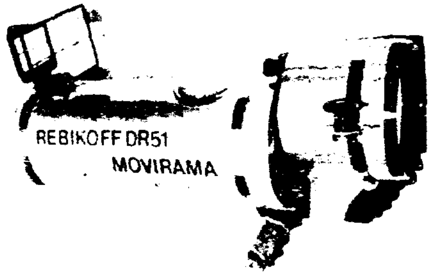
APPLICATIONS

- Stereoscopic television systems for three-dimensional viewing are now available for offshore applications
- Positioning tasks using manipulators or other work systems
- Precise control of remotely manned vehicles
- Inspection and video tape documentation (diver or vehicle)
- Enhanced optical search and detection
- Real time and recorded stereoscopic bottom mapping and site surveys
- Subsea equipment positioning in drilling and production operations
- Mating of structures in offshore construction

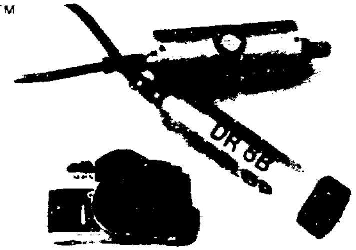
Figure 3-3 Stereo closed cirucit underwater television



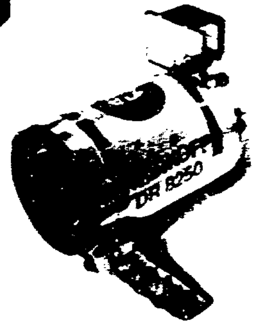
REBIKOFF DR 631 COLOR TV ™
Camera With 105° Angle and
Fully Corrective Lens.



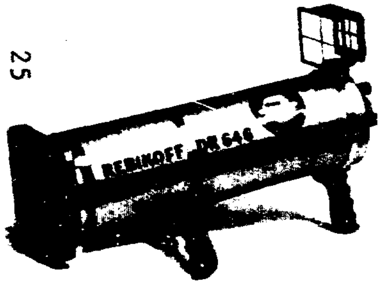
REBIKOFF DR 5 51 16mm
MOVIRAMA ™ With 70° 102°
Angle Corrective Lenses



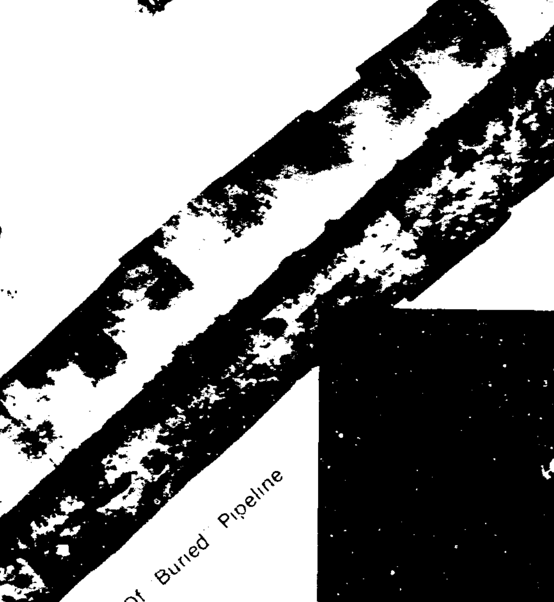
REBIKOFF DR 6B CYCLOP ™
Miniature B W Television
Camera With 72° Angle
Corrective Lens (Helmet
And Other Use)



REBIKOFF DR 8250 PROMARINE ™
35mm Motor Camera. 250 Exposures.
105° Corrective Lens



REBIKOFF DR 646 VIDEONITE ™
Low Light Level Television
Camera With Corrective Lens.
105° Angle



Mosaic Picture Of Buried Pipeline

REBIKOFF DR 330 SEA INSPECTOR ™
Unmanned Vehicle

Mosaic Picture Of Oil Tower Structure
Note The Active Electrodes

Figure 3-4 Underwater Photography

TABLE 3-2. UNDERWATER TELEVISION SYSTEMS

NOMENCLATURE	MODEL	MANUFACTURER	ADDRESS	CAMERA TYPE	SENSITIVITY	LENS	DEPTH LIMIT	CABLE	REQ. POWER	DIVER COMMUNICATION	BID
Rebikoff Mini CCTV	DR 6	Rebikoff Institute of Marine Technology	3060 S.W. 4th Ave., Ft. Lauderdale, FL 33315	Vidicon	400	68° 9.5 mm F 2.2	300m/ 1000'		120 VAC 50/60 cycle	None	48
Rebikoff Videonette	DR 646	"	"	Low light level	600	105° wide angle 6.5 mm F 1.4	200m/		115 VAC 60 Hz or 24 VAC	None	48
Rebikoff Full Color	DR 631	"	"	Stabil-ized low light level ruggedized	270	100° 7.5 mm F 1.5	200-2000m		12 VDC	None	48
Surveyor	TC camera miniature	Hydro Products	P.O. Box 2528, San Diego, CA 92112		525	63° 6.5 mm F 1.2	300m/ 1000'	100m/ 330'	Camera 15 VDC light-28 VDC 115 VAC 60 Hz to control unit	Diver Surface	114
UDATS (Underwater Damage Assessment TV System)	TC125 Camera	"	"	Vidicon	525 lines or 625 lines (optional)	64° 12.5 mm F 1.4	300'		12 VDC at camera 115 VAC 60 Hz to light and control unit	Diver Surface	157
Low Light Level TV Camera	TC-125-SIT	Hydro Products	P.O. Box 2528, San Diego, CA 92112	Low light level	High level resolution at 0.0005 foot candles and 400 lines	39° 12.5 mm F 1.4	2000'		12 VDC		114
TV Camera	CM-40	Sub-sea Systems Inc.	753 Washing-ton Ave., Escondido, CA 92025	Hybrid Vidicon	290 lines	65° 12.5 mm F 1.5	1000'	1500'	12 VDC	Optional	49
Color Observer I		Kinergetics Inc.	6029 Reseda Blvd. Tarzana, CA 91356	Vidicon	300 lines	12.5 mm F 1.5	450 m		12 VDC or 110-220 VAC	Diver Surface	
B & W Observer V		"	"	Vidicon	500 lines	8.5 mm F 1.5	900 m		12 VDC or 110-220 VAC	Diver Surface	

TABLE 3-2. UNDERWATER TELEVISION SYSTEMS (Continued)

NOMENCLATURE	MODEL	MANUFACTURER	ADDRESS	CAMERA TYPE	SENSITIVITY	LENS	DEPTH LIMIT	CABLE	REQ. POWER	DIVER COMMUNICATION	BID
TV System	See Bee I	Sub-Sea Systems, Inc.	753 Washington Ave., Escondido, CA 92045	Vidicon (Newvicon or SIT Optional)	600 lines	8 mm F 1.7	2500'	300'	13.5 VDC	Two-way Diver Surface (Optional)	49
TV Camera	104	Bush Oceanographic Equip. Co.	214 S. Hamilton St., Saginaw, MI 48602	Vidicon or low light level	500 lines at one foot candle 0.0005 for low light level	58° hor. 8.5 mm F 1.9	3000'	300'	120 VAC 60 Hz (36 VDC available)		114
TV Camera	1641	Edo Western Corp.	2645 South 300 West Salt Lake City, Utah 84115	Vidicon	Face plate illumination 0.05 foot candles 800 line resolution	63° 12.5 mm F 1.4	5000'	2000'	13 VDC	None	
Low Light TV Camera	1643	Edo Western Corp.	"	SIT	650 lines	63° 12.5 mm F 1.4	5000'		13 VDC	None	
Observer II Television System	II	Aquadyne	333 E. Haley St., Santa Barbara, CA 93101	Vidicon low light level	525 lines	8.5 mm F 1.5	400'	2000' max	Self contained battery or 12 VDC or 115 VAC	Two-way Diver Surface	114
Sea Snoop		Seacor, Inc.	P.O. Box 22126 San Diego, CA 92122		300 lines		600'		Self contained or 117 VAC 60 Hz		114
Explorer II		Video Sciences Inc.	21113 Superior St. Chatsworth, CA 91311	Vidicon (Newvicon or Silicon diode tube Optional)	550 lines	63° 8.5 mm F 1.5 (Optional) 110° 4.8 mm F 1.8)	600'	2000'	105-265 VAC or 12, 24, or 48 VDC	Two-way Diver Surface	138
Fathom	36 inch	Fathom 36	P.O. Box 12825 Salem, OR 97309	Vidicon (Optional Saticon)	280 lines	12.5 mm F 1.4 (Optional 25 mm F 1.4, or 6.5 mm F 1.8)	450 m		12 VDC		

TABLE 3-3. UNDERWATER TELEVISION SYSTEMS (ADDITIONAL DATA)

NOMENCLATURE	MODEL	TYPE FOCUS	B&W OR COLOR	LIGHT	LIGHT CONTROL	MONITOR SIZE	SYSTEM COMPONENTS	CAMERA SIZE	CAMERA WEIGHT	COST	BID
Rebikoff Mini CCTV	DR 6	Lens contact-infinity	B&W			9"	TV, monitor cable & helmet mount	2" dia x 9"	2 lbs		48
Rebikoff Videonette	DR 646	Lens contact-infinity	B&W			9"	TV, monitor	6" dia x 23"	28 1/2 lbs		48
Rebikoff Full Color	DR 631	Fully automatic	"				TV, monitor lights	6" dia x 25"	30 lbs		48
Surveyor		Remote 3" infinity	B&W	75W tungsten halogen	Automatic		TV, monitor 330' cable light video recorder case, control unit cases	9" LX 5" WX 2 1/8" T	less than 1 lb in water		114
UDATS		Automatic 3"-infinity	B&W	240 W, Thallium Iodide			TC-125 camera, light, mask, control unit (contains monitor & speaker), Video Recorder, Frequency Stabilizer shipping cases, test cable	3" dia x 21"	7 lbs 3.5 lbs in water	20,600	157
Low light level TV camera	TC-125-SIT	10" infinity motor controlled	B&W				TV camera only	4" dia x 20"	26.3 lbs 17.1 lbs in water	16,990 ($1977)	114
TV System	Sub-sea		Color	Quartz Iodide		8"	CM-40 camera, lights cable, lamp power supply, monitor	6" dia x 14"	11 lbs 2 lbs in water	8500	49
Color Observer I		4" (min)	Color	Optional		8"	Camera, surface console, power, communcation, V14S Recorder		18 lbs 0.7 lbs in water	12,900	
B & W Observer V		4" (min)	B&W	Optional		9"	Camera, surface console, power, communcation, V14S Recorder and helmet mount		6.2 lbs 1.8 lbs in water		

TABLE 3-3. UNDERWATER TELEVISION SYSTEMS (ADDITIONAL DATA) (Continued)

NOMENCLATURE	MODEL	TYPE FOCUS	B&W OR COLOR	LIGHT	LIGHT CONTROL	MONITOR SIZE	SYSTEM COMPONENTS	CAMERA SIZE	CAMERA WEIGHT	COST	BID
TV Camera	See Bee I	Fixed 2"-infinity	B&W	Tungsten Halogen		9"	CM-8 camera, lamps, cable, surface control	2.8" dia x 9.7"	3.6 lbs 1.1 lbs in water	$8400	49
TV System	Busch	Fixed 4"-20'					104 camera, 104C control console and power supply for lights (includes 10" monitor), 104L5 light 104 VTR tape recorder			7,340 or 9,137 for low light level	114
TV Camera	1641	Camera face to infinity	B&W	Thallium Iodide			camera, lights, surface console, VTR recorder	2.88 dia x 17.75	7 lbs 2.5 lbs in water	(1973$)	
Low light TV camera	1643	camera face to infinity	B&W	Thallium Iodide			camera, lights, surface console, VTR recorder	2.88 dia x 21"	8 lbs 3.0 lbs in water		
Observer II TV System	II	Fixed 3" to infinity	B&W	28 V bulb		8"	8929 camera and type 965 lamp mounted on helmet model DM-5, video monitor tape recorder, voice communications, batteries			17,000	
Sea Snoop		6" to infinity	B&W				Self contained camera system with instant diver replay			15,000 (1977$)	114
Explorer II		Fixed 4"-infinity	B&W (May be converted to color in future)			9"	camera with built in lights, power supply, surface console, VTR recorder	12" x 18" x 24"	39 lbs with 250' umbilical		135
Fathom	36 in	Minimum 8"	Color	Optional			camera and surface console, recorder and lights optional		16 lbs dry 2.8 lbs in water		

Camera systems are offered as diver hand-held, helmet mounted, and remote control vehicle mounted. Helmet mounted systems offer freedom of movement for the diver. Three helmet mounted systems were compared by the Naval Coastal Systems Center (BID 12), and a summary of the test results is provided in Table 3-4.

When it comes to viewing large areas, e.g., the flat bottom of a tanker, divers cannot cover the area in a reasonable time or with any degree of accuracy, because of fatigue, life support limits, and navigation problems. Remote controlled vehicles such as Scan, manufactured by Harwell Research, are superior for this purpose (BID 131). Scan has three cameras; two CCTV cameras, one for wide area viewing, the other for close-up viewing, and one 35 mm camera for detailed close-up color pictures. The cameras are mounted along with viewing lights on a self-propelled frame.

Where greater detail of image is needed of certain areas, film photography, either 35 mm still or movies, is superior. A variety of diver held systems are available, some with 400 ASA film capability for very low light conditions. Stereo photography can be used for accurate three dimensional pictures of corrosion pits, gouges, and dents.

C. Research Underway for Advancing Technology: Manufacturers would not identify specific R&D being pursued to advance this technology in order to maintain their competitive edge. In general one can expect more compact equipment since the electronics are built up with the ever shrinking solid state chips. Improvements in lenses and camera resolution can also be expected.

D. Application to Inspection Requirements: Divers visual inspection of ships are adequate for only small localized areas. However, when it comes to inspecting a large hull, a diver is limited by the following: (BID 110)

1. Length of time he can spend in water at a given depth.

2. Fatigue, experience, technical knowledge, memory, and the ability to interpret and describe what he sees underwater.

3. Problems with orientation.

CCTV has made several advances over recent years, especially in color systems. CCTV improves upon the diver limitations by: (BID 110)

1. Allowing simultaneous remote surveying by an expert inspector either concurrent with the diver survey or later with video tapes.

2. Compensating for human optical limitations and actually improving images.

3. Reducing diver time and expense.

4. Providing communications with the topside inspector to assist in orientation.

TABLE 3-4. COMPARISON OF PERFORMANCES OF HELMET MOUNTED (B & W) VIDEO SYSTEMS

	Hydro Products Surveyor	Sub Sea Systems Sea Bee I	Video Sciences Model 400350
I. Daylight, Clear Water			
Resolution	Sat.	Sat. (Best)	Unsat. (a)
Corrosion Detect.	Sat.	Sat. (Best)	Sat.
Crack Detect.	Sat. (Best)	Sat.	Sat.
Marine Growth	Sat.	Sat.	Sat.
Contrast Between Shades of Gray	Sat.	Sat. (Best)	Sat.

(a) No focus control available.

	Hydro Products Surveyor	Sub Sea Systems Sea Bee I	Video Sciences Model 400350
II. Nighttime, Clear Water			
Resolution	Unsat.	Sat.	Unsat.
Corrosion Detect.	Unsat.	Sat.	Unsat.
Crack Detect.	Unsat	Sat.	Unsat.
Marine Growth	Unsat.	Sat.	Unsat.
Contrast	Unsat.	Sat.	Unsat.
III. Daytime, Turbid Water			
Resolution	Sat.	Sat.	Sat. (Poorest)
Corrosion Detect.	Sat. (Poorest)	Sat.	Sat.
Crack Detect.	Sat. (Best)	Sat. (Poorest)	Sat.
Marine Growth	Sat.	Sat.	Sat. (Poorest)
Contrast	Sat. (< 5 ft.)	Sat. (< 5 ft.)	Sat. (< 5 ft.)
IV. Daytime, Very Turbid Water			
Overall	Sat.	(b)	Sat.

(b) Unsat. if transmission only 1% -- Sat. 8 - 10% transmission.

E. Advantages of Technology: Hand-held units have an advantage over helmet mounted units in viewing confined areas. However, helmet-mounted units allow for more diver freedom of movement when inspecting large areas. Units are available which can easily be attached and removed from a diver's helmet and should be preferred (BID 114).

For general overall inspections, the CCTV is the most often used because it can be operated without film limitations, and be simultaneously viewed by an inspector (who generally will not be a diver) topside via a CCTV monitor. Where closer detail is desired of specific areas, particularly in murky, turbid waters, photograph inspections can be conducted with 35 mm still, or 8 or 16 mm movie cameras (BID 39). Dealers claim that with the proper combination of camera and lights, better pictures can be produced than what is viewed directly with the diver's eyes (BID 157). Good pictures have been claimed of ship's hull damage taken in water with only one foot visibility (BID 157). Using stereo photography, a good assessment of corrosion, pitting, cracks, blisters and thickness of marine growth to an accuracy of 1/64 inch can be expected (BIDS 163 and 165).

Color CCTV or photography offers many advantages over B&W (BID 39). With color photographs one can identify the onset of corrosion and marine fouling with much greater accuracy, in particular if the area of inspection is painted in a contrasting color. Color pictures can be used to detect fatigue or crystalline failure cracks since cracks reflect a whole prismatic range of brilliant diamond-like color flashes.

Disadvantages: Color CCTV images are generally less sharp than B&W CCTV because the sensor is generally less sensitive and has fewer lines of resolution. Film movie photography is very limited in capacity (with only a few minutes of film available per cartridge) and also requires processing for results; thus, it is not suitable for general overall hull inspections.

F. Problem Areas & Anticipated Difficulties: Many problems have been identified during the development of underwater CCTV. Visibility in poor water conditions will limit inspection sites. Limited field of view requires careful diver use to ensure the entire hull is inspected. Clarity of remote viewing is limited by the camera, recorder, and monitor. Optical abberations, such as refraction, distortion, loss of sharpness, depth of field of images, and varying light conditions can affect the quality of the picture. And finally, the video tape reviewer may have problems with orienting himself and have difficulty distinguishing between looking straight up at a horizontal surface vs. looking forward at a vertical surface (BID 213). It is also anticipated that stereo photography of hull surfaces in turbid waters will be difficult.

G. Proposed Remedies: Many of the anticipated problems can be overcome by using a system designed for the conditions, with matched camera sensitivities (sensor type), light source, power availability, etc. Even in clear water conditions, the blue-green color of sea water filters out reds. Therefore, a camera should have maximum sensitivity in the blue-green spectrum (BID 157). A good underwater hull inspection cannot be conducted in very turbid waters (BID 12) with even the best equipment. Therefore, selection of the inspection port is equally important.

The field of view as well as improvement of color pictures is enhanced by using wide-angle (WA) lens. Using a WA lens allows closer focusing, thus less color absorption in the blue-green water (BID 39). Clarity of remote CCTV is improved with larger (19") viewing screens when the camera and recorder are also designed to provide better resolution. Optical abberations can be compensated for by using self-correcting lenses (BIDS 48, 110). Ensure that the cameras dynamic range for adjusting to light changes is high, on the order of 10,000:1, or greater, will improve picture quality in light changing situations. Displaying on the video tape the vehicle depth and pitch angle assists in viewer orientation.

The stereo photography camera should be placed inside a clear water box which in turn is placed against the surface to be photographed. Pictures are easily taken since camera aperture, shutter speed, and focus settings are fixed.

H. Impact on Pass/Notify/Fail Criteria: Critical decisions should not be based on underwater CCTV alone. The inspector should insist on still color photographs when there is any doubt.

I. Additional Training:

USCG Inspector: The USCG inspector must learn how to interpret CCTV pictures on a small screen and learn to understand the diver's remarks under less than optimum communication conditions. Twin screen monitors are available which allow simultaneous viewing of two films taken of the same area at two different periods to easily show the deterioration over time.

Operator/Diver: Extensive training of divers television picture taking techniques will be required if the video tapes records are to be of any consequence.

J. Estimated Cost: Cost figures for different systems are included in Tables 3-2 and 3-3.

K. Recommendations: Underwater CCTV provides the USCG inspector with a view of the surfaces being inspected and as such is invaluable. Because of distortions or lack of resolution the CCTV should be augmented with color movie or still photography.

General Technology: Light Sources **Code: 03**

Specific Description: Light sources are used with underwater closed circuit television systems, photography, and general area visual inspection.

Applied to Inspection Requirements: All

A. Status: X **Operational (see par. B)** X **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: Several kinds of lights are available. To recreate the full color spectrum with all reds included, the subject must be illuminated with a full range white light, best from a full range quartz iodine or xenon arc lamp for television or xenon strobe arc for still photography (BID 39). Monochromatic gas discharge lights cannot be used for color photography since reds would appear gray or black. Some companies, including Hydro-Products, Inc. (BID 157) offer hand-held lights with interchangeable bulbs for different applications.

C. Research Underway for Advancing Technology: The U.S. Navy is conducting tests in Panama City, Florida to determine how to overcome backscatter effects on CCTV pictures. Byrnes Oceanographics continues to be a commercial leader in underwater lighting and is conducting in-house research on improved reflectors.

D. Application to Inspection Requirements: Light sources provide for diver visual inspection, and illumination for underwater television and photography. Several types are available; large lights that can be mounted on Remote Controlled Vehicles (RCVs); hand-held lights that can be used for underwater television or visual inspection; small lights which may be mounted on diver's helmets for small area inspections; and, strobe lights for underwater photography.

E. Advantages of Technology: The four commonly available light sources with their individual advantages and disadvantages are listed below.

1. Tungsten Quartz Iodide (Halogen or Xenon Incandescent Lights)(BIDS 39, 157, 228, 230).

Advantages:

a. Best for color photograph; good to about 10 - 15 feet.

b. Simplest power requirements - AC or DC.

c. Instant turn-on; no warm up time required.

d. Low initial cost; however, lower life than gas discharge lamps.

Disadvantages:

a. Low efficiency of light transmission compared to gas discharge lamps.

b. Spectral output very sensitive to varying line voltage.

2. Mercury Vapor Gas Discharge Lights (BIDS 49, 157).

Advantages:

a. High efficiency of light transmission; better than triple that of incandescent lamps.

b. Bulbs have very long life; approximately 5 - 10 times that of incandescent lights.

c. Much better illumination for B&W photography than incandescent lamps.

Disadvantages:

a. Good for black & white photography only.

b. Expensive; requires electric ballast unit.

c. Requires 7 - 25 minute warm up time, depending on bulb size.

3. Sodium or Thallium Iodide Gas Discharge Lights (BIDS 39, 159).

Advantages:

a. Best of all types for B&W photography.

b. Maximum efficiency of light transmission; 4 - 6 times that of incandescent lamps.

Disadvantages:

a. Not suited for color photography.

b. Bulbs have shorter life; only about 10% of the life of mercury vapor lights of the same size.

c. Expensive; requires electric ballast unit.

d. Warm up time necessary; similar to mercury lamp.

4. Ballastless Gas Discharge Lamps.

Advantages:

a. No bulky and expensive external electrical ballast needed.

b. Partial instant light source (from incandescent element).

c. AC or DC operation.

d. Variable intensity capability.

e. Efficiency equivalent to mercury gas discharge lamp.

f. Lower initial cost than gas discharge light.

Disadvantages:

a. Cannot be used for color photography.

b. Warm up period required similar to gas discharge lamps for full illumination capability.

F. Problem Areas & Anticipated Difficulties: Backscatter and glare may hinder diver and/or result in poor CCTV pictures. Lighting system and CCTV system must be matched for optimum performance and adequate light/frame overlay (BID 174). Regardless of light type or intensity, due to the quick absorption characteristics of long-wave red light in water, the only way to recreate a full spectrum for color photograph is to get closer to the object with wide-angle reflectors and optics (BID 48). Even with 1,000 watt quartz-iodide lights, one can only get balanced color to approximately 2 meters. In cases where the subject is very large and must be viewed from a distance, the natural blue of the water must be accepted.

G. Proposed Remedies: Since the amount of backscatter will vary with turbidity, the lights should be equipped with portable auxiliary reflectors designed to scatter light in the near field so that the CCTV camera can be set up for optimal performance in either turbid or clear water conditions (BID 213). To ensure that lighting and CCTV equipment are properly matched, buy package systems which match light types and intensities with camera capabilities for different applications (BIDS 48, 49, 138, 157, 176). To avoid hot spots, choose equipment with reflectors which spread light out evenly (BIDS 48, 230). Flash strobes which are used with still photographic cameras provide best capability to penetrate extreme turbid waters (BID 16). Where motion pictures are necessary, choose inspection sites whose water conditions are compatible with equipment limitations.

H. Impact on Pass/Notify/Fail Criteria: Insufficient or improper lighting may not permit inspector to discern size and depth of damage or result in poor photographic results.

I. Additional Training:

USCG Inspector: USCG inspector needs to discern details through backscatter.

Operator/Diver: Divers will need to learn how to pan and regulate output. They must be trained to distinguish colors underwater, in particular when viewing large objects, e.g., ship's hulls.

J. Estimated Cost: Estimated costs of currently available equipment are as follows:

Strobes for still photography (BID 16) $260 - 800 (1975$).

Gas Discharge Hand Held Lights (BID 157, 174, 176) $560 - 1,000 (1980$)

a.	Spare bulbs	
	Thallium Iodide	$25 - 300
	Mercury Vapor	$25 - 490

Helmet mounted (BIDS 174, 176)		$275 (1980$)
a.	Spare bulbs	$15
b.	Battery Pack	$300 - 375
c.	Battery Charger	$95 - 125

K. Recommendations: The USCG should remain abreast of the latest underwater developments.

General Technology: Communications **Code: 04**

Specific Description: Communications are used between the diver and topside inspector for coordinating hull inspections, and for locating a diver underwater.

A. Status: X **Operational (see par. B)** X **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: The best communications systems available are those which are integrated with the diver's mask and are part of a closed circuit television system since the voice signal is transmitted over cable (BID 49, 88, 138, 157).

C. Research Underway for Advancing Technology: To assist diver orientation underwater, two underwater communications systems are under developmental testing and are available for evaluation. One system utilizes simple, lightweight beacons attached to the diver. The signal is received at two or three stations topside and the location of the diver can be determined by trigonometric methods. The Naval Coastal Systems Laboratory (NCSL) is in the process of developing a diver's navigation system. Using two acoustic transmitters attached to the hull of ship, the swimmer is located on an X - Y plotter via a LED readout on the diver mounted receiver unit. Accuracy with two transmitters is ± 2 feet. Accuracy could be improved with a third transmitter (BID 114).

D. Application to Inspection Requirements: Clear and direct communication between the USCG inspector on deck and the diver below is essential since diver receives instructions and gives a running account of what he sees and feels with his fingers and palm.

E. Advantages of Technology: Two way underwater communications using the hard wire connection through the umbilical provides clear voice transmissions that allow the diver to describe his findings immediately. The inspector is able to maintain instant and continuous control of the inspection. Acoustic beacons allow the inspector to monitor the divers location and helps him direct the diver to different points of interest.
Disadvantages: The diver is restricted in his movements by the umbilical containing the communication cable. Since the microphone is near the divers mouth, the diver's breathing sounds are a background noise to the transmission.

F. Problem Areas & Anticipated Difficulties: Misunderstanding and delays in the inspection can be expected until the inspector/diver teams learn to communicate. Use of helium in the air supply scrambles the diver's voice making communications difficult. Since divers move around into different environments, the audio levels vary considerably.

G. Proposed Remedies: To avoid communication misunderstandings between the diver and inspector, use the best available equipment and attempt to use the same pair of persons whenever possible. If helium is used, ensure communications system has a helium speech unscrambler (BID 157). Ensure communications system is equipped with Automatic Gain Control (AGC) amplifiers to level out audio response (BID 138).

H. Impact on Pass/Notify/Fail Criteria: Distorted communications or misunderstood questions and answers could contribute to a wrong decision on the part of the inspector. Photographic or measured data should be used in conjunction with any audio information in arriving at a decision on the criteria under consideration.

I. Additional Training:

USCG Inspector: Inspectors should acquire correct vocabulary and use it consistently to minimize communication mishaps. Also, the inspector should learn what conditions may distort the diver's transmission. In addition, the inspector must learn to understand the visual display of the diver location sound system so he can direct the diver's movements.

Operator/Diver: The diver should acquire correct vocabulary and use it consistently and learn to speak in a manner that results in a clear transmission. The diver must be familiar with terminology and understand how the audio signal can be distorted.

J. Estimated Cost: Sub Sea Unit $980.00 (BID 49). Underwater Wireless Communication System $800 (1970) (BID 18).

K. Recommendations: There now exist communications systems that provide clear transmission that will provide adequate communications between the diver and the USCG inspector.

General Technology: Submersibles, Manned and Remote Controlled **Code: 05**

Specific Description: Submersibles can be used to reduce the diver's time in the water during an inspection since they can cover a larger area in less time. Remote Controlled Vehicles (RCV) are more applicable to ship work since depths are usually less than 100 ft. Manned submersibles would be useful if it became necessary to inspect or repair an offshore oil platform at greater depths or in very cold waters. The cost of such vehicles and the required support system usually eliminates them from general consideration. An RCV system is shown in Figure 3-5.

A. Status: X **Operational (see par. B)** X **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: The basic tethered, self-propelled remote controlled vehicle (RCV) has been operational since the early 1970s and consists of a vehicle, umbilical cable, and shipboard control/display panel. In some cases, an underwater clump or launcher is included for the purposes of isolating the vehicle from the main cable dynamics resulting from surface vessel motion, and to minimize the effects of cable drag and chances of entanglement (BID 157). These vehicles carry one or two cameras to provide real-time CCTV information. In addition, some systems are equipped with still cameras, stereo cameras, and search devices. Their most useful function currently is in underwater hull inspection. The flat bottom hull of a 380,000 DWT vessel can be inspected in approximately 2-1/2 hours (BID 59). The most effective RCVs are designed with several viewing ports for maximum visibility (BID 172). Most vehicles lack the ability to hover in mid-water (BID 156) unless attached to the hull. Some submersibles are equipped with manipulators and work tools, e.g., drills, wrenches, grinders, brushes, for limited underwater maintenance capabilities. Mission endurance and effectiveness of a manned submersible are limited by the power supply, life support system, safety features, and size limiting access to confined areas.

C. Research Underway for Advancing Technology: Another type of RCV applicable for underwater hull inspections is the untethered, free-swimming RCV which is still in the research and development stage. These vehicles will be designed for preprogrammed courses using microprocessors (BID 42d). Work is still needed to increase mission duration, incorporate a real-time command control link, and extend overall system flexibility and task capabilities (BID 172). Future plans are to fit RCVs with the capability to perform hull and paint gaging (BID 156) and NDT inspections (BID 231).

D. Application to Inspection Requirements: Remote Controlled Vehicles (RCVs) and Manned Submersibles are needed for inspection when divers cannot be used economically for extended operations due to poor weather, cold water temperatures, night-time operations, depths exceeding 130 feet, or areas too large to cover (BID 48). RCVs equipped with CCTV systems may be used to reduce diver saturation by presurveying the site to ensure that proper inspection tools are present (BID 231). RCVs can also be equipped to provide light while a diver is inspecting the ship's hull.

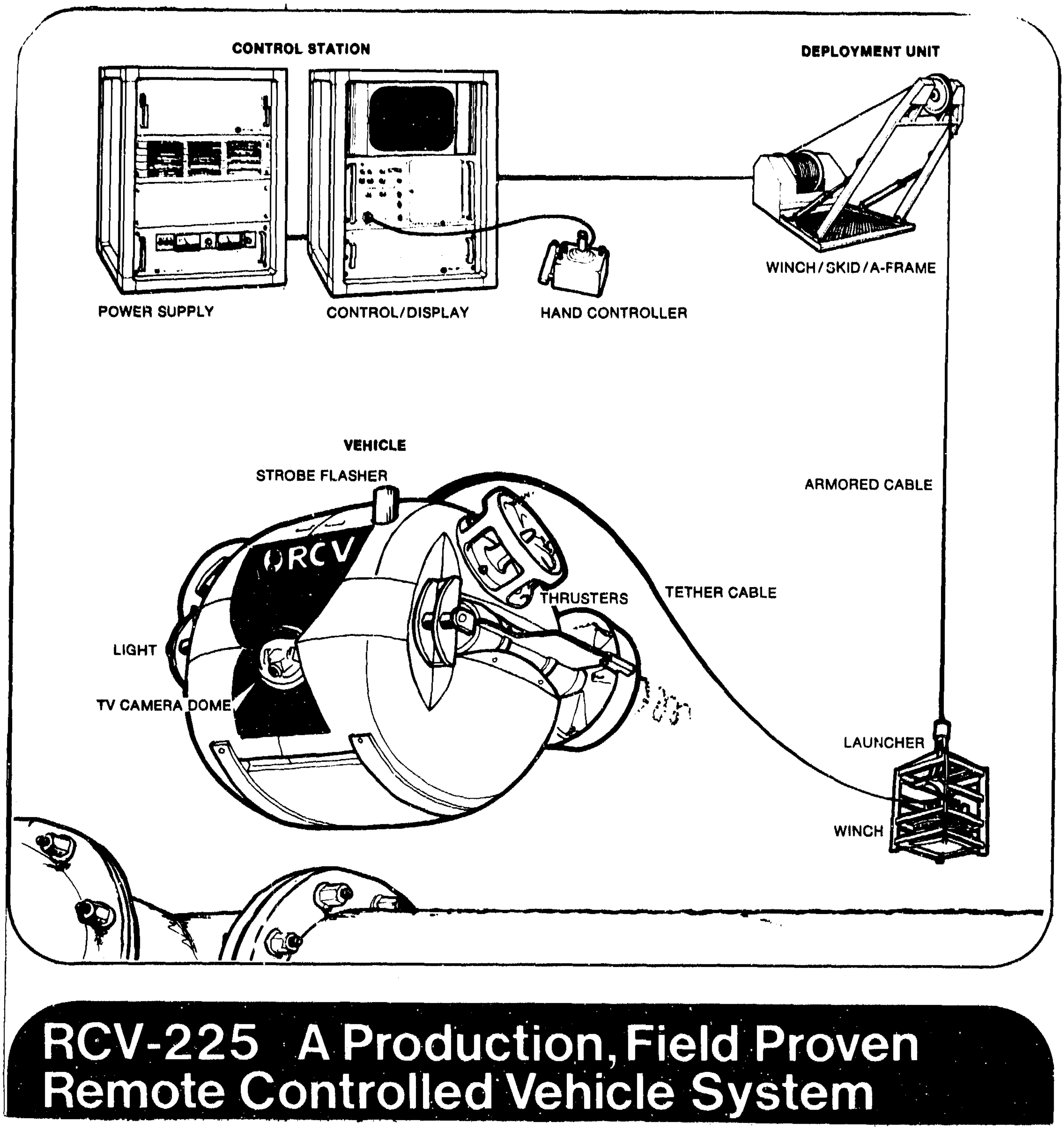


Figure 3-5 Remote controlled vehicle

E. Advantages of Technology: The primary advantage of manned submersibles is the ability to deliver a human to the underwater inspection site and support him in a comfortable, one-atmosphere environment. Untethered RCVs have the advantage of not having an umbilical to become fouled or breaking.
Disadvantages: The primary disadvantage of an untethered RCV is the lack of a high-resolution real-time video link. Current untethered systems under-development are further limited by insufficient real-time control functions, as well as relatively short mission capabilities. The developments costs are high so their eventual price will be high.

F. Problem Areas & Anticipated Difficulties: Manned submersibles cannot be used in confined areas or shallow water, cannot hover in midwater, and are expensive. Tethered RCVs suffer from fouling and severing of the umbilical cable, difficulty to control in rough waters, loss of control during power losses, and difficulty in locating the position of the vehicle.

G. Proposed Remedies: Use of manned submersibles should be limited to large flat areas such as hull bottoms and to supplement diver surveillance in restricted areas. RCVs should be equipped with improved acoustic positioning systems. Martech International, working on the problem, reports that recent tests of an inertial navigation system indicate that positioning accuracies of ± 15 cm may be attainable (BID 156). Currently, the most reliable means of keeping track of the position is by monitoring the depth and heading readouts from the RCV as it moves along its route (BID 60). Some ships paint a stripped grid system on the flat hull which can be used like a road map. These grid lines last up to 4 years and require drydocking to paint (BID 131). Problems with entanglement and severing of the umbilical cable are minimized by using the smaller, more maneuverable RCVs and using a clump or launcher to eliminate surface wave effects (BID 157). The RCV power supply should be backed up by a small battery to prevent power surges or losses in the main supply which may cause loss of RCV control. Underwater hull inspections will have to be scheduled during relatively calm sea conditions, due to the hovering limitations of RCVs in rough water. Remote operation of inspection tools normally hand held will require evaluation to compare accuracy of readings and location verification.

I. Additional Training:

USCG Inspector: The inspector must learn how to interpret the CCTV picture transmitted by the RCV.
Operator/Diver: Manufacturers who sell RCVs generally include in the cost of the RCV a program to adequately train the user of the system.

J. Estimated Cost: Tethered RCVs cost \$50,000 to \$400,000, depending on manufacturer, model, and options. R. T. Wallace in a study for the USCG has compared the specifications of 50 different RCVs in Appendix B of BID 172.

K. Recommendations: Many manufacturers lease RCVs which may be a valuable asset during an underwater inspection.

General Technology: Ultrasonic Gaging **Code:** 06

Specific Description: Ultrasonic Gaging, using a diver to place the transducer on the surface being inspected. The instrument readout is monitored and recorded topside. Two available underwater ultrasonic gages are shown in Figures 3-6 and 3-7.

Applied to Inspection Requirements: I01, I02

A. Status: _X_ **Operational (see par. B)** _X_ **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: Commercial units are available and several offshore firms use this technique to inspect drill rigs and pipelines. In-water ship surveys have also used this technique. A permanent record can be retained and computer averaging of small area readings is available. Measurement is independent of water temperature and turbidity.

C. Research Underway for Advancing Technology: Remote controlled and manned submersible are being developed for underwater NDT work. (BID 118) Ultrasonics have been used with limited success for weld flaw detection. However, the technique is difficult and requires a significant amount of diver/topside monitor coordination. Research is underway to process flaw detection signals with a computer to improve capability. Presently good only for coarse flaw detection. Magnetic Particle testing still primary means for surface flaw detection.

Ultrasonic Image Convertor Tubes (UCIT) (BID 118) are under development which will project actual image of what is being measured. Current status is that picture resolution requires improvement to obtain desired accuracy.

Acoustical holography uses a matrix of ultrasonic transducers, focused to inspect each point of a weld volume. The phased signals received at the several transducers are processed to obtain a focused acoustic holograph (3-dimensional image of object). The system appears capable of detecting cracks, but requires further R&D. It is especially useful for surveillance work in murky water, but appears unlikely that it could be used as a primary inspection tool for evaluating welds (BID 27). Holosonics Inc. is testing a system which is designed for application by submersible manipulation systems or manually by divers. The flaws can be viewed in real time or recorded for magnified close-up inspection. Acoustic Holography may eventually be used for determining the extent of fouling that arises on a ship's hull (BID 114).

D. Application to Inspection Requirements: Gaging hull plate thickness with underwater ultrasonic instruments would satisfy part of the Inspection Requirements for Hull Plating (I01) and Welds & Rivets (I02).

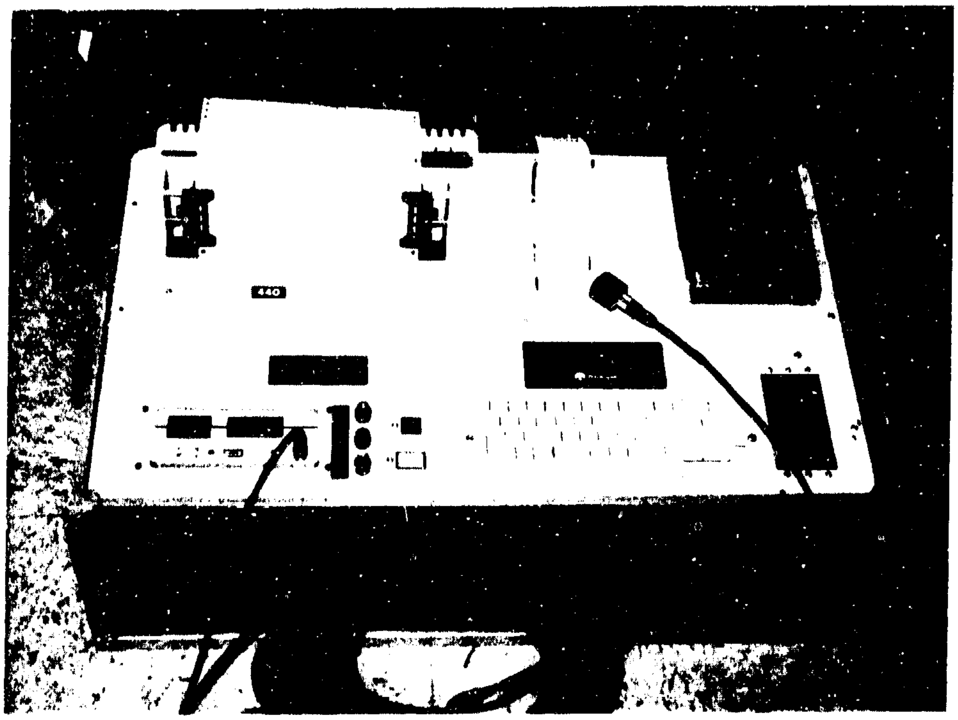


Figure 3-6 Ultrasonic gage with microprocessor

PANAMETRICS

UNDERWATER GAGING SYSTEM MODEL 5222UG

MODEL 5222UG

- Totally self-contained, diver operated unit, reduces surface support and eliminates long connecting cables.
- Increases diver measurement productivity and reliability.
- Pressure tested to 1000 feet.
- Small and lightweight enough to be easily transported by a diver.
- Works with most commercially available masks and helmets without reducing diver mobility or safety.
- Makes reliable measurements from 0.125" to 10".
- Eight-hour battery allows plenty of productive diver downtime.
- Rugged welded aluminum housing carries a full year warranty.

DESCRIPTION

The Model 5222UG underwater gaging system is an ultrasonic thickness gage designed to make accurate measurements on subsea structures and pipelines to depths of 1,000 feet. The system consists of an ultrasonic thickness gage, an instrument housing, a breastplate mount, a cable, and a transducer. These components have all been engineered to meet the rugged demands of underwater work, and are covered by a one year limited warranty.*

APPLICATIONS

The Model 5222UG provides a way to make accurate, reliable thickness measurements in underwater applications. Because it is a self contained, diver operated instrument designed for independent underwater operation, the 5222UG eliminates the need for surface support and long, cumbersome connecting cables, and allows the diver to considerably increase his measurement output and productivity.

*excluding the transducer and connecting cable.

Operation in the field is easy. After a simple topside calibration procedure, the gage electronics are slid into the instrument housing. A Lexan® faceplate seals the front of the housing and allows the diver to view the LED Digital Display clearly.

The breastplate mount permits the housing to be retracted against the diver's chest for transport or work surface preparation and then folded out for convenient viewing of the display while making thickness measurements. The breastplate mount is designed to be used with most commercially available masks and helmets without interfering with diver mobility and safety.

Ultrasonic thickness measurements can be made accurately over a range of 0.125" to 10", depending on the material type and condition and the probe selected. Access is required to only one side of the structure, and measurements can be made rapidly with minimal surface preparation. Ultrasonic thickness measurements can be used to detect excessive thinning that could seriously weaken the material.

Figure 3-7 Diver operated ultrasonic gage

E. Advantages of Technology: Little diver training needed to operate equipment. Corrosion thickness may be measured independently of hull plating thickness. High Sensitivity - will detect "tight" cracks. Measures thickness of any material.
Disadvantages: Areas to be gaged must be prepared and cleaned. Difficult to gage complex shapes. Usually no permanent record. Surface roughness can affect measurements.

F. Problem Areas & Anticipated Difficulties: Proper instrument calibration and operation mandatory for correct and reliable readings. Exact location of gaged area difficult to establish without a grid painted on the ship's hull. Contact transducer must have surface contact for accurate measurement, erroneous readings given if placed over corrosion pits.

G. Proposed Remedies: Firms providing ultrasonic gaging services must prove calibration, operation and interpretation capabilities. Ship owners should routinely paint grids on hull with regular drydock painting.

Ship plating diagram may be used to locate gaged areas for general survey and use of acoustic beacons on diver and listening transducers at known hull locations may be used to pinpoint the diver's position.

Use focused immersion transducers vice contact transducers on plating with corrosion pits.

Overcome measurement errors by feeding data into a computer and average several (hundred) measurements.

H. Impact on Pass/Notify/Fail Criteria: The only impact recognized prior to implementing underwater inspections is the inspector's own lack of confidence in the underwater readings, resulting in a more conservative application of wastage criteria.

I. Additional Training:

USCG Inspector: None. Results of survey can be recorded, processed, and presented to the inspector in a standard, easy to interpret form.
Operator/Diver: Qualified diver must also be trained as an ultrasonic technician and certified by a recognized organization.

J. Estimated Cost: $1,495 to $3,200 for standard unit; $25,000 with microprocessor.

K. Recommendations: The hull gaging inspection requirement appears satisfied by underwater ultrasonic methods.

General Technology: Magnetic Particle Inspection Code: 07

Specific Description: Underwater nondestructive inspection for cracks employs a slurry of dyed magnetic particles, a pair of magnets, and an adhesive tape to make an impression of the crack. A commercial MPI kit is shown in Figure 3-8.

Applied to Inspection Requirements: All

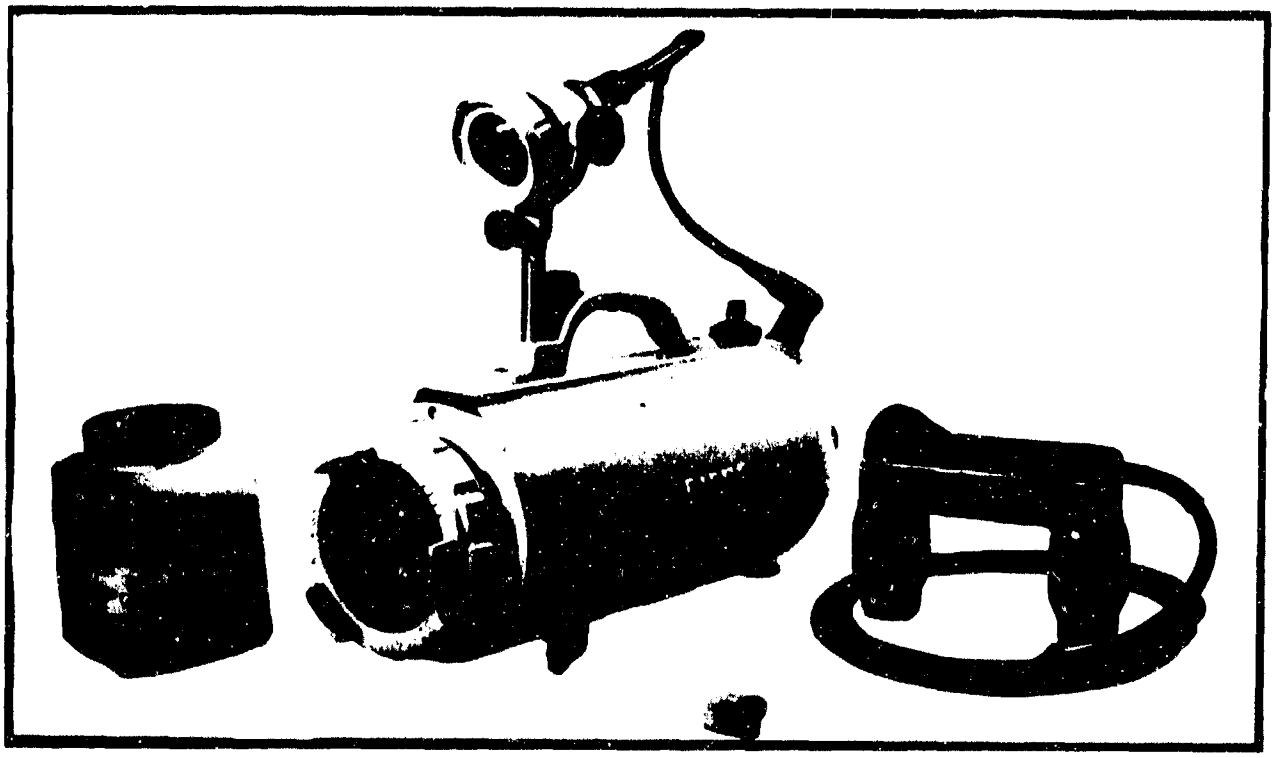
A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: Underwater use of magnetic particle inspection (MPI) has been completely satisfactory since it is not affected by water temperature. Since it is a diver employed method, it is dependent on diver's skill. Underwater tests performed by NCSC (BID 115) demonstrated that electromagnets (AC powered) were superior by a large margin to permanent magnets which were considered ineffective. Both magnetic rubber and fluorescent magnetic particles in a water base were effective inspection materials. Magnetic paint (magnetic flakes in an oil base) proved unsatisfactory. Magnetic rubber (magnetic particles in a rubber base) produces a hard copy of results. However, rubber base takes a long time to set in cold water. A hard copy may be obtained of magnetic particles by pressing a putty based tape over particles. Also video or photographic pictures may be recorded underwater. Magnetographics has been used with some success on relatively flat surfaces (BID 27). A magnetic tape is placed over weld to be inspected and an image is recorded. Analysis of weld is performed topside by a qualified inspector using a special playback recorder. Eddy current testing has been used with success recently. It is similar to MPI without the use of any magnetic particles or tape. An electrical current is placed around area to be inspected. An impedance charge which will result across a flaw is measures and analyzed. Eddy current testing is successful in small scale applications. Can be used for not only surface flaw detection, but also used to measure paint thickness, corrosion thickness, and plate thickness, (BID 127); is adaptable to computer data processing.

C. Research Underway for Advancing Technology: Det Norske Veritas (BID 118) is experimenting with MPI methods to measure crack depth. Another method of crack detection which doesn't use particles or tape material is the Hull Effect Transducer. These transducers measure flaw leakage around cracks. This information may be processed through a computer for accurate topside image reproduction for analysis by a qualified inspector.

D. Application to Inspection Requirements: Magnetic particle inspection may be used to detect minute cracks in any ferromagnetic part of the ship such as hull, rudder, sea chest, through hull fittings, and tailshaft. MPI is particularly useful with highly stressed, dynamically loaded assemblies such as tail shaft and rudder stock.

THE BLACKBIRN



Preserving the integrity of the increasing number of underwater pipelines and steel structures in the oil patch is the growing concern of the oil industry. To help discover the small leaks and minor fractures before they become major disasters, we designed the BLACKBIRN™, a multi-task, "black light" power pack.

The BLACKBIRN is many things: an ultra-violet "black" light for visual inspection of the fluorescent chemical particles to be applied by the diver; a "white light" to illuminate the diver's underwater path as he descends to the job as well as to illuminate his work area; and a 12-volt DC magnetic probe with which to align the metal particles in the applied chemical solution. It is all contained within one modular system.

The white light (a Birns Oceanographics 12-volt, 50-watt AC Snooperette™) is controlled by a fingertip switch so that it can be doused during the ultra-light inspection. The magnetic probe is switch-controlled as well, the rubber-covered toggle mounted on the power pack at the diver's fingers.

The probe is manufactured by Texas Magnetics of Houston, for whom Birns Oceanographics will be the international distributor. A six-foot power cable from the power pack to the probe itself allows the diver sufficient freedom to manipulate both probe and pack.

Rather than utilizing an additional ultra-violet glass filter in the system, BOI has been successful in incorporating the filter coloration directly into its front glass port for design simplification.

The BLACKBIRN is priced out as a system. It includes the power pack with black light, magnetic probe and cable, the adjustable white light, ground fault interrupter, and 500 feet of 14/3 Aquaprene® cable. The system bears the BOI Catalog number 7000. Birns-O Aquaprene is available in continuous lengths to 1000 feet.

B
O
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BIRNS *Oceanographics, Inc.*

Figure 3-8 Magnetic particle inspection underwater

E. Advantages of Technology: MPI is the best means for detecting surface flaws and provides an instantaneous picture of the flaw. The detected flaw may be video recorded or imprinted for topside analysis. Magnetographics can measure the depth of cracks and requires less diver skill than particle MPI. Eddy-current testing does not require paint removal prior to inspection.

Disadvantages: When using MPI or magnetographics, the surfaces to be inspected must be clean to the base metal. Both techniques are good for near surface flaw detection only. MPI is currently unable to accurately measure a crack's depth. The equipment needed for MPI is bulky and requires a substantial amount of diver skill to operate.

F. Problem Areas & Anticipated Difficulties: Accurate location of suspected crack area and final determination of exact crack location is always a problem. Cracks which are just discernable by the naked eye in air will be invisible to a diver looking through a face mask plate and a few inches of water. The tip of a crack may be invisible even when it contains some colored magnetic particles. Detection of flaws in turbid, murky water is difficult.

G. Proposed Remedies: Ship owners should incorporate the painting of grids into underwater painting system. Color photographs of the actual crack should include one high magnification view of the crack tip. Detection in turbid, murky water is assisted by use of fluorescent particles and ultraviolet lights.

H. Impact on Pass/Notify/Fail Criteria: Any error which exists between measuring a crack in air and underwater will have to be considered in deciding whether a crack needs repair or can be tolerated. This possible error is unknown.

I. Additional Training:

USCG Inspector: The inspector must learn how to interpret the data he is presented about a crack he has not actually seen.

Operator/Diver: Training requirements for qualified divers includes use of MPI above water to become expert in its use. Training underwater will develop skill to avoid errors produced by fluid environment.

J. Estimated Cost: A complete MPI kit, which would include the magnetic probes, a Byrnes Blacklight, a supply of adhesive tapes and magnetic particle mixture, costs about $4600 in 1979.

K. Recommendations: Magnetic particle inspection for cracks can be performed underwater with sufficient accuracy to permit this NDT technique to be acceptable to the USCG.

General Technology: Radiographic Inspection Code: 08

Specific Description: Radiographic inspection of hull plating and welds employs a gamma or x-ray radiation source and a sensitive film plate.

Applied to Inspection Requirements: 101, 102

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: Radiographic Testing is not used that often in underwater applications due to its difficulty of operation and radiation health hazard that must be controlled. Access to both sides of the weld of interest is necessary so that film and source may be opposite to one another. Film can be inside or outside of plate. If in water, the film is waterproofed with polyethylene sheet and the source (gamma or x-ray) machine is inside; the two components can be reversed. Commercial units are now available.

C. Research Underway for Advancing Technology: The National Bureau of Standards and several universities are studying neutron radiography as a replacement for gamma and x-ray radiography. The greater detail and sensitivity to nonmetallic materials of neutron radiography are expected improvements. Submersibles are being developed to perform NDT work which will solve the problem of radiation exposure.

D. Application to Inspection Requirements: Radiographics can be used to detect surface and subsurface flaws in welds underwater.

E. Advantages of Technology: Radiographic NDT does not require cleaning of the hull to be used effectively. The exposed film provides a permanent record of the inspected area. The system has been used reliably and effectively by the industry. There are material limitations as there are with the use of magnetic particle NDT.
Disadvantages: Access to both sides of the area being photographed is necessary. Radiation exposure to the diver is a health hazard and must be closely controlled. The system is not very sensitive. The flaw must be 2 percent of the hull gage to be detected (BID 156). The equipment is difficult to use on complex geometrics. Since water is a radiation absorber, the water must be displaced between the source and the area being inspected. This requires a dry housing for the source. Since the film must be developed, there is a time lag before the results can be analyzed.

F. Problem Areas & Anticipated Difficulties: Film should be shielded from backscatter of water. With source in water (outside hull) sensitivity and exposure time increase with distance from hull. Hull thickness must be known to calculate exposure. Also must match the location of source and film on opposite sides of plate. Both sides of plate must be accessible. Radiation dosage monitoring will be required.

G. Proposed Remedies: Ultrasonic Gaging can be used to measure plate thickness and match locations on both sides of the plate.

H. Impact on Pass/Notify/Fail Criteria: At this time there is no known error produced by the fluid environment so no compensation in applying the existing criteria is anticipated.

I. Additional Training:

USCG Inspector: Interpretation of radiographic films same as for surface welds, except for backscatter shadows which he must learn to recognize.

Operator/Diver: The qualified diver must also be a qualified radiation technician. In-air training must be followed by in-water training to learn how to adjust power output and how to position both the film and source.

J. Estimated Cost: None available.

K. Recommendations: This is not recommended for underwater inspection procedures. It should be used to inspect welds resulting from hull repairs, or whenever a weld is considered questionable.

SECTION 4 - COMPARISON OF UNDERWATER TECHNOLOGY WITH PRESERVATION, MAINTENANCE AND REPAIR

Satisfaction of all inspection requirements by the underwater technology areas discussed in Section 3 would certainly allow adoption of a drydock extension policy. However, should the inspection uncover deficiencies requiring repairs, the ship might still have to be drydocked. The ship owner/operator would then be faced not only with the expense of the drydocking, but the expense of waiting to have the ship drydocked since it would not have been on the shipyard's schedule. For this reason, it is important to ascertain the status of underwater technology for performing ship repairs. In addition, any underwater technology that permitted ship preservation and maintenance without drydocking would also contribute to the extended drydock policy.

As in Section 3, underwater technology now available or very near commercial development was examined to determine its applicability to vessel preservation, maintenance, and repair. The resulting underwater technology codes are the last eight shown in Table 3-1. The evaluation of these technology areas was similar to that performed in Section 3, in fact the first three paragraphs of the present format are identical to those previously used. The discussion in paragraph D of each technology area is directed as to how it contributes to preservation, maintenance and repair. The next four paragraphs on advantages, problems, remedies, and training are as before. Then safety and environmental impact are added to the present evaluation, followed by the previously considered topics of cost and recommendations.

The overall impression of this comparison is that underwater preservation, maintenance, and repair are a feasible alternative to drydocking. Several techniques proposed have yet to be used, but there was no obvious technical reason for barring their execution. The conservative attitude of ship owner/operators will very likely be the principle reason certain underwater measures are not immediately adopted. As the maritime industry gains experience with new techniques, they will be more easily accepted. Since the first five Underwater Technology codes were described in Section 3, this section contains only a specific description pertaining to underwater preservation maintenance, and repair. All other aspects remain the same.

General Technology: Diver **Code:** 01

Specific Description: Divers equipped with umbilicals for air and hard wire communication or SCUBA gear will work on the ship's underwater parts to preserve, maintain, and repair them. A discussion of this technology is found in Section 3 of this report, where the reader should substitute supervisor or foreman for the USCG inspector. Generally a diver can perform almost any preservation, maintenance or repair (PMR) task which is routinely done in drydock. The particular task may take more or less time and some results will have to be classified as "temporary" or "emergency patch". The removal of propellers and rudder pose the greatest difficulty because of the size of the objects and the surface area exposed to wave and current forces. The use of lifting pads on the ship's hull and support cranes from work barges could give divers the extra lifting force required for heavy work. Less strenuous work such as welding, painting, and hull cleaning are now done routinely on offshore structures. Divers involved in PMR should be certified in some additional skill such as welding or NDT so that the number of personnel required in the water would not grow to an uncontrollable size.

General Technology: Television, Movie and Photography **Code:** 02

Specific Description: Closed Circuit Television (CCTV), movie film, and still photography permit monitoring underwater work and making a permanent record of before and after conditions. The topside supervisor can direct diver activity and keep abreast of progress through CCTV. Detailed color photographs of damaged areas can be studied by engineers to decide what repairs are needed. The condition of the coating system can also be determined from good color photographs, movie, or CCTV. Additional details on this technology can be found in Section 3 of this report.

General Technology: Light Sources **Code:** 03

Specific Description: Underwater light sources illuminate the water and ship's hull to allow divers to work efficiently and safely. The selection of light sources will depend on the turbidity of the water and the type of work planned. In a busy work site the power cables for lights should be grounded and protected against abrasion and tangling. A discussion of light sources is presented in Section 3.

General Technology: Communications **Code:** 04

Specific Description: Communications between divers and topside supervisors is essential in performing underwater work. Divers can request assistance, order down equipment and material, and advise supervisors of difficulties or hazardous situations. Hard wire communication via the diver's tether umbilical is preferred, however communication can be maintained to some degree with SCUBA divers also. Acoustic beacons attached to the diver or his work station can help keep the diver on site and inform topside personnel of the divers location. For more details on communication systems refer to Section 3.

General Technology: Submersibles, Manned & Remote Controlled **Code:** 05

Specific Description: Manned and remote controlled submersibles have been in extensive use to perform underwater work on pipelines and offshore structures. They have the capability of working on a floating vessel, but must be operated carefully since they will be closer to the effects of surface waves and currents. Submersibles can provide lighting, monitor work through CCTV cameras, carry a payload, and operate underwater tools. Additional information on submersibles is contained in Section 3.

General Technology: Brush Scrubbing **Code: 09**

Specific Description: The underwater hull can be cleaned of fouling and oxidized paint by rotating brushes controlled directly by a diver or remotely by a surface operator. Brush scrubbing is not appropriate for complex surfaces or confined areas where hydroblasting is often used. Several brush scrubbing units and an assortment of brush heads are shown in Figures 4-1, 4-2, 4-3, 4-4, and 4-5.

A. Status: X Operational (see par. B) X Under Development (see par. C)

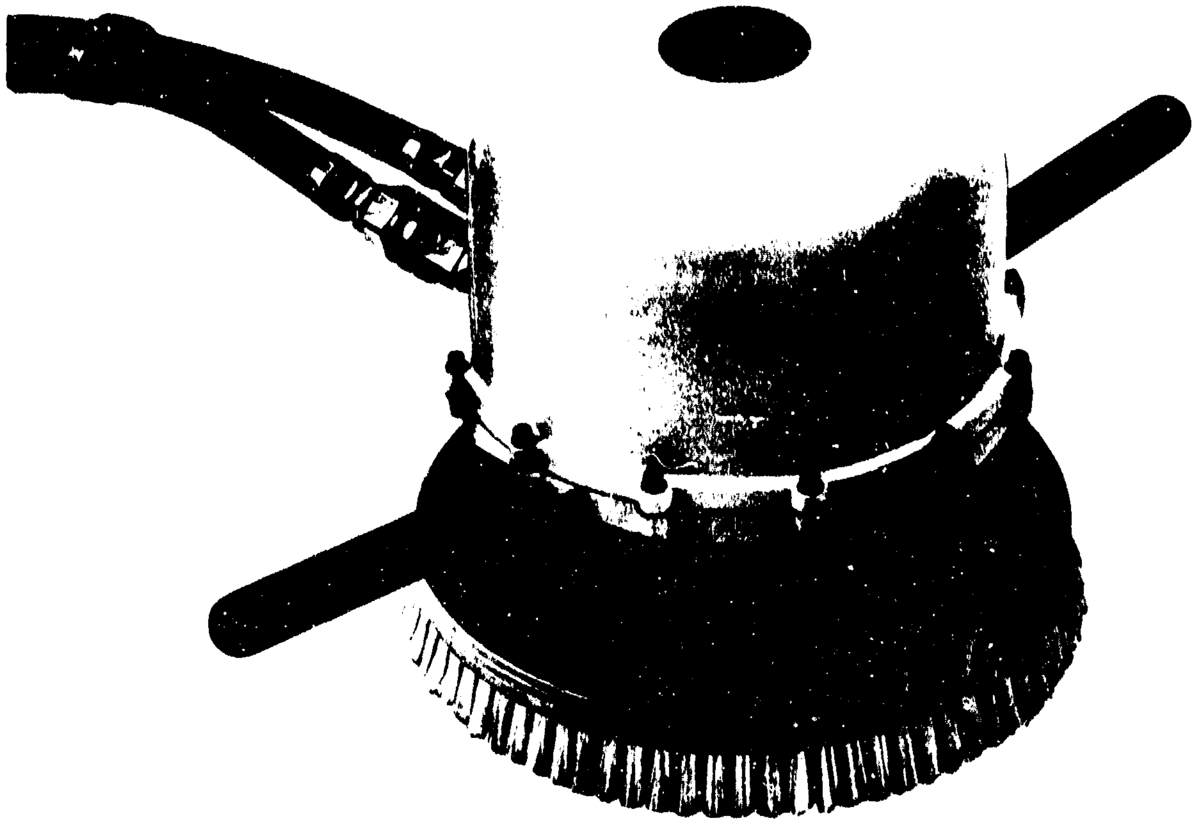
B. Present 1980 State-of-the-Art: Brush scrubbing of ship hulls today is based on over ten years of experience which has seen improvements in hardware and technique. Available at cleaning stations around the world are such systems as SCAMP, Brush Kart, Aqua Kleen, Trellclean and Sea Scrubber (BID 13, 14, 56, 173, 211). Although different in configuration and capabilities, all these systems rely on a rotating bristle brush and require diver support to some degree. Interchangeable brush heads permit the removal of heavy barnacle fouling and the light brushing to remove only the oxidized antifouling paint film. All of these systems require that the ship be anchored or moored in a protected body of water with at least three inches of visibility. The U.S. Navy has contracted one firm using SCAMP units to clean naval vessels. Commercial cleaning stations in Las Palmas and Aruba routinely clean tankers and cargo ships in a twenty-four hour period.

C. Research Underway for Advancing Technology: The only research on brush scrubbing that could be identified had to do with brush bristles. In the interest of leaving a very smooth surface the bristle materials and the angle of the bristle are being investigated by the U.S. Navy.

D. Application to Preservation, Maintenance and Repair: Brush scrubbing is used for preserving and maintaining the hull. By removing fouling the antifouling paint can be reactivated since the oxidized layer is removed and a new, toxic rich surface is exposed. Prior to any inspection and maintenance work on the hull, the surfaces must be cleaned of fouling and if present, corrosion deposits.

E. Advantages of Technology: Brush scrubbing can extend the service life of antifouling paints and help the ship keep a smooth hull surface. This results in higher speeds and less fuel consumption (BID 23, 25, 26, 86). Since the cleaning operation can be performed while the ship is loading or unloading its cargo, delays in transit are avoided. Regular hull cleaning and the accompanying inspection can detect damages which can be repaired immediately or scheduled for the next port or drydock.
Disadvantages: The disadvantages of brush scrubbing are that it leaves a less than perfectly smooth surface, depends on the experience and skill of the diver/operator, and cannot be used in sea chests, propellers, appendages, or in confined areas. If the wrong bristles are inadvertently employed, the marine coating can be irreversibly damaged.

The Aqua Kleen Hull Scrubbing Unit

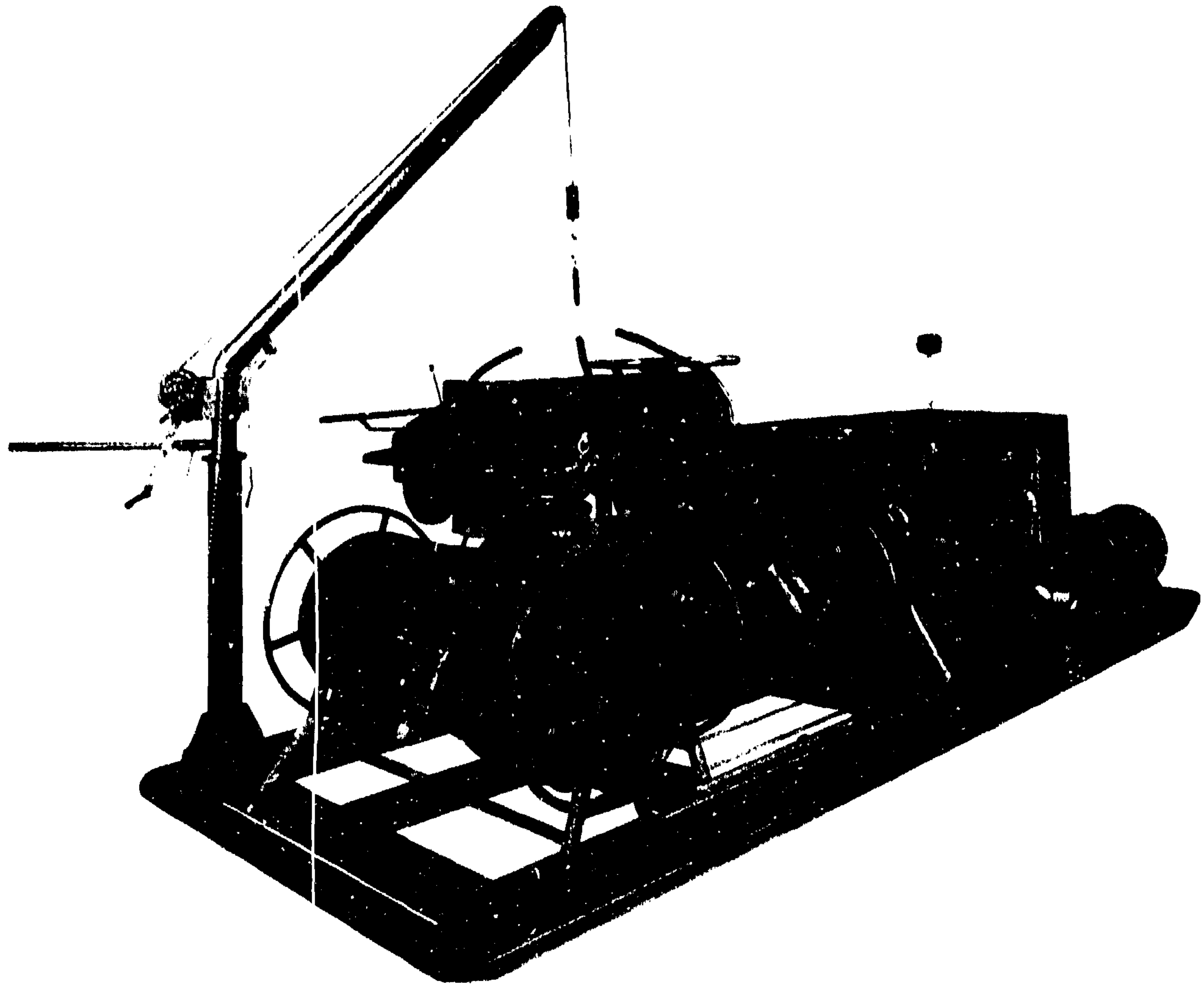


Fast and easy to use

The durable Aqua Kleen Scrubbing Unit cleans hulls quickly and thoroughly. It is easily operated because it is almost neutral weight in water.

When ready to work, simply snap in the power hoses. The scrubbing unit speed is controlled by a single valve and all the diver needs to do is guide it.

Figure 4-1 Single brush scrubbing unit



"BRUSH KART" STANDARD EQUIPMENT

❶ 1 Hydraulic unit 13RM/S comprising the installation of the equipment on a steel welded skid:
1 Air cooled diesel motor of 52 HP.
Electric starting to diesel motor, lighting and re-charge of batteries ensured by alternator of 24 Volts.
1 Double bodied hydraulic pump.
1 Air compressor.
1 Oil (hydraulic) tank.
1 Control panel.
1 Safety air tank.
1 Carbon air cleansing filter.

Technical description:

❷ 1 Winder with double revolving connection, holding 100 m. (328') of coaxial floating hose, for BK. Quick release couplings.

❸ 2 Winders with double revolving connection, holding each 80 m. (263') of coaxial floating hose, for the 500 DS brushing machines. Quick release couplings.

❹ 2 Winders with revolving connection, holding each 100 m. (328') of air hose, floating, for narghile.
2 Underwater brushing machines, self propelled, two-way rotating, type 500 DS.

❺ 1 Davit (swinging) with hand winch.
1 Sling with 3 hooks.
1 Metal tubed cradle for the BK.
1 Set of steel slings for lifting the assembly.

❻ 1 Brush Kart complete with its 3 brushes, fitted with 24 volts lighting system, situated above the forward brushes.

The entirety is protected by an insonorised cover.

Dimensions : Length 4,54 m. (15 ft) Width 1,50 m. (5 ft) Height 1,50 m. (5 ft)

Overall weight: 1600 kg (3400 lbs)

Figure 4-2 Brush Kart hull scrubbing unit

Figure 4-3 Brush scrubbing units

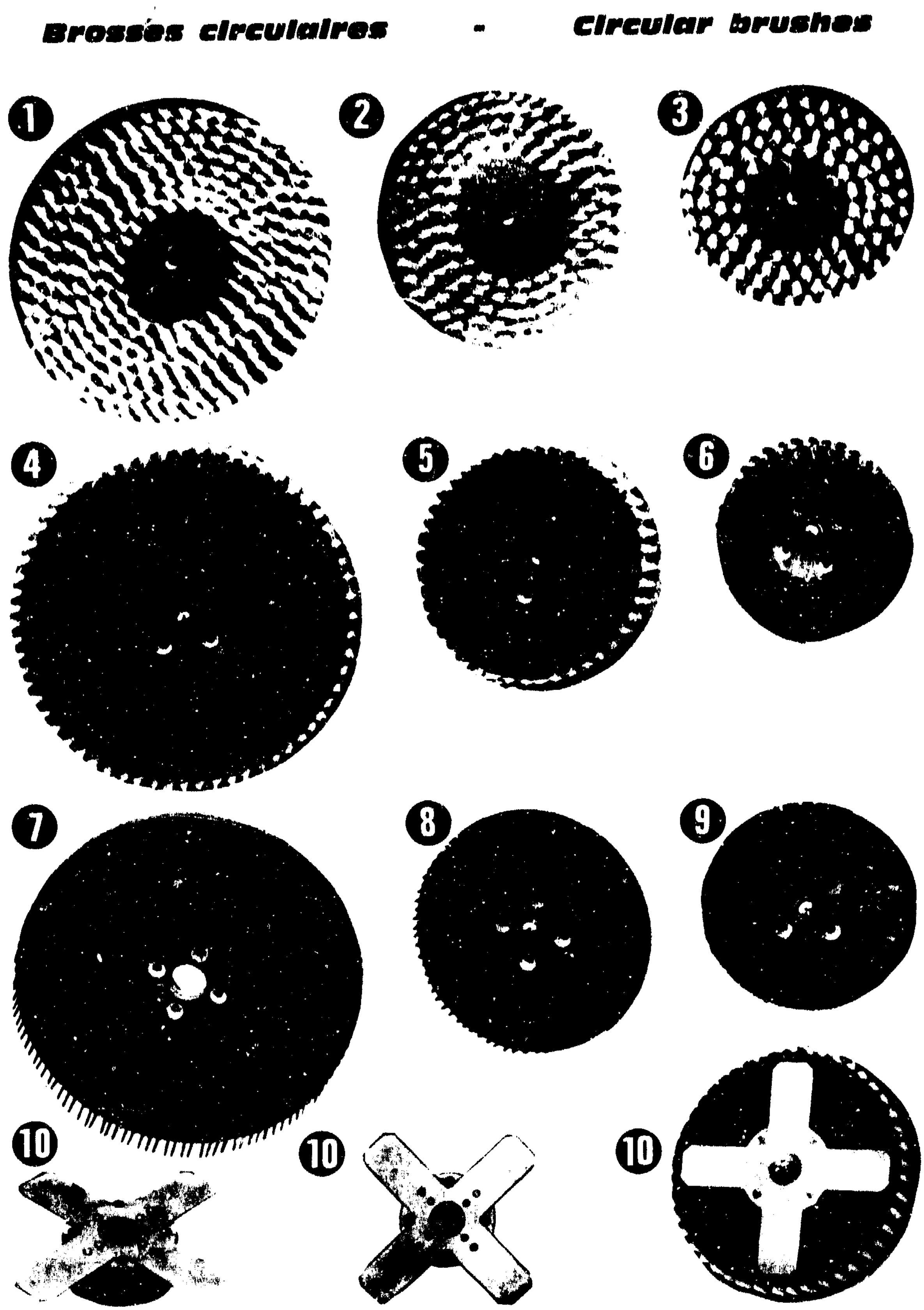


Figure 4-4 Variety of brushes for scrubbing

TRELLCLEAN®
Method of Operation

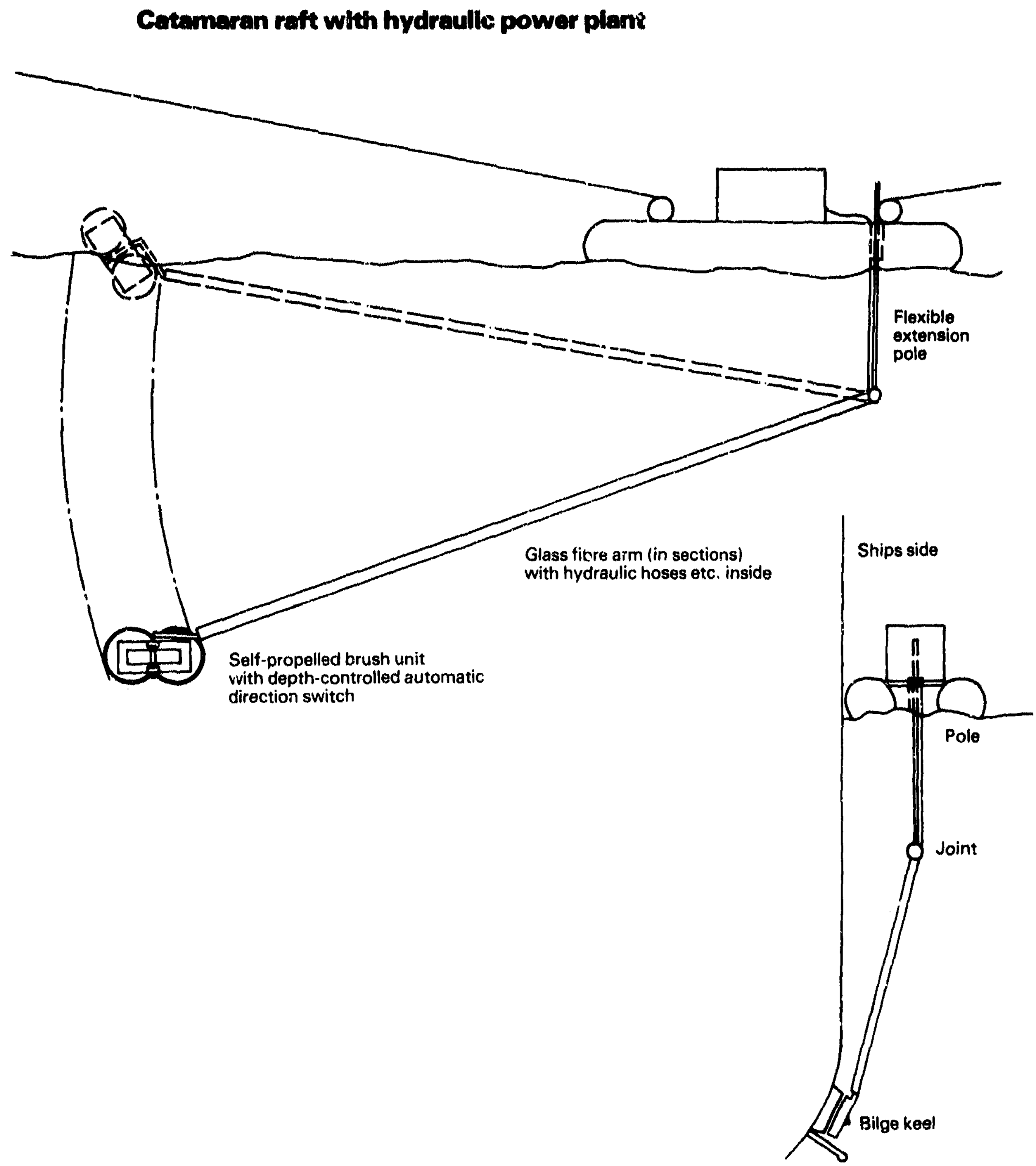


Figure 4-5 Remote controlled hull cleaning equipment

F. Problem Areas and Anticipated Difficulties: As in other underwater activities, the turbidity of the water and the forces from surface waves and currents can reduce the operating ability of the brush scrubbing systems. Recognition of the true fouling conditions and the type of marine coating may not be possible and result in unnecessary work or even damage to the marine coating. Brush scrubbing of only the hull will not improve fuel consumption if the fouling in the stern area is not cleaned also.

G. Proposed Remedies: Experienced brush scrubbing contractors have recognized the importance of location and for this reason cleaning stations are often found where there is clear water and a protected harbor. Good lighting should be provided and color CCTV or still photography should be used to inspect the hull surface before and after brush scrubbing. To complete the cleaning job, hydroblast units should be used in conjunction with any brush scrubbing operations. Hydroblast units with and without sand injection can clean sea chests, propellers and rudders.

H. Training Requirements for Operator/Diver: Training of qualified divers for brush scrubbing should include recognition of different degrees of fouling and recognition of different marine coatings. They should know the color sequence in multiple layer paint systems, and be able to control the brushing action so they leave the hull as smooth as possibie.

I. Safety Precautions or Logistics: The hydraulic power drives of brush scrubbing units are a potential hazard for divers, but guard frames and well designed controls have contributed to a safe work record. Power for the brush system and diver support are provided by a work boat or directly from the pier. Since the operation is performed in three eight hour shifts the logistics are minimal.

J. Environmental Impact: ___Yes _X_No

K. Estimated Cost: In 1979 the U.S. Navy accepted a figure of $32/sq. ft. for brush scrubbing of the hull and hydroblasting of the propeller, sea chests and rudder. Work costs are often quoted on an hourly basis or by the job, after the contractor has examined the underwater surfaces.

L. Recommendations: Brush scrubbing has already been adopted by many ships owners/operators to reactivate the antifouling paint and reduce fuel consumption. The inspection of a ships hull should not proceed until after fouling has been removed so that the CCTV monitor can display the true condition of the metal hull. The USCG should inform the ship owner/ operator that a clean hull is required for underwater inspections.

General Technology: Hydroblasting **Code: 10**

Specific Description: Hydroblasting is the cleaning of the ship's underwater surface with a stream of high pressure (7,000 psi) water, or a lower pressure (3,000 psi) water stream which contains cavitation bubbles. Both forms of hydroblasting are used to clean surfaces not amenable to brush scrubbing and both are operated by a diver. A complete hydroblast system and optional gear are shown in Figure 4-6.

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: High pressure hydroblasting has been commercially available for the last fifteen years and is routinely used in drydocks to clean a ship's hull when abrasive blasting is not planned (BID 21, 40, 42c, 179). On occasion, sand or other fine size abrasive grit is injected into the water stream to obtain faster cleaning rates. The high pressure hydroblasting is used by commercial hull cleaning firms to compliment the brush scrubbing equipment. Sea chests, propellers, rudders and other hull appurtenances are cleaned with hydroblasting.

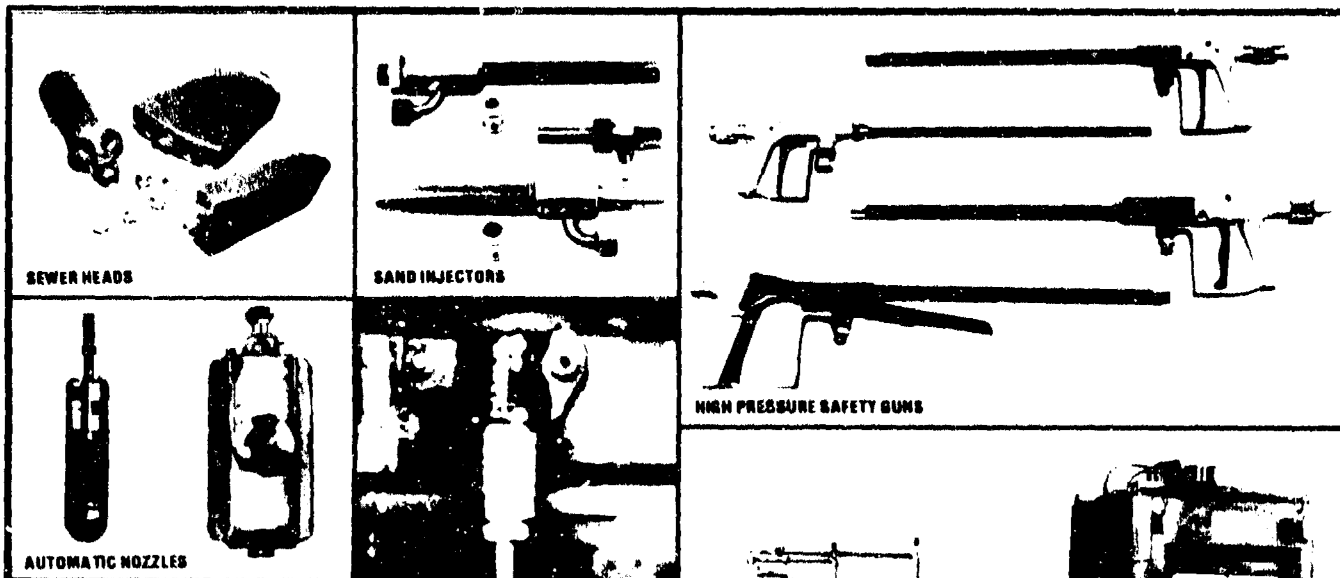
C. Research Underway for Advancing Technology: Research in direct support of high pressure hydroblasting is basically directed at the design and selection of nozzles with good abrasive resistance. The major research effort has been the development of the cavitating hydroblast cleaning units. Two such systems were field tested by the U.S. Navy this year, the CAVIJET and CONCAVER (BID 152, 160). Since the cavitating units require less water pressure and volume the necessary pumps are smaller. Preliminary results by a commercial hull cleaning station indicate that the cleaning rates of the cavitating units is not much better than the high pressure hydroblast units. Further research with cavitating hydroblast units is attempting to establish their capability as underwater cutting tools.

D. Application to Preservation, Maintenance and Repair: As with brush scrubbing, hydroblasting is used to perform maintenance on the ship's hull by cleaning off fouling and corrosion deposits. In addition hydroblasting is capable of leaving a clean metal surface in anticipation of a welding repair, NDT inspection, or painting. When operated by experienced divers hydroblasting can be used to remove only the oxidized antifouling paint and feather-in the edges of an area to be repainted. Weld seams can be easily cleaned for inspection without disturbing the adjacent marine coatings.

E. Advantages of Technology: Hydroblasting permits one to obtain a completely clean hull, even in areas inaccessible to brush scrubbing. The small area of cleaning is an advantage when reaching into recessed locations. Disadvantages: The small jet means that large areas would take too long to clean with hydroblast units. Fresh water or a filtering system is also required by most hydroblasting systems since use of sea water would attack pump components.

F. Problem Areas and Anticipated Difficulties: Again water turbidity can limit visibility and so reduce the effectiveness of hydroblasting. Several water lines or loose connections can also become a problem because of the high pressure water. The amount of energy available at the nozzle of a cavitating hydroblast unit is capable of damaging marine coatings or injuring the diver.

ACCESSORIES THAT MAKE THE DIFFERENCE...



WOMA matches the system to your application through a choice of drivers, tanks and other system options, as well as a vast selection of accessories, that include over 500 different types of nozzles.
WOMA systems are used for surface, inside diameter and tank cleaning; wet sand blasting; cutting; and sludge and dust removal.
Engineered systems include automatic tube bundle cleaners, deburring units, keg and crate washers, and many others.

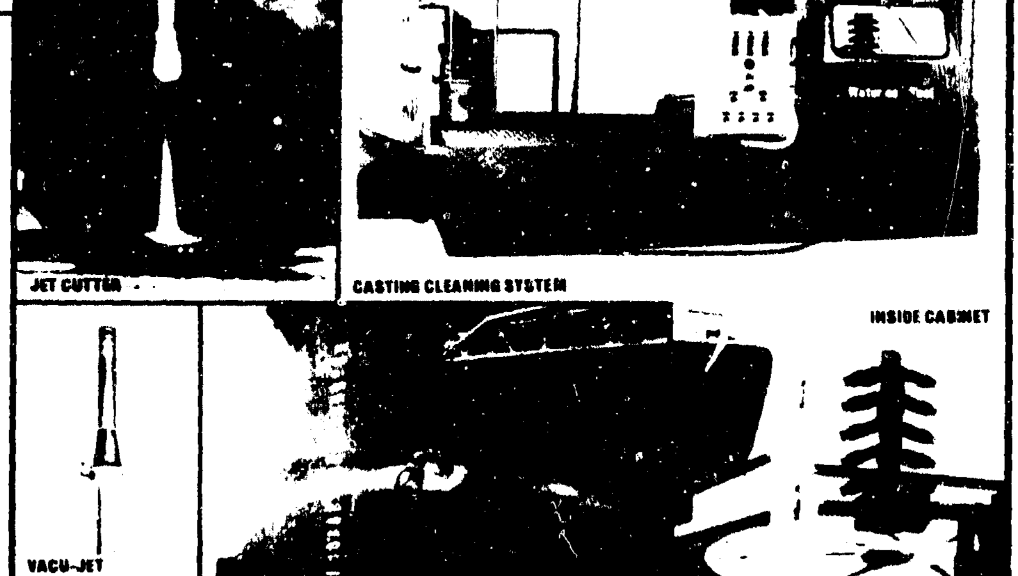


Figure 4-6 Hydroblast components and systems

G. Proposed Remedies: Selecting a location with clear water will eliminate visibility problems not eliminated by underwater lights. Regular maintenance on hydroblast equipment and checkouts before each use should reduce the danger from line failures. Possibly a retracting wire mesh guard around the nozzle or cavitating units would protect the diver, and if designed as a fixed, offset frame, the marine coating could also be protected. Perhaps the best remedy is well designed controls and intensive training.

H. Training Requirements for Operator/Diver: Only experienced divers should receive training with hydroblast units. Both types of units should be operated on dry land first before commencing underwater training. The diver should learn to respect the pressure and energy available at the nozzle of these units. As with brush scrubbing, the diver should learn the different degrees of fouling and be able to recognize the different paint films by their color and sequence in a multiple layer paint system.

I. Safety Precautions or Logistics: As already mentioned, the potential for diver injury exists because of the high water pressure and the cavitating jet which may some day become a metal cutting tool. Only trained divers should be allowed to handle hydroblast units. If sand is to be injected into the water stream then it will have to be brought to the work site, on the support barge or on the pier.

J. Environmental Impact: ___Yes X No

K. Estimated Cost: The CAVIJET unit rents for $3,000/yr. and this figure was considered extremely high by a commercial hull cleaning operator who elected to stay with the less expensive high pressure hydroblast units for which a complete system with pump could be purchased for $15,000. The entire CAVIJET system including diesel engine and suction pump is being offered for $50,000.

L. Recommendations: Hydroblasting is the ideal method for cleaning sea chests, propellers, rudders, hull appurtenances, and small, hard to reach spaces. Both the high pressure units and cavitating units can provide effective cleaning of fouling and corrosion deposits.

General Technology: Cathodic Protection **Code:** 11

Specific Description: Passive Cathodic Protection is provided by sacrificial anodes which corrode away, while Active Cathodic Protection is provided by an electric current from permanent type anodes.

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art. A ship in sea water is like a wet cell battery; the hull is the anode (+) or corroding part, the sea water the electrolyte, and the propeller or hull appendages of metals higher on the galvanic scale are the cathode (-). Passive or galvanic cathodic protection employs sacrificial anodes of zinc, aluminum, or magnesium on the hull. These metals are lower on the galvanic scale and so transform the hull plating into a cathode. Active or impressed current cathodic protection (ICCP) employs disc or rod anodes of platinum surfaced tantalum, niobium or titanium. Several other combinations of alloys and surface metals are also used. The ICCP drives a current toward the hull and thus makes the hull the cathode. The impressed current cancels the current normally flowing from the hull as an anode to the cathodic propeller or appendages. Since 1966 the U.S. Navy has converted most ships to the ICCP system. In the commercial sector this conversion started in the mid-seventies. Both cathodic protection systems yield excellent results, but must be designed for each vessel to avoid excessive current potentials which can damage the hull coating.

C. Research Underway for Advancing Technology: As conventional ships increase their steaming speed or if the ship is a hydrofoil or surface effect ship, the cavitation erosion of the protective anodes increases. Studies are presently underway to improve the configuration and mounting of these anodes.

D. Application to Preservation, Maintenance and Repair: Cathodic protection reduces or controls the corrosion of a ship's hull when the coating fails, thus preserving the hull.

E. Advantages of Technology: Cathodic protection increases the life of the hull plating and reduces the roughening of the hull and the resulting increased hull drag, which in turn slows the vessel and increases fuel consumption.
Disadvantages: Sacrificial anodes increase hull drag while ICCP anodes are easily damaged by collision with objects or groundings and by brush cleaning operations. If the electric potential between the anodes and the hull (cathode) is too high, the coating system is weakened.

F. Problem Areas and Anticipated Difficulties: Underwater inspection of anodes in extremely turbid waters will be difficult especially when the condition of anodes is based on a visual examination. Hull cleaning by high speed brush units or high pressure or cavitating water guns can damage or knock off the ICCP anodes which are not welded in place, but simply snapped into a mount. Repair of the potential shield around the ICCP anodes will pose a problem to obtain satisfactory adhesion.

G. Proposed Remedies: Inspection of anodes will have to be performed in ports where existing illumination sources can permit a careful visual examination. For ICCP anodes the diver can simply use his hands to determine if the anode is properly mounted while internal electronics can determine if the anode is operating properly. Underwater paint application techniques using cofferdams or dry atmosphere habitats can be used by divers to effect permanent repairs of the ICCP potential shields. The ship's hull plate expansion plans should be studied before hull cleaning commences so that anode locations are known. To further protect ICCP anodes from brush cleaning operations a guard bar could be welded over the anode.

H. Training Requirements for Operator/Diver: Divers must be taught how to visually examine anodes to determine the percent consumed and the condition of electrical connections. They will also have to learn how to remove consumed galvanic anodes and weld in new ones, and replace ICCP anodes. The inspection and repair of the potential shield will also require training.

I. Safety Precautions or Logistics: The rough and sharp surfaces of sacrificial galvanic anodes are a source of cuts and abrasions for a diver. Before cutting or welding operations begin, the adjacent hull surface and internal tanks must be ready for hot work. If tanks cannot be made gas free, then they must be treated to prevent any explosions or fires.

J. Environmental Impact: ___Yes X No

K. Estimated Cost: None.

L. Recommendations: Both the passive and active cathodic protection systems can be renewed while the ship is afloat.

General Technology: Marine Coatings **Code:** 12

Specific Description: Antifouling coatings, anticorrosive coatings and their application underwater.

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: In 1980 the state-of-the-art in marine coatings has changed from what it was in 1979. The antifouling organotin polymer using the tributyltin bis-oxide derivative has reached the commercial market place after EPA registered the formulation sold by International Paint Co. The available anticorrosive coatings have improved in quality by the introduction of high build (thick paint film, 30 mils) coatings with improved abrasion resistance that relies on new epoxy technology (Devoe) and glass flake reinforcement (Jotan-Baltimore). The conventional antifouling paints relying on cuprous oxide have also improved by binding the toxin in material that can be brush scrubbed or hydroblasted to remove oxidized paint film. Conventional anticorrosive paint systems are available as chlorinated rubber, vinyl-copolymer, vinyl-tar, and coal tar epoxy. Besides using the best available antifoulant, organotin, the International Paint Co. system is self-polishing. As the water flows over this paint film the toxin leaches out and the hydrophilic free carboxylate film is easily eroded away by the water. Even during a five month lay up, a test patch of the self-polishing copolymer (SPC), had resisted fouling. The Hempel Co. is marketing a self-activating copolymer antifouling paint using either organotin or cuprous oxide.

Application of either anticorrosive or antifouling paints underwater is presently performed inside dried out cofferdams or habitats. The surface is prepared in the usual manner of abrasive blasting or hydroblasting with sand injection. The surface is dried and paint sprayed on. Warm dry air is blown across the coating to speed up the curing. Since the bonding and curing of most marine coatings is sensitive to humidity and temperature, such underwater touch-up work is often considered a temporary repair. An alternative available to newer construction is the practice of listing a vessel from port to starboard, and vice versa, an amount equal to eleven degrees. This exposes the hull down to the turn of the bilge, or a point just beyond the bilge keel. Again the surface is prepared in the usual manner and spray painted. The ship remains listed until the paint cures.

C. Research Underway for Advancing Technology: The long term toxic effects of organotin antifouling paints will receive continued attention both from the U.S. Navy and commercial manufacturers. The Navy's interest is to eventually approve organotins for ship use while the commercial sector needs to demonstrate to the EPA that organotins do not pose a pollution problem and therefore additional formulations should be approved. The U.S. Navy's Civil Engineering Laboratory has recently demonstrated the feasibility of applying a marine coating to a metal surface in direct contact with seawater. The surface can be prepared for painting by hydroblasting with conventional high pressure guns using sand injection. The paint is then brushed on, rolled on, or spread with a stiff applicator. The bonding was excellent, but long term service performance is still unknown. A Japanese consortium, including the Mitsui Co., has developed a pressurized paint applicator for use on submerged surfaces of offshore drill rigs, but its performance is still unverified.

D. Application to Preservation, Maintenance and Repair: The anticorrosive coatings are applied to prevent the corrosion of the metal surfaces in contact with sea water. For the hull this means that general and pitting corrosion are reduced. The antifouling coatings applied over the anticorrosive film is intended to prevent the attachment of plant and animal forms abundant in sea water. This maintains a smooth surface for the ship hull. Underwater application of either anticorrosive or antifouling coatings can maintain a continuous protective film when the original coating film was damaged or became depleted of its antifouling property.

E. Advantages of Technology: The improved anticorrosive paints will reduce corrosion and so extend the drydocking intervals which have been based on higher rates of corrosion. The improved antifouling paints will maintain a smooth, clean hull longer, reducing drag and increasing fuel economy as well as extending the drydocking interval now required for removal of heavy fouling of the hull, intake grates, and other appurtenances. Underwater application of marine coatings means that paint repairs will not in themselves require drydocking of a ship, and the listing of a ship will allow permanent type painting.

Disadvantages: The pollution potential of the organotin paints is still to be completely understood. Any cumulative toxic effects on shipyard personnel are still unknown. Attempts to list a vessel not designed or sound enough to withstand the unusual stresses may result in structural damage.

F. Problem Areas and Anticipated Difficulties: Examination of the anticorrosive and antifouling paint films underwater will be affected by turbidity, both before and after hull cleaning. Distinguishing the colors of the different paint layers may be difficult as will be determining the extent of any coating failure. Underwater application of marine coatings may result in poorly bonded films which never cure completely. Clean up of application equipment will definitely be a problem.

G. Proposed Remedies: Divers should be provided with sufficient and correct illumination so that the paint film colors appear in their true tones. Underwater color CCTV should be used since these systems can be more sensitive to color variations than the diver's eye, and so will allow the topside monitor to confirm or question a diver's comments concerning the paint film he is examining. Whenever possible underwater coating application should be performed in an evacuated and dry cofferdam or habitat. The surface should be prepared properly and dry air circulated to assure the paint cures and bonds completely. Development of wet paint systems should be monitored.

H. Training Requirements for Operator/Diver: Divers will have to learn to recognize the different types of marine coating failures such as blistering, flaking, and delamination. For each ship to be worked on the diver should be informed of the types and number of marine coatings applied previously so that he will be better able to recognize the coating films. The estimation of an area of damaged paint film is also a skill the diver will have to learn. Measuring the dry film thickness underwater should not be more difficult to learn than doing the same in air. The divers will have to be trained to use any new equipment for applying paint directly on a wet submerged surface. If a dry chamber is to be used to enclose the surface to be painted, then the diver will have to learn how to prepare the surface and operate air or airless paint spray gear. He must learn how to apply uniform coating films of the proper thickness.

I. Safety Precautions or Logistics: When marine coatings are applied inside dry cofferdams or habitats these structures will increase the logistics support required. Furthermore, the normal safety precautions for painting will have to be strictly enforced. In particular the need for adequate ventilation must be met since the underwater structures have small air volumes that can easily be filled by solvent vapors.

J. **Environmental Impact:** ___Yes _X_No
Acceptance by the EPA of at least one commerical formulation with organotin implies that no major pollution problem is evident at this time.

K. **Estimated Cost:** None

L. **Recommendations:** Underwater preservation, maintenance, and repair of marine coatings is not a technological limitation on the extension of the drydock interval. A combination of new coatings and the development of underwater work techniques will permit keeping a ship's hull fully protected with anticorrosive and antifouling paints. Whether these approaches to hull preservation are adopted by a particular ship will depend on associated costs and owner policy. Therefore, the limitation of marine coatings on the drydock interval will still exist for some ships.

General Technology: Tailshaft Maintenance **Code:** 13

Specific Description: Tailshaft maintenance involves the dismantling of the stern bearing, and removal of the top part of split bearings, and pulling of the tailshaft. Defects must be machined out of the tailshaft and bearing and both must be returned to like new condition and dimensions. Such maintenance usually involves a drydocking or tipping the ship's stern out of the water. The latter procedure and some proposed underwater procedures are the subject of this discussion.

A. **Status:** _X_Operational (see par. B) _X_ Under Development (see par. C)

B. **Present 1980 State-of-the-Art:** The split stern bearing introduced in the early seventies (BID 132) was the first to permit removal of the top part of the bearing, and to allow examination of the bearing surface and of the tailshaft, without allowing entry of sea water. Should the examination of the tailshaft require machining and welding repairs, or replacement, the propeller must be pulled off. This requires that the ship be lightly ballasted and trimmed forward so that the propeller becomes easily accessible to a work barge crane. The tailshaft is then removed from the ship, repaired in a machine shop, and returned to the ship. The stern bearing would be fitted and sealed and the entire stern tube assembly again made watertight. The propeller would then be remounted and the ship returned to normal trim.

C. **Research Underway for Advancing Technology:** A completely underwater maintenance procedure has recently been proposed, but yet untried (BID 192, 223). The ship would remain at normal trim while the propeller was pulled off and hung from previously installed pad eyes on the ship's stern. A watertight cone or blanking flange would be installed to seal the stern tube opening and the tailshaft then pulled into the shaft alley. Using equipment which is commercially available, the tailshaft would be machined right in the alley way. Another machine would rebuild the shaft diameter by welding, and finally the tailshaft would be machined back to specifications. The tailshaft would then be returned into the stern bearing, seals made watertight, and the enclosing cone removed. The propeller would then be remounted on the tailshaft.

D. Application to Preservation, Maintenance and Repair: This particular underwater technology would remove one of the major maintenance tasks which usually require drydocking.

E. Advantages of Technology: Both the existing and proposed tailshaft maintenance procedures avoid a costly drydocking and make tailshaft maintenance available to even the largest tanker or a mobile offshore oil rig preparing to abandon its station. The recently proposed underwater procedure would not require removing the cargo or cause undue stress to the ship's structure.
Disadvantages: The trimming of the ship could produce compressive stresses in longitudinal bulkheads and could reach or exceed acceptable limits. The underwater approach exposes the ship to possible flooding if the stern tube cone were to fail.

F. Problem Areas and Anticipated Difficulties: Not all ship designs are amenable to either procedure described. Some ships cannot support the streses of trimming and ohters are built so that the propeller cannot be pulled off the tailshaft; the tailshaft must be pulled into the ship first. On some new construction the tailshaft is one continuous stock from the gear box to the taper so "pulling" the shaft would actually require cutting it to make the bearing surface portion available for repair. The very size of some propellers (60 tons) makes this a strenuous task at the very minimum, and until experience is gained, one with potential danger to the ship and divers.

G. Proposed Remedies: Each operator or captain of a ship should know its structural weaknesses. Computer programs and portable instrumentation should be developed to permit measuring strains and calculating stresses in a ship as it is trimmed. The underwater procedure should be employed in drydock settings to gain experience and work out details.

H. Training Requirement for Operator/Diver: Execution of either of these procedures requires training of the ship's crew and the maintenance crew. Listing and trimming of the ship should first be done for hull cleaning or touch-up painting to give the crew experience with such an operation. The underwater procedure should be practiced in a drydock by the same dive team that would perform the work in the water.

I. Safety Precautions or Logistics: As already mentioned, both the ship and divers would be exposed to a dangerous situation. Required precautions or logistics support would have to be determined during practice maneuvers.

J. Environmental Impact: ___Yes _X_ No

K. Estimated Cost: None.

L. Recommendations: This is one of the most complex and difficult underwater maintenance tasks and should be investigated further. The cost savings are sufficient to warrant eventual adoption of these procedures.

General Technology: Work Tools **Code:** 14

Specific Description: Work tools include impact wrenches, grinders, small pumps, chain saws, wire rope cutters, cable cutters, come-a-longs, lift bags, abrasive wheel saws, drills, and small and large capacity power supplies. Tools or instruments that are an integral part of some other underwater technology are not considered here; such as NDT tools, hull cleaning tools, and welding tools. Although underwater tools can be powered pneumatically and electrically, the hydraulic power tools are more often preferred and readily available. Available hydraulic tools from Stanley Inc. are shown in Figure 4-7.

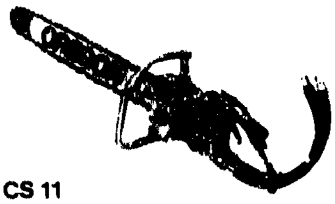
A. Status: X **Operational (see par. B)** X **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: Work tools used by divers have evolved in response to tasks previously performed above water. Initially pneumatic tools were used, but now hydraulic tools, with their greater power, less dangerous power lines, and absence of air bubbles, are more commonly used (BID 114, 162, 195, 204, 210). The U.S. Navy has supported research for work tools at Battelle Columbus Laboratory and at the Naval Coastal System Center in conjunction with the Experimental Diving Unit. These efforts have resulted in a complete diver work tool kit which is available to the fleet. The commercial sector has also developed tools in direct response to the offshore industries increased use of divers to work underwater. The motivation by divers to get a job completed is very high and is the driving force behind many adaptations, modifications, and newly constructed tools for a specific job.

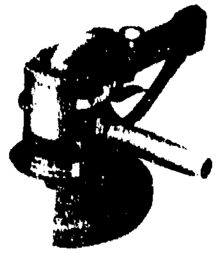
C. Research Underway for Advancing Technology: The Naval Coastal System Center is currently working on new work tools for the Navy's diver tool kit and experimenting with modifications to existing tools in order to increase their power and make them easier to use (BID 159, 162). Other research supported by the Navy is directed at developing a hydraulic vane motor using pressurized sea water as the working fluid. Commercial firms engaged heavily in diving are also funding in-house research to improve the operating efficiency of work tools by reducing maintenance and increasing versatility. All of these research efforts also have a constant objective of making the tools safer and lighter.

D. Application to Preservation, Maintenance and Repair: Work tools are primarily used for maintenance and repair tasks that involve on site mechanical or electrical changes, or the replacement of some structural component

UNDERWATER TOOLS



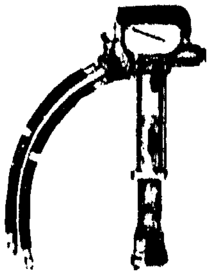
CS 11



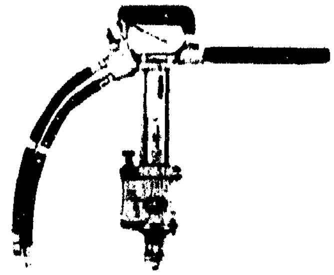
GR 24

IW 22

IW 32



CH 18



HD 20

IW 23

SC 10

CO 08

IW 06

CO 23

IW 13

CO 24

IW 20

DL 22

SPECIFICATIONS

MODEL	CS11	CH18	CO08	CO23
Capacity	24", 30", 36", 43" bar lengths	2-1/2" shank x .580 hex	8" wheel	10" wheel
Weight	14 lbs./6 kg.	24 lbs./10.9 kg.	16 lbs./7 kg.	23 lbs./10.5 kg.
Length	17 in./43 cm.	20 in./50.8 cm.	26 in./64 cm.	19.5 in./49.5 cm.
Width	9 in./23 cm.	3 in./7.6 cm.	6.5 in./16.5 cm.	11 in./28 cm.
Pressure	1500-2000 psi 105-140 bar	1500-2000 psi 105-140 bar	1000-2000 psi 70-140 bar	1500-2000 psi 105-140 bar
Flow Range	10-14 gpm 38-53 lpm	7-9 gpm 26-34 lpm	7-9 gpm 26-34 lpm	10-15 gpm 38-57 lpm
Optimum Flow	14 gpm 53 lpm	8 gpm 30 lpm	8 gpm 30 lpm	15 gpm 57 lpm
Porting	1/2 SAE	3/8 SAE	3/8 NPT	1/2 SAE
Hose Whips	Yes	Yes	No	Yes
Connect Size and Type	1/2 male pipe hose end	3/8 male pipe hose end	3/8 NPT in handle	1/2 male pipe hose end
Hyrevz Motor	03272		02979	integral

Figure 4-7 Hydraulic underwater work tools

or electrical item. Tools are used to remove sea chest grates, cut away torn hull plating, straighten propellers, attach sacrificial zinc anodes, prepare metal edges for welding, and grind weld build up down to a finished dimension.

E. Advantages of Technology: Work tools permit divers to perform maintenance and repair on a ship and thus avoids drydocking. Most tools are made nearly neutrally buoyant so they are easy to carry. The use of hydraulic power eliminates the danger of high air pressure or exhaust bubbles from pneumatic power sources. The improved designs now available have simpler controls and require little maintenance.
Disadvantages: As with all power tools there is the danger of injury to a diver who is already working in a potentially hazardous environment. Electric shock from tools operating on high voltage or current is another source of injury. The sea water environment is very corrosive and so tools must be manufactured from more expensive materials.

F. Problem Areas and Anticipated Difficulties: When divers are issued work tools on a particular job they should understand exactly what they are to do. Removal of the wrong piece of hull structure or the cutting of a strength member can cause unnecessary repairs and delays. A torque wrench or impact wrench in the hands of an inexperienced worker can strain or weaken fasteners in such a way that is not immediately obvious. Only later with the influence of ship loads and sea water corrosion does an unexpected failure occur. The use of several divers, each with one or more hydraulic tools, can produce a dangerous maze of hydraulic lines and umbilicals.

G. Proposed Remedies: Work tools should be used only by experienced personnel under constant supervision by the diving supervisor or dive team leader. Jobs should be discussed before going overboard and they should be coordinated in a sequence that reduces the number of divers and tools in the water at any particular time. When a diver returns from completing a job he should be debriefed to ascertain that the job was completed and that the tools used were operated as planned.

H. Training Requirements for Operator/Diver: Only experienced divers should receive training with underwater work tools, because once on the job site the diver's concentration should be on handling the tool and not on his diving gear. Training should progress from dry land, to a well lighted pool or tank, to a clear and protected body of water. General training with most tools should be augmented with intensive special training on a selected number of tools. This would permit the diving supervisor to assign personnel to particular jobs where their skill level was highest.

I. Safety Precautions and Logistics: Work tools operating at high rpm and/or pressure are a possible source of injury to the diver and damage to the vessel. The diving supervisor should inspect all tools before they are issued to divers on each work shift. Tools needing repair or adjustment should be disabled to prevent their unauthorized use. Protective shields and guides, electrical grounding, and rugged power coupling joints can all contribute to a safe work site.

J. Environmental Impact: ___Yes X No
Leaks in hydraulic lines can cause oil pollution to a small degree. The accumulation of expendable accessory to work tools such as drill bits and grinding discs can create a local "dump" at work sites.

K. Estimated Costs: The following are representative prices of three underwater work tools in the 1980 Stanley Hydraulic Tool Catalog. 7" Wheel Grinder, GR24, $1100.00, 1" Sqr. Drive Impact Wrench, IW22, $2300.00, Scaler, SC10, $800.00.

L. Recommendations: Work tools can contribute directly to the drydock extension concept by allowing divers to perform maintenance and repair work normally performed in a drydock. The versatile tools available plus the "can do" attitude of most divers has resulted in an increasing number of jobs that can be done underwater. Continued research support by the U.S. Navy, the Maritime Administration, and private industry should produce a greater variety of tools that will increase the divers capabilities.

General Technology: Welding Code: 15

Specific Description: Underwater welding for ship repair can be done in the dry environment of a habitat or cofferdam or in the wet environment of sea water, using electric arc electrodes. The welding technique is similar to surface welding in that a bead of molten metal is laid along a prepared joint of two surfaces. A remote controlled welding unit is shown in Figure 4-8.

A. Status: X Operational (see par. B) X Under Development (see par. C)

B. Present 1980 State-of-the-Art: The demand for underwater welding in joining offshore pipelines in place on the ocean floor and in repairing offshore platforms has resulted in various techniques and procedures (BID 114, 143, 235). Many of these techniques have been adopted for ship repairs by the U.S. Navy and the maritime industry. Welding is used to replace damaged plates, rope guards, sacrificial zinc anodes, repair bilge keels, and repair gauges and tears in the hull, rudder, and propeller (BID 58, 62, 63, 64, 147). The best quality welds, in terms of porosity and brittleness, are obtained when the welding is done inside the dry atmosphere of a cofferdam or habitat enclosure. Although such an atmosphere can still produce hydrogen contamination, the cool down time is comparable to a surface weld. Wet welding yields joints of equal or higher tensile strength, but ones that are often porous and have only 80% of the ductility of a surface weld. This, the result of the rapid sea water quenching. Automatic welding machines are now available which requires a diver simply to locate the machine over the joint and then a topside operator controls the current, feed wire and movement of the machine (BID 192).

A weld head set up
will be illustrated as shown

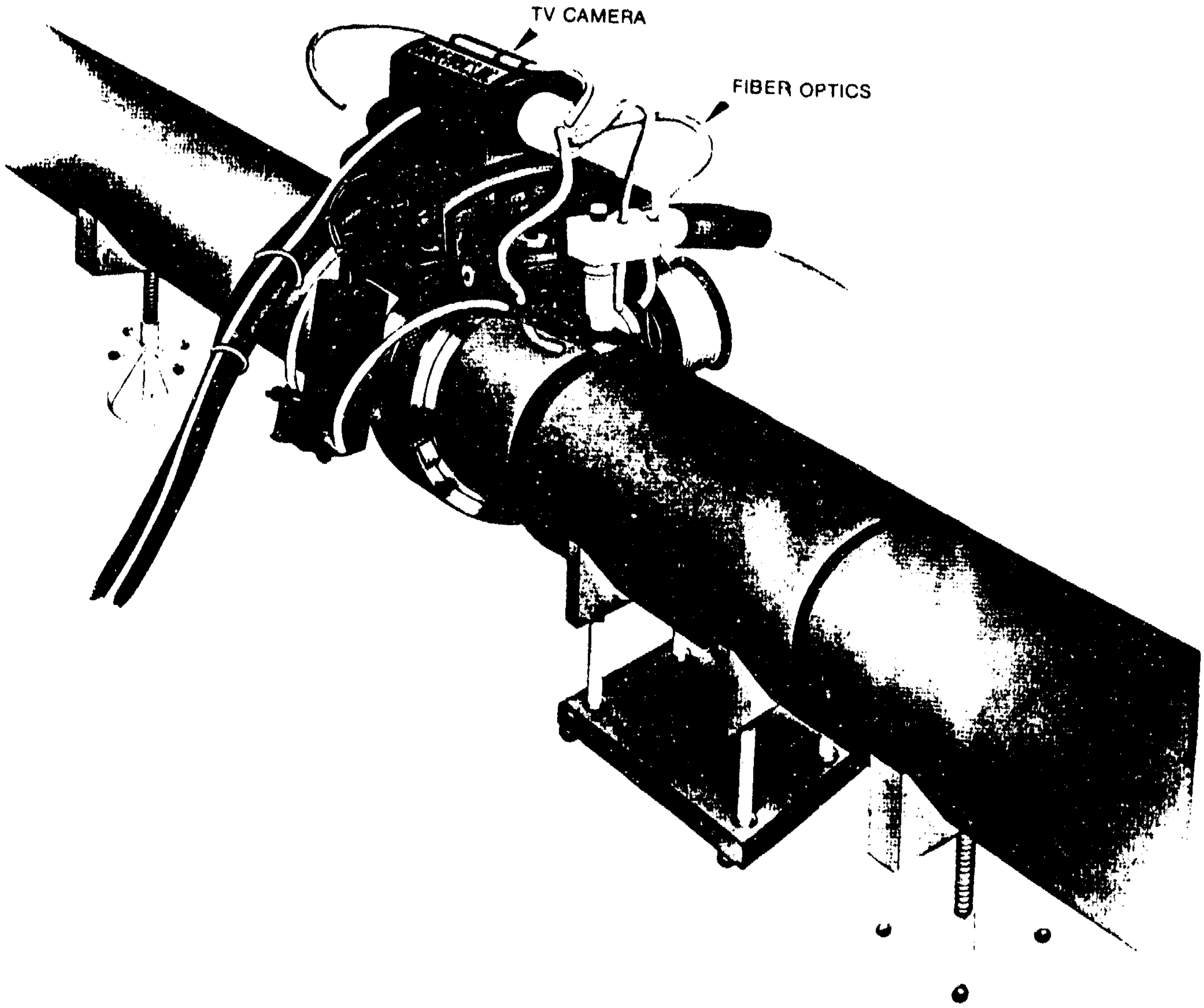


Figure 4-8   Remote controlled welding.

C. Research Underway for Advancing Technology: Research in underwater welding is concentrated on improving the quality of a conventional weld and on developing new high temperature welding tools (BID 55, 164, 186). By preparing the electrodes with special covering materials the porosity and hydrogen contamination will hopefully be reduced. The creation of a small dry zone around the tip of the conventional electrode or feeder wire can give the weld metal a few more seconds of cooling before the quenching action begins. Welds with greater ductility is the goal of these efforts. Electron beam welding and laser beam welding are also being studied. Laser beams using carbon dioxide and yttrium-aluminum-garnet have made laser applications to welding cutting, boring, and heat treating feasible. The accuracy of a laser beam in the highly refractive sea water medium is still to be determined.

D. Application to Preservation, Maintenance and Repair: Welding is an essential element in the maintenance and repair of ships, extending from the simple attachment of a sacrificial zinc anode to the replacement of entire sections of hull plating. The reinforcing of structural members by welding on additional material or load carrying members has often been used to extend the service life of a ship, or at least to enable it to complete its journey. Tailshaft repair, whether conducted in a machine shop or in the shaft alley, depends on careful welding of new metal to damaged or worn surfaces. The welding of hull cracks can often return the plating to a serviceable condition.

E. Advantages of Technology: Underwater welding allows a diver to repair a ship without the need of a drydocking. Work can usually be accomplished in a matter of hours or days so that costly delays are avoided. Welding inside a dry cofferdam or habitat can yield welds of top quality which can be certified as permanent repairs.
Disadvantages: Wet welding produces a more brittle seam than one performed in air. Welding is a skill acquired with training and practice so that not just anyone on a dive team can be expected to carry out weld repairs. To establish the quality of weld repairs, NDT inspection is often necessary.

F. Problem Areas and Anticipated Difficulties: When welding repairs must be done without the benefit of a cofferdam or habitat, the problem of visibility arises. The initial weld passes can be guided by the groove along the joint, but later passes require the diver to guide the electrode. Stray currents from improper grounding can cause corrosion of the hull plate while welding repairs are underway. Welding on the flat bottom of the hull may result in the accumulation of hydrogen gas which can contaminate the weld and is an explosion hazard. The orientation of the weld joint can cause the diver to put down a less than quality bead.

G. Proposed Remedies: The problem of visibility may be controlled with proper lighting or the use of a clear water bag taped around the joint area. Clear fresh water could be pumped into the bag to give the diver a clear view of the weld seam. The selection of electrodes especially prepared for wet welding can contribute both to the quality of the weld and the generation of hydrogen gas. To avoid stray current corrosion the welding machine current returns should be isolated and the machine itself should be grounded. The training of diver/welders should include procedures to overcome the difficulty of welding vertical and overhead joints.

H. Training Requirements for Operator/Diver: Underwater welders are sometimes experienced welders that have been trained to be divers and sometimes experienced divers who have been trained to be welders. Both types should receive intensive welding training in air, inside a water filled tank or pool, and in protected sea water sites. New welding machines that reach commercial status should be used in this training so that the best available equipment is used by skilled operators. ABS certification of all welders would be desirable.

I. Safety Precautions and Logistics: Surface preparation tools such as grinders should be handled carefully. The hazard of electric shock or heat burn is always present in underwater welding and can be overcome only by maintaining equipment in good condition and by initial and review training sessions. Logistics support of welding will at least demand a portable generator with controls and sufficient cable to reach the weld joint. When cofferdams or habitats are employed then a work barge with a crane will have to be moored alongside the ship being repaired.

J. Environmental Impact ___Yes _X_No

K. Estimated Costs: None.

L. Recommendations: The present and developing technology of welding contributes to an extension of drydock inspection by permitting in-water repairs of serious deficiencies. Ship owners/operators should keep abreast of the latest developments in underwater welding. Underwater welding is now considered a temporary repair, not a permanent one.

General Technology: Marine Engineering **Code: 16**

Specific Description: Marine engineering encompasses techology associated with ship design and construction that facilities underwater preservation, maintenance, and repair. It also includes other marine engineering structures such as mini-drydocks and cofferdams that allow a ship to remain afloat while work is performed on it.

A. Status: _X_ **Operational (see par. B)** _X_ **Under Development (see par. C)**

B. Present 1980 State-of-the-Art: The listing of vessels up to 10° in order to expose the hull down to the turn of the bilge has been a routine practice since 1975 in Las Palmas, Canary Islands (BID 59, 134). Tipping of ships from bow to stern to expose the bulbous bow and the propeller has also become a routine afloat procedure that facilitates preservation, maintenance, and repair (BID 57, 131). Such measures can only be undertaken with ships designed and constructed to withstand high compressive loads in their bulkheads and whose machinery is not damaged by such shifts in ballast. Custom made and standard all purpose blanking flanges are available now that permit divers to seal off sea chests and other through hull fittings and so permit servicing of sea valves and other machinery which is normally exposed to sea pressure while a ship remains afloat. The fabrication of templates, cofferdams, dry boxes, and habitats has reached a stage where ship repairs normally requiring a drydock, are now performed in the water (BID 141). Sea chest grates are now being installed with hinges and lifting pads are being welded to the hull at the stern. These and other measures increase the number of jobs which a diver can do safely and efficiently. Some ship owners/operators have grid lines painted in white on the flat bottom of the hull while others are relying on acoustic beacons or remote controlled vehicles to improve navigation on the underside of a ship. Mini-drydocks have also been constructed which can be floated up onto a ship, sealed, pumped out, and one has a drydock work platform around the bow or stern of a ship.

C. Research Underway for Advancing Technology: Research by the U.S. Navy and the Research Institute of Norway will advance marine engineering. The Navy has programs for developing stronger and lighter materials for shipbuilding. Some of these candidate materials would be less sensitive to the rapid quenching of wet welding. Overseas cooperative research efforts are developing improved blanking flanges and techniques for performing underwater repairs. Commercial firms here in the United States are conducting research to modify existing ship equipment so that repairs can be more easily performed on the ship while it remains afloat.

D. Application to Preservation, Maintenance and Repair: Marine engineering as described in paragraph B is directed at facilitating preservation, maintenance, and repair activities while the ship remains afloat. The listing and tipping procedures are used for hull cleaning and painting while blanking flanges, hinged grates, and lifting pads are used for maintenance and repairs. Cofferdams, dry boxes, and habitats are used for ship repairs requiring welding.

E. Advantages of Technology: The measures described above avoid a drydocking which is often inconvenient and always expensive. Preservation, maintenance and repair procedures which previously required a nonprofitable rerouting to a shipyard can now be performed at stations located along the major transit routes of shipping.
Disadvantages: The quality of preservation, maintenance and repair work may not be as high as in some drydocks where quality control is stressed. Underwater procedures may discourage shipyards from upgrading or enlarging their drydock facilities.

F. Problem Areas and Anticipated Difficulties: Marine engineering techniques which are appropriate for some ships may cause structural damages which may go undetected and cause a catastrophic failure during a storm.

The leaking of a blanking flange while a sea valve is open for examination would flood the ship and possibly result in engine damage or even sinking.

G. Proposed Remedies: Classification societies and the USCG should review marine engineering procedures and identify ship classes not eligible for certain procedures. Operators/owners may want to invest additional funds to have custom fabricated blanking flanges available for several sister ships, rather than rely on standard general purpose flanges.

H. Training Requirements for Operator/Diver: The captain of a ship should learn just how far he can shift ballast on his own ship or on other ships he might command. Divers will require special training on how to install and check the seal of blanking flanges. The use of underwater lifting equipment and attachment points will also require special training for divers.

I. Safety Precuations and Logistics: The very safety of the ship and its entire crew must be considered before commencing unusual sea keeping conditions. As already mentioned flooding and sinking must be avoided while performing underwater repairs. Support barges will be required whenever major jobs such as hanging a propeller or rudder while the ship remains afloat.

J. Environmental Impact: ___Yes _X_No

K. Estimated Costs: In 1977 an in-water survey, hull cleaning and painting cost $17,000 for a 130,000 DWT vessel, as opposed to $116,000 for the same work in a drydock.

L. Recommendations: Ship owners/operators, classification societies, and commercial firms should participate actively in conferences or symposiums to exchange knowledge and develop safety standards for all afloat procedures. The economic incentive exists to adopt these new procedures, but there should also be motivation to avoid any tragic consequences.

SECTION 5 - CONCLUSIONS

Underwater Inspection

An inspection process that relies primarily on visual examination of underwater surfaces will be affected by the turbidity of the water and available illumination. At present there is no easily applied turbidity index or scale that could be used to determine whether or not an inspection should be conducted in a particular body of water on a particular day. The attenuation of light transmission in water is both general and selective. Surfaces that appear obscure and without color under one type of light source, can appear very clear and exhibit true colors under another light source. Careful selection of the light source and the optical lens system of underwater cameras can often yield a sharper image on the monitor screen than that perceived by the diver.

Recognizing that underwater visibility will be a limitation that may exclude certain sea ports as sites for underwater inspections, the U. S. Coast Guard can expect that underwater visual inspection of a ship is feasible. To examine large surface areas in a reasonable period of time may require remote controlled vehicles, while divers with helmet mounted or hand-held cameras can transmit the visual information from confined areas such as sea chests and around the propeller and rudder. Color still photographs which contain even more detail can be used to support opinions that repairs are or are not required.

The quantitative measurements of plate thickness, clearances, wear, and crack length will also be affected by visibility, but to a lesser degree. If the diver's location can be made independent of visibility through acoustic beacons or hull grid lines, ultrasonic gaging and feeler gage measurements can be performed in very poor visibility. The ultrasonic gage readout can be transmitted to a topside display and tactile identification of the feeler gages will allow the diver to measure without needing to see. Detection of a crack will be difficult under poor visibility, but once detected, the length of the crack can be determined by magnetic particle inspection or eddy current techniques which are both independent of visibility; one because of the ultraviolet light and close working distance, and the other because the instrument readout can be displayed on deck. The confidence in decisions based on underwater visual examinations will increase as experience is gained both by the divers and the topside inspector.

Underwater Preservation, Maintenance, and Repair

Control of corrosion and fouling is now feasible with existing techniques of underwater preservation and maintenance. Such techniques require protected water with little wave action to allow the ship to be listed or tipped and to create a safe work site for divers and support vessels. Not all ships will be able to adopt such techniques due to limitations of the ship itself, caused by design or age. Since the ship's age will be a consideration in permitting an underwater inspection, it may result that all ships allowed to submit to an underwater inspection will also have the capability of adopting underwater preservation and maintenance techniques.

Ship repairs involving welding, cutting, and metal replacement can be performed while a ship is afloat. Temporary repairs can be performed in the wet environment while permanent repairs require the use of dry boxes, cofferdams, habitats or mini-drydocks. The limitations on such repairs will depend on the extent of damage and the experience and ingenuity of the repair crews. As experience is gained in underwater repairs, the quality of repairs will improve, and more ships will be willing to undergo underwater repairs.

The environmental impact of any of the underwater technologies described for inspection, preservation, maintenance, and repair appears to be minimal. Underwater work can leave some oil and debris at the site, and can become a problem if a large number of repairs are performed during a short period of time. The Environmental Protection Agency has registered at least one organotin antifouling paint, but the U.S. Navy is still evaluating the pollution potential of these paints before approving them for fleet use. Therefore, the environmental impact of organotin paints is still an unanswered question.

SECTION 6 - RECOMMENDATIONS

Underwater Inspection

Since the underwater inspection depends on several factors, the U. S. Coast Guard should take a more active role in areas usually left to the drydock operator or ship owner.

1. The U. S. Navy work on evaluating underwater light sources, cameras, and remote controlled vehicles should be monitored by the Coast Guard.

2. The development of underwater diver locating systems should be continued. The technology exists today, but there is a lack of actual in use experience.

3. The accuracy and reliability should be determined for underwater inspection instruments such as ultrasonic gages, radiographic NDT, magnetic particle inspection and eddy current inspection. The error in readings attributed to the diver handling techniques should be separated from the error attributed to the instrument itself.

Within the Coast Guard itself, the training of inspectors should be augmented to cover the following topics:

1. Planning an underwater inspection and instructing a diver beforehand.

2. Interpretation of visual images on the monitor of CCTV, still color photographs, and stereo photographs.

3. Recognition of preferred underwater inspection equipment and equipment unacceptable for such work.

Finally, it is recommended that underwater inspection be adopted for a trial period at one or two MIO/MSO seaports. These inspectors should receive some additional training and diving firms with experienced personnel should be identified. To avoid a large number of applications from ship owners/operators, a restrictive set of acceptability guidelines for vessels should be prepared and published.

Underwater Preservation, Maintenance and Repair

In order for more ships to take advantage of underwater techniques of preservation, maintenance, and repair, limitations imposed by the ship itself should be removed. During new construction, the design and fabrication plans should include consideration of the underwater techniques. The ship's structure can be built to withstand the stresses from listing and trimming, and the piping and valve system can be optimized to increase ballast control. Sea chests should be fitted to make installation of blanking flanges an easy task for divers, and lifting pads should be installed in the stern to facilitate handling of the propeller and rudder. Ships already in service could be refitted at the drydocking prior to a period of anticipated underwater inspections.

The owners/operators of ships should become familiar with underwater techniques and determine which are applicable to their own ships. Each ship should carry on-board a set of guidelines for employing underwater techniques and keep careful records of any work performed on the ship while it was afloat. If a vessel has been painted or "marked" to facilitate underwater inspection, a diagram of the markings should be kept on board the vessel. Symposia on ship operations should attempt to have at least one session devoted to underwater preservation, maintenance, and repair. Through such exchanges of information and experience, the entire maritime industry can benefit from lower operating costs without jeopardizing ships or crews.

Further Efforts

The U. S. Coast Guard should prepare a set of procedures and guidelines for conducting an underwater inspection. These procedures and guidelines should then be used in a demonstration exercise wherein a commercial vessel would undergo an underwater inspection. A detailed report would be prepared of this inspection, identifying problems encountered and suggested remedies. This same ship would then be drydocked within a reasonable time frame, during which a careful record of the ship's route and activities would be maintained. The drydock inspection report would also be very detailed and formatted to permit easy comparison with the underwater inspection report. This comparison would identify deficiencies and advantages of the underwater inspection and the careful record of the ship's activities in the interim period might be used to explain some discrepancies in the two reports. On the basis of this evaluation, the underwater procedures and guidelines could be revised and distributed to the MIO/MSO personnel that would be involved in underwater inspections during the trial period.

APPENDIX A

INFORMATION SOURCES

FEDERAL

Civil Engineering Laboratory
Naval Construction Battalion Center
Port Hueneme, CA 93043

DTNSRDC
Annapolis, MD 21402

Office of the Federal Register
Department of Commerce
Washington, D. C.

Foreign Patents Office
2021 Jefferson Davis Highway
Arlington, Va.

Library of Congress
Washington, D. C.

National Technical Information Service
U. S. Department of Commerce
Springfield, VA 22161

Naval Coastal Systems Center
Panama City, Florida 32401

Naval Surface Weapons Laboratory
White Oak, Maryland

NAVSEA
Crystal Mall #2
Washington, D. C. 20362

Navy Experimental Diving Unit
Panama City, Florida 32407

USCG, Hqtrs
Washington, D. C. 20593

USCG, Offices of Marine Inspection
a. Baltimore, Md.
b. Long Beach, CA
c. Norfolk, VA
d. Seattle, WA
e. Portland, OR
f. San Diego, CA
g. San Francisco, CA

USCG
R&D Center
Groton, Connecticut 06340

USCG
Reserve Training Center
Yorktown, VA 23690

U. S. Government Printing Office
Superintendent of Documents
Washington, D. C. 20402

U. S. Naval Research Laboratory (NRL)
Washington, D. C.

COMMERCIAL

American Bureau of Shipping
65 Broadway
New York, N. Y. 10006

Aqua Vision
1761 Fort St.
Lincoln Park, MI 48146

Aqua-Air Industries
221 Bark Drive
Harvey, LA 70059

Bear Paw Magnetic Tools
673 Berger Way
Sparks, NV 89431

Benthos, Inc.
Edgerton Drive
North Falmouth, MA 02556

Birnes Oceanographics, Inc.
P. O. Box 24-B-78
Los Angeles, CA 90024

Butterworth Systems, Inc.
Ave. J and East 22nd St.
P. O. Box 9
Bayonne, N. J. 07002

Cavico, Inc.
328 3rd St.
Alexandria, VA 22314

Cohu, Inc.
5725 Kearny Villa Rd.
San Diego, CA 92123

Continental Diving Service, Inc.
P. O. Box 2484
Morgan City, LA 70381

Daedalean Associates, Inc.
15110 Frederick Rd.
Woodbine, MD 21797

DESCO Corporation
240 N. Milwaukee St.
Milwaukee, WI 53202

Detek, Inc.
685 Cooleridge Dr.
Camp Springs, MD 20031

DIALOG
Rockville Library
Rockville, MD 20852

Dimetrics
16630 Schoenborn
Sepulveda, CA 91343

Edo Western
2645 South 300 West
Salt Lake City, Utah 84115

Engineering Societies Library
345 East 47th Street
New York, N. Y. 10017

Exxon International
1251 Avenue of the Americas
New York, N. Y. 10019

Fathom 36
P.O. Box 12825
Salem, Oregon 97309

B. F. Goodrich
500 South Main Street
Dept. 0751, Bldg. 24B
Akron, Ohio 44318

Global Cathodic Protection, Inc.
5109 Ashbrook
Houston, Texas 77081

Hydro Products, Inc.
Box 2528
San Diego, CA 92112

International Paint Co.
3105 Lorena Avenue
Baltimore, Maryland 21230

Interocean Management Corporation
Suite 215
400 Oceangate
Long Beach, CA 90802

Jay-May Engineering Services
1910 Milan Place
San Pedro, CA 90732

Jotun-Baltimore Copper Paint Co.
501 Key Highway
Baltimore, MD 21230

Kinergetics, Inc.
6029 Resada Bldg.
Tarzana, CA 91356

M & E Marine Supply Co.
Box 601
Camden, N. J. 08101

M & T Chemicals, Inc.
Rakway, N. J. 07065

Magnaflux Corp.
7300 W. Lawrence Ave.
Chicago, Illinois 60656

Marine/Engineering Log
350 Broadway
New York, N. Y. 10013

Maritime Assoc. of the Port of
New York
80 Broad Street, 34th Floor
New York, N. Y. 10004

Mitsubishi Heavy Industries Ltd.
277 Park Avenue
New York, N. Y. 10017

Mobay Chemical Corporation
Plastics & Coatings Division
Pittsburgh, Pennsylvania 15205

National Association of Corrosion
Engineers
P. O. Box 218340
Houston, Texas 77218

NORTEC
3001 George Washington Way
Richland, WA 99352

Panametrics
221 Crescent Street
Waltham, MA 02154

Rebikoff Underwater Products, Inc.
3060 S. W. 4th Avenue
Ft. Lauderdale, Florida 33315

Reimers Consultants
6269 Leesburg Pike
Falls Church, VA 22044

Remote Ocean Systems, Inc.
5111 Santa Fe Street, Suite L
San Diego, CA 92109

Rhode Island Marine Services, Inc.
P. O. Box 209
Snug Harbor, R. I. 02880

Seaward Marine Services, Inc.
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Norfolk, VA 23513

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One World Trade Center
New York, N. Y. 10048

Sound Wave Systems, Inc.
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Bldg. 1, Suite 102
Costa Mesa, California 92626

SSM Corporation
8930 Lawndall
Houston, Texas 77012

Stanley Hydraulic Tools
3810 S. E. Naef Rd.
Milwaukee, OR 97222

Sub Enterprises, Inc.
P. O. Box 16531
17865 Skypark Circle Drive, 18K
Irvine, CA 92713

Subsea Products, Inc.
1006 West 15th Street
Riviera Beach, Florida 33404

Sylvester Underseas, Inc.
900 Hingham Street
Rockland, Massachusetts 02370

Taylor Diving & Salvage Company
P. O. Box 795
Belle Chasse, LA 70037

Teledyne Camera Systems
131 North 5th Street
Arcadia, CA 91006

Telestar Electronics Corporation
700 Hummel Avenue
Southhold, New York 11971

Tetra Tech, Inc.
630 North Rosemead Boulevard
Pasadena, California 91107

U. S. Divers Company
3323 W. Warner Avenue
Santa Ana, CA 92702

U.S. Nemrod, Inc.
P. O. Box 457
25 Bernhard Road
New Haven, CT 06473

UPA Technology, Inc.
60 Oak Drive
Syosset, New York 11791

Underwater Construction Co.
1701 East 1st Avenue
Anchorage, Alaska 99501

Underwater Tools & Equipment Co.
999 N. Elm Street
Orange, CA 92667

Video Sciences, Inc.
21113 Superior Street
Chatsworth, CA 91311

WOMA Co.
242 S. Nicholas Avenue
South Plainfield, N. J. 07080

Ziff-Davis Publishing Co.
1 Park Avenue
New York, N. Y. 01016

FOREIGN

British Ship Research Assoc.
Wallsend Research Station
Wallsend Northumberland
England

Det Norske Veritas
P. O. Box 300
N-1322 HOVIK
Oslo, Norway

Lloyd's Registry of Shipping
17 Battery Place
New York, N. Y. 10004

Peters Divers Company Ltd.
P. O. Box 1028
Seroe Colorado
Aruba, Neth. Antilles

Phoceenne Sous-Marine S.A.
21, Boulevard de Paris
13002 Marseille (France)

Seatrade Publications Ltd.
Fairfax House
Colchester CO 1 1 RJ
Essex, England

Shimada Physical & Chemical
Industrial Co., Ltd.
Central P. O. Box 136
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The Glacier Metal Co., Ltd.
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BID EVALUATION FORMS

FEASIBILITY STUDY FOR

EXTENSION OF TIME BETWEEN DRYDOCKING

Contract: DTCG23-80-C-20009

Collated:

APPENDIX B - INSPECTION REQUIREMENTS BIDs

APPENDIX C - UNDERWATER TECHNOLOGY BIDs

APPENDIX D - STORED BIDs

By: Engineering Systems Company
10916 Middleboro Dr.
Damascus, MD 20750

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Form 1

BID EVALUATION

BID No. 1 File No. 1-I01.02

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Navigation and Vessel Inspection Circular No. 7-68
2. Title/Publisher: Notes on Inspection and Repair of Steel Hulls; DOT, USCG - Merchant Marine Technical Division
3. Publication Date: 10-68
4. Key Words/Descriptors: Steel Hulls, Inspection and Repair, Welds
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: It does, in some detail, tell "where to look", and "what to look for", but, in most cases does not tell the "how-to" look for.
6. Timeliness: ___ Outdated X Current ___ Future
   This 1968 circular is still in use by USCG inspectors.
7. Verity: Identified as a guide book by USCG inspectors at Baltimore and Norfolk.
8. Determination: ___ Store X Accept & Code
9. Comments: The inspector has total responsibility and must exercise his judgement, relying on his training and experience. This applies to the 25% corrosion allowance for hull plating and 20% allowance in the mid-ship hull plating.
10. Inspection Requirement Codes: 01, 02, ___, ___, ___,
11. Underwater Technology Codes: ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    1-I01.02

E. KAPP
Evaluator

5/6/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 2 File No. 2-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Inspection Book)
2. Title/Publisher: Small Passenger Vessel Inspection Book/DOT, USCG, CG-840T
3. Publication Date: February 1969
4. Key Words/Descriptors: Vessel Information/Condition of Vessel
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: A standard record book of inspection.
6. Timeliness: ___ Outdated X Current ___ Future
   In present use.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: X Store ___ Accept & Code
9. Comments: Does not list requirements for inspection of a ship during drydocking.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    2-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 3 File No. 3-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other USCG Inspection Book
2. Title/Publisher: Barge Inspection Book; DOT, USCG CG-840E (Rev. 6-67)
3. Publication Date: 6-67
4. Key Words/Descriptors: Barge Inspection Record
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: BID is an inspection record booklet listing items to be checked visually and the results of cited inspections. It first lists a vessel description, then it covers lifesaving equipment, fire protection equipment, emergency equipment, etc.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently in use by USCG.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: X Store ___ Accept & Code
9. Comments: This BID is part of the permanent record kept by the USCG of a vessel and is the basis for certifying the vessel fit for service. Not pertinent to drydock inspection.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    3-00-00

E. KAPP
Evaluator

5/3/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 4 File No. 4-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Inspection Book)
2. Title/Publisher: Hull Inspection Book/DOT, USCG - CG840T.
3. Publication Date: November 1980
4. Key Words/Descriptors: Vessel Inspection, Hull, Sea Valves
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Lists items for inspection of cargo, passenger, and miscellaneous ships.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: X Store ___ Accept & Code
9. Comments: Does not list requirements for drydocking.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    4-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 5 File No. 5-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other USCG Inspection Book
2. Title/Publisher: Hull Inspection Book - Condition of Vessel, DOT, USCG, CG-840A (Rev. 6-67)
3. Publication Date: 6-67
4. Key Words/Descriptors: Lifesaving equipment; Fire Protection equipment; Emergency equipment; Ventilation; Navigation equipment; Ground Tackle; Hulls, Decks, fittings, and watertight integrity.
5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: BID is an inspection record booklet listing items to be visually checked, and the results of said inspection not pertinent to drydock inspection.
6. Timeliness: __ Outdated X Current __ Future
   Currently used by USCG.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: X Store __ Accept & Code
9. Comments: This inspection does not require drydocking of the vessel.
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    5-00-00

E. KAPP
Evaluator

6/9/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 6 File No. 6-I99

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other USCG Inspection Book
2. Title/Publisher: Drydock Examination Book, DOT, USCG, CG-840H (Rev. 1-68)
3. Publication Date: 1-68
4. Key Words/Descriptors: Plate, gaging, sea valves
5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: BID is an inspection record listing items to be checked visually and/or other procedures performed, such as (at random), material thickness gaging, or sea valves opened for inspection, or other items operationally tested.
6. Timeliness: __ Outdated X Current __ Future
   In current use by USCG.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: __ Store X Accept & Code
9. Comments: This is the form used in the biannual inspection required for issuance of USCG certificates.
10. Inspection Requirement Codes: 99 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 00 , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    6-I99

E. KAPP
Evaluator

5/3/80
Date

DTCC23-80-C-20009
Form 1

BID EVALUATION

BID No. 7 File No. 7-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other USCG Inspection Book
2. Title/Publisher: Boiler Inspection Book - Condition of Vessel, DOT, USCG CG-840B (Rev. 4-58)
3. Publication Date: 4-68
4. Key Words/Descriptors: Propulsion Machinery, Boilers, Unfired Pressure Vessels
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: BID is an inspection record booklet listing items to be checked visually and the results of such inspection not pertinent to drydock inspection.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG.
7. Verity: Obtained directly from Baltimore OMI.
8. Determination: X Store ___ Accept & Code
9. Comments: Book lists items for inspector to check on propulsion machinery, boilers, and unfired pressure vessels.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , 00 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    7-00-00

E. KAPP
Evaluator

5/5/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 8 File No. 8-U01

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other Code of Federal Regulations
2. Title/Publisher: Federal Register Commercial Diving Operations - OS&H Requirements, Dept. of Labor
3. Publication Date: July 1977
4. Key Words/Descriptors: Commercial Diving Operations, Occupational Safety and Health Requirements, see (5) for other key words.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: This BID establishes safety and health standards for personnel and medical requirements, operations procedures, equipment procedures and requirements, and recording. Cross reference: Title 46, CFR 222, same subject.
6. Timeliness: __ Outdated X Current __ Future
   This BID references BID 9.
7. Verity: By its creation and publication this BID became its own verity.
8. Determination: __ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 01
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    8-U01

E. KAPP
Evaluator

05/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 9 File No. 9-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Register)
2. Title/Publisher: Federal Register/U.S. National Archives, Volume 42; No. 222
3. Publication Date: 11/16/78
4. Key Words/Descriptors: Diver's Equipment/Dive Procedures/Decompression Chambers/First-Aid
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity:
8. Determination: X Store ___ Accept & Code
9. Comments: Deals with Divers; Inspection & Operation of Equipment/Safety & Health Standards.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    9-00-00

PAUL DEFAYETTE
Evaluator

6/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 10 File No. 10-U05

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Magazine Article
2. Title/Publisher: Remote Control Vehicles Service Underwater Telephone Lines, SEA TECHNOLOGY, Page 14, Author: H. Osborn
3. Publication Date: February 1976
4. Key Words/Descriptors: Vehicles, Underwater, rescue, salvage, surveying, mining, locating and repairing underwater cables and pipelines.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Vehicles described in BID provide many extensions of man's arms and eyes. Adaptable to many lines of work.
6. Timeliness: ___ Outdated X Current ___ Future
   Current as of the publication date of the BID, at best; further checking needed.
7. Verity: Reportedly the equipment operates as designed - further check needed.
8. Determination: ___ Store X Accept & Code
9. Comments: Sounds like a handsome adjunct to existing inspection support equipment and for enlarging on popular systems now in use in hull cleaning.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 05, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    10-U05

E. KAPP
Evaluator

05/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 11 File No. 11-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Magazine Article

2. Title/Publisher: Deck Gear on the Job for Research & Industry, "Sea Technology"

3. Publication Date: 7-76

4. Key Words/Descriptors: Deck gear, availability, applications, manufacturers, capability of specific units.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: BID describes pieces of deck gear and cable, used in research, industry and commerce.

6. Timeliness: ___ Outdated X Current ___ Future
   All equipment is current as of publication date.

7. Verity: None

8. Determination: X Store ___ Accept & Code

9. Comments: Contains no information pertinent to project.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    11-00-00

E. KAPP
Evaluator

5/8/80
Date

DTCC23-80-C-20009
Form 1

BID EVALUATION

BID No. 12 File No. 12-U02

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Head Mounted TV Test & Evaluation, U.S. Naval Sea Systems Command; Barrett, F.B., NCSC/NAVSEA OOC

3. Publication Date: April 1978

4. Key Words/Descriptors: TV Monitor, Head mounted by diver, test and evaluation, methods, equipment.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Successful test results will establish methods of complying with Inspection Requirements, and use of said equipment advances known Underwater Technology.

6. Timeliness: ___ Outdated X Current ___ Future
Some equipment now in use; other equipment and methods continuing to be developed, expanded and developed.

7. Verity: A U.S. Navy report.

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 02 , ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
12-U02

E. KAPP
Evaluator

05/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 13 File No. 13-U13

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Hull Cleaning, Phocienne Sous-Marine S.A.
3. Publication Date: None - latest correspondence dated June 1976.
4. Key Words/Descriptors: Underwater Hull Cleaning, Brush Kart
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: BID is sales literature, heavy on the engineering specifications, describing use of manufacturer's equipment in four (4) styles; each covered thoroughly.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Manufacturers sales literature
8. Determination: ___ Store X Accept & Code
9. Comments: Recommend checking source in France and/or USA connections as listed in the brochure.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 13, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    13-U13

E. KAPP
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 14 File No. 14-U09

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: The Aqua Kleen Program, Underwater Tool & Equipment Co., Orange, CA

3. Publication Date: August 1975

4. Key Words/Descriptors: Hull cleaning, cost data, scrubbing units, accessories, and specifications.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: This BID discusses subject company's hull cleaning equipment and techniques for in-water cleaning.

6. Timeliness: ___ Outdated X Current ___ Future
Latest dated literature is 1975, update required.

7. Verity: Advertising which requires checking.

8. Determination: ___ Store X Accept & Code

9. Comments: This BID is sales literature of a company primarily manufacturing brush heads for the smaller, single brush cleaning units.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 09 , ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
14-U09

E. KAPP
Evaluator

05/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 15 File No. 15-U12

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Barnacle Bill. Rhode Island Marine Services, Inc.

3. Publication Date: Unknown

4. Key Words/Descriptors: Aqua/Sonic Hull Tender, marine growth retardant.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID proposes that this equipment is at least an addition to the state-of-the-art in hull cleaning.

6. Timeliness: ___ Outdated X Current ___ Future
   Update check required.

7. Verity: Possibly, the U.S. Navy use of this gear would substantiate the alleged facts.

8. Determination: ___ Store X Accept & Code

9. Comments: U.S. Navy uses this equipment.

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 12

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    15-U12

E. KAPP
Evaluator

05/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 16 File No. 16-U02.03

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Undersea Strobe Light, Subsea Products, Inc.
3. Publication Date: None. Latest correspondence dated July 1975
4. Key Words/Descriptors: Underwater Strobe Light, accessories, i.e., strobe lights, handling equipment, cameras, case, power PAK
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: BID is sales literature with operating specifications and technical data about the equipment.
6. Timeliness: ___ Outdated X Current ___ Future
   Recheck required on company and their equipment.
7. Verity: Referenced data by manufacturer must be rechecked.
8. Determination: ___ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 03, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    16-U02.03

E. KAPP
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 17 File No. 17-U06

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other Cataloging
2. Title/Publisher: Ultrasonic Thickness Gages, Panametrics, Waltham, Mass.
3. Publication Date: 7-79
4. Key Words/Descriptors: Ultrasonic Thickness Gages, on land or in water, specifications.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: This BID responds to Inspection Requirements on material thickness; one group of gages used "dry", another set used underwater.
6. Timeliness: __ Outdated X Current __ Future
   Present BID less than 1 year old.
7. Verity: Advertising.
8. Determination: __ Store X Accept & Code
9. Comments: This BID is sales literature. No advance in the state of the art.
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 06 , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    17-U06

E. KAPP
Evaluator

05/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 18 File No. 18-U01.04

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Ultrasonic Communication System, Simada Physical & Chemical Industrial Co. Ltd., Tokyo, Japan.
3. Publication Date: None. Latest correspondence May 1970.
4. Key Words/Descriptors: Underwater Ultrasonic Communication System, Voice and telegraphic and Homing Signal.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: BID is sales literature with operations, applications and technical data.
6. Timeliness: ___ Outdated X Current ___ Future
   Check required on company and their equipment.
7. Verity: Referenced data by manufacturer must be rechecked.
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 01, 04, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    18-U01.04

E. KAPP
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 19 File No. 19-U02

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other Catalog
2. Title/Publisher: Surveyor, Dual Purpose Work TV System, Hydro Products, San Diego, Ca.
3. Publication Date: July 1976
4. Key Words/Descriptors: Dual Purpose Work TV Systems, camera, control unit.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: This BID presents the subject company's underwater TV camera and control unit for either inspections or work duty underwater. Camera mounts to diver's helmet and can be hand held.
6. Timeliness: __ Outdated X Current __ Future
   Update needed, assuming currency, the equipment is available for consideration within the scope of ESCO's contract assignment.
7. Verity: Earlier models have been in service for up to 15 years, therefore, we should assume the facts in evidence in the brochures.
8. Determination: __ Store X Accept & Code
9. Comments: (Commercial) Unit now in exclusive one year manufacturing phase for U.S. Navy. Hydro Products also mfg. a remote controlled vehicle which carries camera and lights (tethered unit).
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 02, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    19-U02

E. KAPP
Evaluator

05/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 20 File No. 20-U00

1. Type: X Report __ Article __ Advertising __ Trip Report __ Questionnaire __ Other __

2. Title/Publisher: Effects of Bottom Maintenance on Frictional Resistance of Ships, T&R Report R-18, SNAME, N.Y., N.Y.

3. Publication Date: February 1975

4. Key Words/Descriptors: Hull maintenance, frictional resistance of ships.

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology

   Specify: Many pertinent references are cited, and conclusions drawn on the state of the art as of 1975.

6. Timeliness: __ Outdated X Current __ Future

7. Verity: SNAME

8. Determination: __ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 00

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    20-U00

F. MATANZO
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 21 File No. 21-U10

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Development of a CAVIJET SYSTEM (TM) for Removing Marine Fouling and Rust. 3rd International Jet Cuttings Symposium, 11-13 May 1976, Chicago, Ill. Authors: A.F. Conn, S.L. Rudy, G.D. Mehta
3. Publication Date: May 1976
4. Key Words/Descriptors: CAVIJET SYSTEM (TM), Removal of Marine Fouling and Rust, Jet Cutting Technology.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: BID discusses cause and effect of fouling and rust plus description of and test results from the CAVIJET SYSTEM testing.
6. Timeliness: ___ Outdated X Current ___ Future
   As of 1976. Reexamination of the brochure and contact with the company will provide needed updating.
7. Verity: Sales literature
8. Determination: ___ Store X Accept & Code
9. Comments: Performance should be determined from U.S. Navy, Diving Training Unit, Panama City.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 10 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    21-U10

E. KAPP
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. ~~2~~ File No. 22-U02,06

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ______

2. Title/Publisher: Shortcomings of Offshore Subsurface Engineering Inspections, SNAME, Vol. II, No. 1, Pages 19-30

3. Publication Date: January 1974

4. Key Words/Descriptors: Undersea inspections, towers, man-made islands, ships, etc., investigations after accidents, towing accidents, ineffectual engineering of towers, etc.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID heavily criticizes present inspection practices of towers, ships, etc., and, ascribes to the present practices the many losses experienced since 1955. The author is highly critical of design, construction, inspection, towing, erecting, insurance practices; he hits it all.

6. Timeliness: ___ Outdated X Current ___ Future
   This article is 6 years old.

7. Verity: Published by Society of Naval Architects and Marine Engineers.

8. Determination: ___ Store X Accept & Code

9. Comments: ______

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 02 , 06 , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    22-U02,06

E. KAPP
Evaluator

05/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 23 File No. 23-U09

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Hull Cleaning for Fuel Conservation in the U.S. Navy. David W. Taylor, Naval Ship Research and Development Center, Annapolis, Md.
3. Publication Date: Unknown. Apparently 1975.
4. Key Words/Descriptors: Underwater hull cleaning, fuel conservation. Brush and/or SCAMP cleaning.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Hull is inspected before, during, and after cleaning. The entire subject is based on cleaning at sea.
6. Timeliness: ___ Outdated X Current ___ Future
   Further studies are currently taking place on the same subject.
7. Verity: U.S. Navy Report
8. Determination: ___ Store X Accept & Code
9. Comments: This BID presents all facets of a very good study, the results of which have been matched by other studies. When the behind the scenes boys get all of their work together, we will have a good report.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 09 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    23-U09

E. KAPP
Evaluator

05/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 24 File No. 24-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other

2. Title/Publisher: Energy (fuel) Conservation Through Underwater Removal and Control of Fouling on Hulls of Navy Ships, DTNSRDC, Bethesda, Md.

3. Publication Date: 12/75

4. Key Words/Descriptors: Fuel conservation, underwater hull cleaning, anitfouling/anit-corrosion coatings; improved ship performance; ancillary fouling control methods; marine fouling; nonmilitary application.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID reviews literature current at time of publication concerning hull cleaning principles and practices. Its main value is the bibliography. The authors did a good review, but only hit the high spots.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: By visiting source.

8. Determination: ___ Store X Accept & Code

9. Comments: The authors of this paper had initiated their own studies earlier in hull cleaning.

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 12

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    24-U12

E. KAPP
Evaluator

05/14/80
Date

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Form 1

BID EVALUATION

BID No. 25 File No. 25-U09,14

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
X Other Journal
2. Title/Publisher: Review of Underwater Cleaning Methods and Their Interaction on Navy Anti-Fouling Paint Systems. Federation of Scientists for Coatings Technology, Journal of Coatings Reprint: C.P. Colager, G.S. Bohlander, and H.S. Preiser
3. Publication Date: October 1976
4. Key Words/Descriptors: Underwater cleaning methods, Anti-fouling paint.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
Specify: BID discusses causes and effect of fouling of vessel hulls and discusses several brush methods of cleaning. Also lists advantages of underwater hull cleaning and describes current and future studies in this and related areas at NSRDC, Annapolis, Md.
6. Timeliness: __ Outdated X Current __ Future
Recontact with DTNSRDC will determine whether or not this is the latest word on brush cleaning techniques.
7. Verity: DTNSRDC to be contacted.
8. Determination: __ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 09, 14
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
25-U09,14

E. KAPP
Evaluator

05/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 26 File No. 26-U09

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other __

2. Title/Publisher: Fouling Control Means Fuel Savings for the U.S. Navy, T10-4, SNAME, Pages 499-516

3. Publication Date: May 1977

4. Key Words/Descriptors: This BID, presented to SNAME, May 1977, is a "take off" of BID 25; two of three authors are the same.

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify:

6. Timeliness: __ Outdated X Current __ Future

7. Verity:

8. Determination: __ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00, __, __, __, __,

11. Underwater Technology Codes: 09, __, __, __, __,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    26-U09

E. KAPP
Evaluator

05/14/80
Date

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Form 1

BID EVALUATION

BID No. 27 File No. 27-U06,07,08

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Nondestructive Testings of Ship Hull Welds. Ship Structure Committee. SSC-293.
3. Publication Date: September 1979
4. Key Words/Descriptors: Underwater, Nondestructive Testing, Ship Hull Welds. Also: Radiography, Magnetic particle, ultrasonic, Hull butt welds.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Techniques are discussed on underwater nondestructive testing of hull butt welds; modifications as required, materials and equipment.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Ship Structure Committee, U.S. Government
8. Determination: ___ Store X Accept & Code
9. Comments: This BID also covers diving equipment, underwater cleaning, environmental limitations, NDT methods, and cost considerations.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 06 , 07 , 08 , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    27-U06,07,08

E. KAPP
Evaluator

05/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 28 File No. 28-U14

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Technical Data Sheet, CEL
2. Title/Publisher: Field Measurement of Paint Film Thickness, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Heuneme, CA
3. Publication Date: November 1974
4. Key Words/Descriptors: Instruments, field measuring of paint film thickness, wet, dry, techniques.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: ___
6. Timeliness: ___ Outdated X Current ___ Future
   Call to NCEL verified technique is still in use.
7. Verity: Dr. H.G. Lasser, via telecon, confirmed accuracy and timeliness.
8. Determination: ___ Store X Accept & Code
9. Comments: Products described in BID 28 are still in use today. For calibration it is possible to go to National Bureau of Standards for sample chips.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 14 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    28-U14

E. KAPP
Evaluator

05/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 29 File No. 29-U012

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Prediction of Paint Performance from a Combination of Accelerated Laboratory Tests., Naval Facilities Engineering Command

3. Publication Date: 11-75

4. Key Words/Descriptors: Accelerated laboratory tests, performance prediction, paints, coatings, field exposure, electrical properties, permeability, correlation, linear regression analysis, steel substrate.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Linear regression analysis indicated that individual accelerated laboratory tests were not particularly good predictors of paint performance.

6. Timeliness: ___ Outdated X Current ___ Future
   Check required of any new laboratory tests.

7. Verity: Check required of any new laboratory tests.

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 012, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    29-U012

E. KAPP
Evaluator

05/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 30 File No. 30-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Technical Data Sheet
2. Title/Publisher: Abrasive Blasting Guide for Aged or Coated Steel Surfaces, T & R Bul. 4-9, SNAME
3. Publication Date: Unknown
4. Key Words/Descriptors: Abrasive, grit, sieve size, white steel.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID consists of photographs of segments of steel with different surface finishes as a result of abrasive blasting with dry grit.
6. Timeliness: ___ Outdated X Current ___ Future
   This is the current guide used by ship repair yards when preparing surface for painting.
7. Verity: SNAME
8. Determination: X Store ___ Accept & Code
9. Comments: This BID was loaned for evaluation only and since it contained no pertinent information, was not ordered.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    30-00-00

E. KAPP
Evaluator

5/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 31a   File No. 31a-U12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Proceedings of Professional Society

2. Title/Publisher: Proceedings of the 4th Inter-Naval Conference on Marine Corrosion, "Organotin Antifoulants in the U.S. Navy", U.S. Naval Research Laboratory, Washington, D.C.

3. Publication Date: August 1973

4. Key Words/Descriptors: Organotin Antifoulants - Coatings - Steel and Aluminum Hulled Vessels.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID covers antifouling compositions, panel evaluations, organotin compounds vis-a-vis ecology, safety precautions, applications, and ship evaluations and performances.

6. Timeliness: ___ Outdated X Current ___ Future
   This BID data is still in use and is being expanded and enlarged.

7. Verity: U.S. Naval Research Laboratories promotes this BID as prima facie evidence on the subject. Other interested parties (e.g. USCG) are interested in and guided by the findings of the BID.

8. Determination: ___ Store X Accept & Code

9. Comments: This BID, in my opinion, exemplifies the highest standards in technical reporting. The results are thoroughly supported by names, dates, places, results, and photographic evidence thereof.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    31a-U12

E. KAPP
Evaluator

05/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 31b File No. 31b-U09

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other Proceedings of Professional Society, et. al.
2. Title/Publisher: Proceedings of the 4th Inter-Naval Conference on Marine Corrosion, Underwater Hull Cleaning as an Aid to Fouling Prevention, U.S. Naval Research Laboratory, Washington, D.C.
3. Publication Date: August 1973
4. Key Words/Descriptors: Hull cleaning, underwater, fouling prevention.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: BID discusses and reports on visual examinations, pneumatic, hydraulic and remote controlled equipment.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: U.S. Navy.
8. Determination: __ Store X Accept & Code
9. Comments: The findings tie in with others which we have reviewed.
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ , __ ,
11. Underwater Technology Codes: 09 , __ , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    31b-U09

E. KAPP
Evaluator

05/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 31c File No. 31c-U12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Proceedings of Professional Society
2. Title/Publisher: Proceedings of the 4th Inter-Naval Conference on Marine Corrosion, Environmentally Acceptable Antifouling Materials: Organometallic Polymers; U.S. Naval Research Laboratory, Washington, D.C.
3. Publication Date: August 1973
4. Key Words/Descriptors: Organometallic Polymers - Environmentally Acceptable Materials. Foulings, microfoulings, antifouling, nonbiodegradable, nonfoulings, antisliming, coatings.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID really handles the whole subject.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy
8. Determination: ___ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 12, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    31c-U12

E. KAPP
Evaluator

05/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 32 File No. 32-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Paint Maintenance Procedures, Vol. I and II, NAVSEA

3. Publication Date: June 1975/Chg, July 1, 1976

4. Key Words/Descriptors: Hull Maintenance, Anticorrosive Paint, Antifouling Paint.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Describes hull paint maintenance procedures to be used in drydock to obtain the longest possible service life. Color illustrations in Vol. II.

6. Timeliness: ___ Outdated X Current ___ Future
   Obtaining copies of these two volumes will have to be through USCG.

7. Verity: Navy publication based on contractors work. BID was only loaned for evaluation.

8. Determination: ___ Store X Accept & Code

9. Comments: Although procedures are for drydock they serve as a guide for actual drydock maintenance and for underwater follow up maintenance.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    32-U12

F. MATANZO
Evaluator

06/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 33 File No. 33-U01

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Inspection and Repair of Offshore Structures/Offshore Technology Conf.
3. Publication Date: May 1975
4. Key Words/Descriptors: Corrosion, Underwater Work, Offshore Platforms, Welding, Water Blaster
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: A three phase underwater inspection of offshore structures using divers is described.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: The work described in this article, presented at a recent conference, is similar to that performed by other underwater work firms.
8. Determination: ___ Store X Accept & Code
9. Comments: The value of this 1975 article is that it demonstrates that underwater inspection techniques have a field record on which to evaluate them.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 01, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    33-U01

F. MATANZO
Evaluator

11/15/80
Date

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Form 1

BID EVALUATION

BID No. 35 File No. 35-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Development of Underwater Painting System, Abstract 19,329, ZOSEN.

3. Publication Date: June 1978

4. Key Words/Descriptors: Corrosion Protection/Offshore Structures/ Underwater Painting/Two Systems: Spray, Roller

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Painting

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Contact development companies.

8. Determination: ___ Store X Accept & Code

9. Comments: List of development companies at end of article.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
35-U12

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 36 File No. 36-U06

1. Type: ___ Report X Article X Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Ultrascan III, Sylvester, Underseas Inspection/ Offshore
3. Publication Date: March 1978
4. Key Words/Descriptors: Ultrasonic Testing/Greater Mobility/Compact/ Permanent Record
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Ultrasonic NDT
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Article presented at International Diving Symposium
8. Determination: ___ Store X Accept & Code
9. Comments: Good color photographs of system.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 06
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    36-U06

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 37 File No. 37-I01.03

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ___
2. Title/Publisher: Navigation and Vessel Inspection Circular No. 12-69 (NVC 12-69)/DOT, USCG
3. Publication Date: 12 December 1969
4. Key Words/Descriptors: Drydocking, Mobile Drilling Units
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Special procedures for floating inspection are given.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG
7. Verity: USCG Publication
8. Determination: ___ Store X Accept & Code
9. Comments: Calls for underwater cleaning, inspection (visual), ultrasonic gaging and TV tape record.
10. Inspection Requirement Codes: 01, 03, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    37-I01.03

F. MATANZO
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 38 File No. 38-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Review of Antifouling Marine Coatings and their Influence on Marine Environments/Office of Naval Research

3. Publication Date: April 1978

4. Key Words/Descriptors: Antifoulant Paints and Coatings/Organotin Toxicants/Leaching Rate/Environmental Impact/Fouling Mechanism.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Paints and Coatings - Antifoulant Effect

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Department of Chemistry, University of New Orleans

8. Determination: ___ Store X Accept & Code

9. Comments: Information on Antifoulants and relation to ecosystem.

10. Inspection Requirement Codes: 00 ,___,___,___,___,

11. Underwater Technology Codes: 12 ,___,___,___,___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
38-U12

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05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 39 File No. 39-U02,03

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: A Wide-Angle Correcting Lens for Underwater TV Use/SEA TECHNOLOGY
3. Publication Date: January 1980
4. Key Words/Descriptors: Underwater TV/Color/High Resolution/Wide-Angle Lens
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Inspection
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Used for inspection of gasoline tank for Amoco Oil Co.
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 03, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    39-U02,03

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05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 40 File No. 40-U10

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Uses of Very High Pressure Water-Jet Cleaning in Marine Maintenance. Authors: S.A. Taylor, R.S. Judson/MARINE TECHNOLOGY

3. Publication Date: July 1976

4. Key Words/Descriptors: Underwater Cleaning/Reactionless Control Gun

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Cleaning with high pressure (10,000 psi) water jet.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Successful at depths up to 500 feet.

8. Determination: ___ Store X Accept & Code

9. Comments: A description of the equipment and the environmental pollution laws which impact on use of this equipment.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 10 , ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
40-U10

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 41 File No. 41-U02,03,05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Interim Status Report, Project 4151; Hazardous Chemical Discharge Prevention and Reduction/USCG.
3. Publication Date: September 1979
4. Key Words/Descriptors: Remote Damage Inspection System/Rapid Damage Location and Assessment/No Divers/Television System
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Damage Location
6. Timeliness: ___ Outdated ___ Current X Future
7. Verity: USCG Development
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 02 , 03 , 05 , ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    41-U02,03,05

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 42a File No. 42a-U14

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: R&D Program for Outer Continental Shelf Oil and Gas Operations, Subtitle: Detecting Incipient Crack Formation in Offshore Structures by Internal Friction Monitoring, U.S. Geological Survey

3. Publication Date: 1979

4. Key Words/Descriptors: Internal friction, detection incipient cracking, structural joints, offshore structures, NDT

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Describes an NDT technique now being developed which at some time might be useful in underwater inspections.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Only an R&D progress report of laboratory mode/studies.

8. Determination: X Store ___ Accept & Code

9. Comments: The technique has not yet been demonstrated in field applications.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 14, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
42a-U14

E. KAPP
Evaluator

05/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 42b File No. 42b-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: R&D Program for Outer Continental Shelf Oil & Gas Operations; U.S. Geological Survey; Subtitle: Detection of Incipient Structural Failure by the Random Decrement Method
3. Publication Date: 1979
4. Key Words/Descriptors: Nondestructive Testing Crack Detection
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: ___
6. Timeliness: ___ Outdated ___ Current X Future
   This NDT technique may have future application.
7. Verity: None
8. Determination: X Store ___ Accept & Code
9. Comments: This article does not give any data showing that this process can tell anyone where the crack is, or, is developing.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    42b-00-00

E. KAPP
Evaluator

5/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 42c File No. 42c-U10

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: R&D Program for Outer Continental Shelf Oil and Gas Operations; subtitle: Cavitation Erosion Technology for Cleaning Underwater Joints Prior to Inspection; U.S. Geological Survey.

3. Publication Date: 1979

4. Key Words/Descriptors: Inspection of cavitation erosion technology for cleaning underwater structural joints prior to inspection.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This BID covers the cavitation erosion technology from description of the equipment, through description of its usage, to results achieved.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Only an R&D progress report.

8. Determination: ___ Store X Accept & Code

9. Comments: While the verity determination has been left hanging. This technique should receive considerations.

10. Inspection Requirement Codes: 00 ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 10 ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    42c-U10

E. KAPP
Evaluator

05/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 42d File No. 42d-U05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: R&D Program for Outer Continental Shelf Oil and Gas Operations: Subtitle: Unmanned, Free-swimming Undersea Inspection Vehicle Technology, U.S. Geological Survey.

3. Publication Date: 1979

4. Key Words/Descriptors: Develop the technology for underwater inspections of pipelines, and structures by unmanned free-swimming vehicles.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Both vehicles described in this BID are the results of advanced technology for this type of craft, and, both are primarily designed for inspection functions.

6. Timeliness: ___ Outdated X Current ___ Future
   Both vehicles are still very much in the experimental stage. The major principles of propulsion, floatation, and simple navigation have been fairly well established.

7. Verity: Only an R&D progress report.

8. Determination: ___ Store X Accept & Code

9. Comments: These vehicles, whether or not in their present configurations, could well apply to hull inspection and cleaning. The vehicles are not truly free-swimming because they are tethered to a support ship.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 05 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    42d-U05

E. KAPP
Evaluator

05/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 43 File No. 43-U00

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Instruments for Measuring Painting and Coating Thickness, UPA Technology, Inc.

3. Publication Date: 1978

4. Key Words/Descriptors: Painting, coating thickness

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Provides a means of direct measurement of coating thickness regardless of coating or base material.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Used in industrial applications since 1947.

8. Determination: X Store ___ Accept & Code

9. Comments: Investigation needed to determine if instrument may be used in underwater applications.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 00 , ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    43-U00

RENUART
Evaluator

08/29/80
Date

BID EVALUATION

BID No. 44 File No. 44-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Coating Systems Guide for Exterior Surfaces of Steel Vessels/Society of Naval Architects & Marine Engineers
3. Publication Date: September 1978
4. Key Words/Descriptors: Coating System/Performance Characteristics
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either, but does list coatings for ship hulls.
6. Timeliness: X Outdated ___ Current ___ Future
   With recent (1980) developments in anticorrosive and antifouling paints many systems listed are obsolete.
7. Verity: SNAME
8. Determination: X Store ___ Accept & Code
9. Comments: Ships still using these older formulations; will not be likely candidates for an extended drydock since they will need painting sooner.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 00 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    44-00

PAUL DEFAYETTE
Evaluator

5/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 45 File No. 45-U02

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Photographic Documentation Camera/Remote Ocean Systems, Inc.
3. Publication Date: Undated
4. Key Words/Descriptors: Still, motion, time-lapse photography
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater photography
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Advertisement
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    45-U02

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 46 File No. 46-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Coatings and Corrosion Control, Marine Engineering Log, May 1980
3. Publication Date: May 1980
4. Key Words/Descriptors: Antifoulant Coating and Corrosion Control Systems
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater antifoulant and corrosion coatings.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Journal article
8. Determination: ___ Store X Accept & Code
9. Comments: Wide variety of coatings listed.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    46-U12

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 47 File No. 47-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Maintenance - The Key to Operational Efficiency
3. Publication Date: 11-77
4. Key Words/Descriptors: Painting Afloat and In-Water Survey/Hull Cleaning, Listing of Ship
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater survey and maintenance of a VLCC took only 54 hours.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Actual example given for a VLCC with work performed at Los Palmos where similar work is described in BID 59.
8. Determination: ___ Store X Accept & Code
9. Comments: Gives example of survey and painting including times for whole operation.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    47-U12

P. DEFAYETTE
Evaluator

5-30-80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 48 File No. 48-U02,03,05

1. Type: ___ Report ___ Article _X_ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Rebikoff Underwater Products, Inc.
3. Publication Date: 1979
4. Key Words/Descriptors: Underwater Photography/Color/Underwater Structures Inspection
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: Underwater Color Photography
6. Timeliness: ___ Outdated _X_ Current ___ Future
7. Verity: Used for Inspection of Amoco Oil Co. Gasoline Tank
8. Determination: ___ Store _X_ Accept & Code
9. Comments: Goes along with BID #39/Good color photos
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 03 , 05 , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    48-U02,03,05

PAUL DEFAYETTE
Evaluator

05/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 49 File No. 49-U02.03

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: See-Bee IA Diver B&W Television System/Sub-Sea Systems Inc.
3. Publication Date: April 1, 1980
4. Key Words/Descriptors: Underwater TV Camera/Color/B&W/Hand Held/ Helmet Mounted
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Television
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Advertising
8. Determination: ___ Store X Accept & Code
9. Comments: Lists options and price list
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 03 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    49-U02.03

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 50 File No. 50-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Changes in Technical Manual)
2. Title/Publisher: Naval Ships' Technical Manual: Preservation of Ships in Service/Dept. of the Navy
3. Publication Date: November 1976
4. Key Words/Descriptors: Paints & Cathodic Protection/Safety Precautions
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy
8. Determination: X Store ___ Accept & Code
9. Comments: Contains information for overseas and state side naval shipyards only.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    50-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 51 File No. 51-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Changes in Manual)
2. Title/Publisher: Naval Ships' Technical Manual: Preservation of Ships in Service/Dept. of Navy
3. Publication Date: June 1977
4. Key Words/Descriptors: Coatings Required
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity:
8. Determination: X Store ___ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    51-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 52 File No. 52-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other (Changes in Manual)
2. Title/Publisher: Naval Ships' Technical Manual: Preservation of Ships in Service/Dept. of Navy
3. Publication Date: December 1977
4. Key Words/Descriptors: Insignia sizes & locations
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity:
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    52-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 53 File No. 53-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other (Change in Manual)
2. Title/Publisher: Naval Ships' Technical Manual: Preservation of Ships in Service/Dept. of Navy
3. Publication Date: April 1978
4. Key Words/Descriptors: Coatings for Machinery & Piping
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity:
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 00 , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    53-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 54 File No. 54-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Change in Manual)

2. Title/Publisher: Naval Ships' Technical Manual: Preservation of Ships in Service/Dept. of Navy

3. Publication Date: October 1978

4. Key Words/Descriptors: Painting Procedure/Precautions Surface Preparation/Insignias

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    54-00-00

PAUL DEFAYETTE
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 55 File No. 55-U06.08.15

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Development of Automatic Underwater Welding System/Mitsubishi Heavy Industries Ltd.
3. Publication Date: July 1978
4. Key Words/Descriptors: Underwater Welding/Localized Dry Environment/Automatic/Underwater Ultrasonic and Radiographic Inspection.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Welding and Inspection with ultrasonic device attached to welding unit. Also present radiography inspection data.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Tests carried out and their results presented.
8. Determination: ___ Store X Accept & Code
9. Comments: Good photos of test results and a lot of details.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 06 , 08 , 15 , ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    55-U06.08.15

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 56 File No. 56-U09

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other

2. Title/Publisher: Underwater Hull Maintenance Services/Seaward Marine Services, Inc.

3. Publication Date: N/A

4. Key Words/Descriptors: Underwater Hull Cleaning/Multi-Brush System

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Cleaning, SCAMP and Hand Held Brushes

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Advertisement

8. Determination: ___ Store X Accept & Code

9. Comments: Describes hull cleaning service and other in water inspection services. Cost figures for U.S. Navy contract are included.

10. Inspection Requirement Codes: 00 ,___,___,___,___,

11. Underwater Technology Codes: 09 ,___,___,___,___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
56-U09

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 57 File No. 57-U02.06

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: In Water Survey and Afloat Maintenance from the Operators View Point/Intec Press, Ltd.
3. Publication Date: Undated
4. Key Words/Descriptors: Painting/Tipping Exercise/Hull Inspection
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Does not pertain to either, but comparative analysis between drydock and in water survey. Discusses TV inspection and in water painting.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Examples listed and photographic documentation presented.
8. Determination: ___ Store X Accept & Code
9. Comments: Discusses economic aspects with 1975 and 1977 cost figures.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 06 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
57-U02.06

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 58 File No. 58-I01-U05,06, 09,12,15

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: In Water Maintenance: A Classification Society Viewpoint/Intec Press, Ltd.

3. Publication Date: ___

4. Key Words/Descriptors: Surveys/Ultrasonic Thickness Measurement/ I.W.S Equipment/Rules/Afloat Cleaning/Painting

5. Pertinence to Project: X Inspection Requirement X Underwater Technology
Specify: Pertaining somewhat to both. Introduces rules for IWS (In Water Survey)

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Report from classification society viewpoint.

8. Determination: ___ Store X Accept & Code

9. Comments: Notes that not all ships are suitable for IWS and rules presently exclude tankers or ships older than 10 years.

10. Inspection Requirement Codes: 01, ___, ___, ___, ___,

11. Underwater Technology Codes: 05, 06, 09, 12, 15,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
58-I01-U05,06,09,12,15

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 59 File No. 59-U05,10,12,13,16

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: In Water Surveys Maintenance and Repair-The State-Of-The-Art/Intec Press Ltd.

3. Publication Date: Undated

4. Key Words/Descriptors: In-Water Survey/Scan Survey Vehicle/Hull Cleaning using water jet. Painting/Rudder and Tailshaft Inspection.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Describes in water inspection techniques.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Example given for scan survey/ and in water cleaning and painting. Description of procedure in use, cost figures.

8. Determination: ___ Store X Accept & Code

9. Comments: The listing of the ship from port to starboard exposes the hull down to the bilge keel.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 05 , 10 , 12 , 13 , 16 ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    59-U05,10,12,13,16

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 60 File No. 60-U01.05.06. 07,08

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Techniques and Developments in Underwater Structural Inspection/American Institute of Mining, Metallurgical and Petroleum Engineers, Inc.
3. Publication Date: 1977
4. Key Words/Descriptors: Methods of Inspection Underwater
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater NDT; Magnetic Particle, Ultrasonic, Radiography. Underwater inspection includes discussion of use of submersible and a saturation diving team.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Paper prepared for Offshore Europe 77 Conference.
8. Determination: ___ Store X Accept & Code
9. Comments: Gives details on use of all three techniques and use of diving personnel.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 05 , 06 , 07 , 08 ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    60-U01.05.06.07.08

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 61 File No. 61-I05,07

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ___
2. Title/Publisher: Marine Safety Manual (CG-495), Part 30-8, Drydocking Examinations, USCG
3. Publication Date: ___
4. Key Words/Descriptors: Drydocking, underwater body, outboard fittings, tailshaft, rudder
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Scope and procedure for drydock examination, listing spaces to be inspected, general procedure as well as specific problem areas. The gap between bronze liners must be less than 1 inch.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently in use by USCG although the inspection intervals have changed for the tailshaft.
7. Verity: USCG Publication
8. Determination: ___ Store X Accept & Code
9. Comments: Tabulates intervals for tank barge inspection and describes two ship casualties, one associated with a wasted spool piece nipple and another by a ruptured condenser box.
10. Inspection Requirement Codes: 05, 07, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    61-I05,07

F. MATANZO
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 62 File No. 62-U12,14,15

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Underwater Ship Maintenance in the Royal Navy, Author: S.R. Honour/OCEANOLOGY INTERNATIONAL 72

3. Publication Date: 1972

4. Key Words/Descriptors: Underwater Welding and Cutting/Tools/ Pneumatic Tools/Underwater Painting

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Cutting, Welding and Painting. Pneumatic tools usable to 250 feet depth. At deeper sites, hydraulic or self propelled tools are required.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Underwater Ship Maintenance in the Royal Navy.

8. Determination: ___ Store X Accept & Code

9. Comments: Underwater cutting of metal is acceptable, but welding of steels requiring special conditions is not favored.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , 14 , 15 , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    62-U12,14,15

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 63 File No. 63-U15

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other

2. Title/Publisher: Welding at Work, "No Cure, No Pay" Wet Welding Ship Repair Succeeds; Welding and Design Fabrication

3. Publication Date: January 1980

4. Key Words/Descriptors: Caisson Patch/Underwater Damage Repair.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Welding

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Procedure actually used

8. Determination: ___ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 15, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    63-U15

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 64 File No. 64-U15

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Underwater Wet Welding with Manual Arc Electrodes; Underwater Welding for Offshore Installations; The Welding Institute

3. Publication Date: 9-10 March 1976

4. Key Words/Descriptors: Underwater Welding Methods/Electrodes/ Repairs

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Welding

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Examples given.

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 15, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    64-U15

PAUL DEFAYETTE
Evaluator

06/02/80
Date

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BID EVALUATION

BID No. 66 File No. 66-I01.02

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (ABS Rules for NDT)

2. Title/Publisher: "Rules for Nondestructive Inspection of Hull Welds" 1975, American Bureau of Shipping, New York, N.Y. 10004

3. Publication Date: 1975

4. Key Words/Descriptors: Radiographic Inspection, Ultrasonic Inspection Hull Repairs, Hull Plate Damage, Hull Gaging, Weld Corrosion, Hull Plate Corrosion, Sea Chest Corrosion

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Nondestructive testing of hull welds. Procedures developed for drydock inspection and with trained divers could be done in the water.

6. Timeliness: ___ Outdated X Current ___ Future
   In use by ABS and USCG and additions were made in May 1977.

7. Verity: An ABS publications which is accepted by USCG and technical basis are ASTM procedures.

8. Determination: ___ Store X Accept & Code

9. Comments: Describes locations for making radiographic and ultrasonic inspections of welds. Any weld crack is unacceptable. Also gives equation for computing number of check points.

10. Inspection Requirement Codes: 01, 02, ___, ___, ___,

11. Underwater Technology Codes: ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    66-I01.02

J. METCALF
Evaluator

06/10/80
Date

BID EVALUATION

BID No. 67 File No. 67-I07

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ABS Rules
2. Title/Publisher: "Rules for Building and Classing Steel Vessels" American Bureau of Shipping, 65 Broadway, New York, N.Y. 10006.
3. Publication Date: 1980
4. Key Words/Descriptors: Tailshaft Bearing Clearance. Inspection Intervals Materials Tests
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Rules for special survey. Section 45 contains pertinent requirements for surveys after construction.
6. Timeliness: ___ Outdated X Current ___ Future
   Most recent edition of this publication which is used by ABS and USCG.
7. Verity: Publication of certification society.
8. Determination: ___ Store X Accept & Code
9. Comments: Tailshaft survey (lined) may be extended to 4 years. 45.13.1a proposal for underwater inspection considered. 45.1.12a drydock survey items listed in paragraph 45.1.12. Paragraph 45.13.4 gives the Allowable Bearing Weardown. (see attached)
10. Inspection Requirement Codes: 07 ___, ___, ___, ___, ___,
11. Underwater Technology Codes: ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    67-I07

J. METCALF
Evaluator

06/10/80
Date

BID EVALUATION

BID No. 67 File No. 67-107

9. Comments: (Cont'd)

a. Water-lubricated Bearings Other Than Rubber

Shaft Dia.	Weardown Criteria
229 mm (9 in.)	6.4 mm (0.25 in.)
305 mm (12 in.)	7.95 mm (0.3125 in.)
305 mm (12 in.)	9.53 mm (0.375 in.)

b. Water-lubricated Rubber Bearing

Rebush when any water groove is half of the original depth.

c. Oil-lubricated Bearings

Rebush when weardown exceeds manufacturers criteria.

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 68 File No. 68-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Notice)
2. Title/Publisher: S/S Grand Zenith (PN) & Class Structural Defects & Deterioration/USCG
3. Publication Date: April 1977
4. Key Words/Descriptors: Structural Condition/Examination/Traveling Inspector
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity: ___
8. Determination: X Store ___ Accept & Code
9. Comments: It's a notice of possible structural deterioration on a certain class of ships.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    68-00-00

PAUL DEFAYETTE
Evaluator

6/4/80
Date

DTCC23-80-C-20009
Form 1

BID EVALUATION

BID No. 69 File No. 69-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other (Notice)
2. Title/Publisher: Tank Barges, Susceptibility to Buckling Failure/ U.S.C.G.
3. Publication Date: February 1977
4. Key Words/Descriptors: Buckling/Strengthened in Deck
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity:
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    69-00-00

PAUL DEFAYETTE
Evaluator

6/4/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 70 File No. 70-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Notice)

2. Title/Publisher: Special Inspection of Certificated U.S. Seagoing Break Bulk Vessels Constructed Before 1965/USCG

3. Publication Date: June 1978

4. Key Words/Descriptors: Hull Plating Wastage/Spool Wastage/Weather Deck Ventilation Duct Wastage

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Special inspection to determine wastage. Only a one-time special inspection of certain ships built before 1965.

6. Timeliness: X Outdated ___ Current ___ Future
   Special instruction cancelled June 1, 1979

7. Verity: USCG

8. Determination: X Store ___ Accept & Code

9. Comments: Simply instructs OCMI to conduct a special inspection of selected ships.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    70-00

PAUL DEFAYETTE
Evaluator

06/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 71 File No. 71-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other (Notice)
2. Title/Publisher: Bethlehem Steel 32,650 DWT Tankers, CVK Fractures
3. Publication Date:
4. Key Words/Descriptors: CVK WEB Fractures/Weld Fractures/Bottom Plate Pitting
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity:
8. Determination: X Store __ Accept & Code
9. Comments: Just tells what to look for during inspection not requirements.
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 00 , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    71-00-00

PAUL DEFAYETTE
Evaluator

6/4/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 72 File No. 72-I01

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
X Other Inspection Circular (NAVIC)
2. Title/Publisher: Navigation and Vessel Inspection Circular No. 7-56/ USCG.
3. Publication Date: August 1956
4. Key Words/Descriptors: Hull Inspection, LST Vessels
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
Specify: Hull inspection requirements for LST Vessels with lighter than normal plating.
6. Timeliness: ___ Outdated X Current ___ Future
Although a 1956 publication the instruction is still in force.
7. Verity: USCG publication
8. Determination: ___ Store X Accept & Code
9. Comments: Gives as 15% the corrosion allowance for ¼" deck plating. 3/8" stringer plating. 3/8" sheer strakes and 3/8" bottom plating.
10. Inspection Requirement Codes: 01 , ___, ___, ___, ___,
11. Underwater Technology Codes: ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
72-I01

PAUL DEFAYETTE
Evaluator

06/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 73 File No. 73-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other ____
2. Title/Publisher: Requirements for Hull Structural Steel - Structural Continuity/USCG
3. Publication Date: January 1966
4. Key Words/Descriptors: Strength/Ductility/Notch Toughness
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: Does not pertain to either.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity: ____
8. Determination: X Store __ Accept & Code
9. Comments: Pertains to steel used for production of vessel.
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 00 , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    73-00-00

PAUL DEFAYETTE
Evaluator

6/4/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 74 File No. 74-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Navic
2. Title/Publisher: Navigation and Vessel Inspection Circular No. 3-68/ USCG
3. Publication Date: March 1968
4. Key Words/Descriptors: Inspection/Lockpins/Structural Bolts/ Tightness
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Inspection of tensile fasteners is described.
6. Timeliness: ___ Outdated X Current ___ Future
   Still in force.
7. Verity: USCG Publication
8. Determination: X Store ___ Accept & Code
9. Comments: Does not contain any specific information for inspection of tensile fasteners.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    74-00

PAUL DEFAYETTE
Evaluator

06/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 75 File No. 75-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Notes on Inspection & Repair of Wooden Hulls/USCG.
3. Publication Date: 1963
4. Key Words/Descriptors: Hull Damage/Visual Inspection/Fastenings/Caulking/Fittings/Decay
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
Specify: Some requirements pertaining to Wooden Ships.
6. Timeliness: X Outdated ___ Current ___ Future
7. Verity: USCG
8. Determination: X Store ___ Accept & Code
9. Comments: Deals with Wood Ships Not Steel
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 00 , ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
75-00-00

PAUL DEFAYETTE
Evaluator

6/4/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 76 File No. 76-I01

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other NAVIC 7-68
2. Title/Publisher: Notes on Inspection and Repair of Steel Hulls/ USCG.
3. Publication Date: 1968
4. Key Words/Descriptors: Deterioration/Gaging/Corrosion Limits/ Special Coatings
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Inspection of Steel Hulls is specified with corrosion allowances for various sections. Describes weld repairs.
6. Timeliness: ___ Outdated X Current ___ Future
   Still in force.
7. Verity: USCG publication
8. Determination: ___ Store X Accept & Code
9. Comments: 25% allowance applies to most portions, 20% about midship half-length. 75% allowed for keel plating when no other damage exists.
10. Inspection Requirement Codes: 01 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: ___ , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    76-I01

PAUL DEFAYETTE
Evaluator

06/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 77 File No. 77-U01

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ___
2. Title/Publisher: Rules and Regulations for the Classification of Ships, Periodical Survey Regulations/Lloyd's Register of Shipping, Part 1, Chapter 3, Sections 1 and 2
3. Publication Date: January 1, 1978
4. Key Words/Descriptors: Hull Requirements/In Water Surveys
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Describes what divers are to do in an underwater inspection
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Lloyd's
8. Determination: ___ Store X Accept & Code
9. Comments: Tells what is required to be inspected, not requirements for pass/fail.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 01, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    77-U01

PAUL DEFAYETTE
Evaluator

06/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 78 File No. 78-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: The Design of a Vessel Inspection Information System/U.S. Dept. of Transportation, USCG

3. Publication Date: May 1976

4. Key Words/Descriptors: Gives material conditions to help focus inspection activity/vessel history; includes inspection data.

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: Does not pertain to either.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
78-00

PAUL DEFAYETTE
Evaluator

06/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 79 File No. 79-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Planning & Management of Underwater Maintenance/ R. Goodfellow & P.G. Thornton

3. Publication Date: ___

4. Key Words/Descriptors: Inspection Cost/Planning

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: Neither

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
79-00-00

PAUL DEFAYETTE
Evaluator

6/5/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 80 File No. 80-U11

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Cathodic Protection/The Motor Ship
3. Publication Date: April 1978
4. Key Words/Descriptors: Maintenance of Smooth Hull/Sacrificial Anodes/Impressed Current Systems/Paint Systems
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Cathodic Protection
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Article/Been investigated by BSRA
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 11, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    80-U11

PAUL DEFAYETTE
Evaluator

06/05/80
Date

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BID EVALUATION

BID No. 82 File No. 82-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Recent Developments in Antifoulings/J. Oil Chemical Assoc., Abstract 41,181
3. Publication Date: June 1977
4. Key Words/Descriptors: Antifoulings/Organotins/Hydrophilic Varnishes/Self-Polishing Coatings
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Antifoulant Coatings
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Tests have been conducted/International Marine Coatings R&D Laboratory
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 12
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    82-U12

PAUL DEFAYETTE
Evaluator

06/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 83 File No. 83-00

1. Type: ___ Report _X_ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Pulizia Di Carena A Nave Galleggiante: Considerazioni di Tecnica ed Economia/Cleaning the Underwater Hull with the Afloat: Technical and Economic Consideration.
3. Publication Date: ___
4. Key Words/Descriptors: Cleaning Underwater Hull/Technical & Economic Considerations.
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: Underwater hull cleaning.
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity: ___
8. Determination: _X_ Store ___ Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    83-00-00

PAUL DEFAYETTE
Evaluator

6/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 84 File No. 84-I03,04

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other USCG Publication
2. Title/Publisher: Rules and Regulations for Tank Vessels, CG-123/USCG
3. Publication Date: 1 August 1977
4. Key Words/Descriptors: CFR 46, Subchapter D, Part 30-40 Drydocking, Haul Out
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: 31.10-20(e) lists sea chests, sea valves, sea strainers and bilge injection valves as inspection items during drydocking. Specifies haul out periods for steel hull tank vessels.
6. Timeliness: ___ Outdated X Current ___ Future
   This USCG publication is a reprint of the 1976 CFR 46 with amendments made since then.
7. Verity: USCG Publication
8. Determination: ___ Store X Accept & Code
9. Comments: Leaves to OCMI the decision to open for examination (internal) items listed above. Does not provide any inspection criteria.
10. Inspection Requirement Codes: 03, 04, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    84-I03,04

F. MATANZO
Evaluator

06/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 85 File No. 85-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other USCG Publication
2. Title/Publisher: Rules and Regulations for Cargo and Miscellaneous Vessels, CG-257/USCG
3. Publication Date: September 1, 1977
4. Key Words/Descriptors: CFR 46, Subchapter I, Parts 90-109
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Only general regulations with no specific reference to drydock inspections.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: USCG Publication
8. Determination: X Store ___ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    85-00

F. MATANZO
Evaluator

06/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 86 File No. 86-U09.12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Renewed Antifouling without Drydocking/SEATRADE. Author: Trevor Lones

3. Publication Date: February 1975

4. Key Words/Descriptors: Reactivating Unused Antifouling/Hull Cleaning Machines

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Antifouling points are applied per a schedule that permits frequent hull cleaning to rejuvenate the antifouling paint.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Procedure developed by Jotun, a paint mfg. and the Ship Research Institute of Norway.

8. Determination: ___ Store X Accept & Code

9. Comments: The unusually thick layers of paint, 250 microns on the sides and 150 microns on the flat bottom will increase the ships weight.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 09 , 12 , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
86-U09.12

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 87 File No. 87-U01,13

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (Rules Book)
2. Title/Publisher: Classification and Maintenance of Class/Bureau Veritas
3. Publication Date: 1977
4. Key Words/Descriptors: Special Survey-Hull/Propeller Shafts/ Annual Surveys Afloat-Hull/Underwater Surveys of Large Vessels and Requirements for
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Requirements for Underwater Surveys (what has to be inspected)
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: International register for classification of ships and aircrafts.
8. Determination: ___ Store X Accept & Code
9. Comments: Lists what must be inspected for each survey, not requirements for pass/fail.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 13 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    87-U01,13

PAUL DEFAYETTE
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 88 File No. 88-U02,04

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other ____
2. Title/Publisher: Color Observer I and Black and White Observer V Underwater Video Communications System, Kinergetics Inc.
3. Publication Date: Undated
4. Key Words/Descriptors: Underwater Television/Color/B&W/Voice Communication/VTR
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Underwater Television
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Advertising
8. Determination: __ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 02, 04, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    88-U02,04

PAUL DEFAYETTE
Evaluator

06/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 89 File No. 89-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
X Other (Newsletter)
2. Title/Publisher: Painting Practices in Shipbuilding/BSRA News, Wallsend Research Station, Wallsend Tyre and Wear NE 28 6U4
3. Publication Date: April 1980
4. Key Words/Descriptors: Education courses/Surface Coatings/ Roughness Gauging/One Diver
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
Specify: Hull roughness gauging
6. Timeliness: __ Outdated X Current __ Future
7. Verity: BSRA
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 00
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
89-00-00

PAUL DEFAYETTE
Evaluator

06/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 90 File No. 90-U13

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
X Other

2. Title/Publisher: Guide for Repair, Welding, Cladding, and Straightening of Tailshafts; American Bureau of Shipping

3. Publication Date: 1975

4. Key Words/Descriptors: Tailshafts, Welding repair

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Not directly applicable since procedures are clearly for out of water and repair in shop. However, these procedures would serve as a guide for an underwater method.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: ABS publication

8. D~termination: ___ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 13

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
90-U13

F. MATANZO
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 91 File No. 91-I99

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other ABS Publication
2. Title/Publisher: Guide for Underwater Inspection in Lieu of Drydocking Survey/ABS
3. Publication Date: 1975
4. Key Words/Descriptors: VLCC, Drilling Units, Divers, Underwater Inspection
5. Pertinence to Project: X Inspection Requirement X Underwater Technology
   Specify: Provides ABS guidelines for in water inspection identifying items, but not exact procedure. Applicable to vessels less than 15 years old.
6. Timeliness: __ Outdated X Current __ Future
   Most recent ABS publication on topic.
7. Verity: ABS publication.
8. Determination: __ Store X Accept & Code
9. Comments: Since 1975 more specific procedures may be in use, but are not in any ABS publication. Private diving firms have prepared specific procedures for offshore rigs and barges.
10. Inspection Requirement Codes: 99 , __ , __ , __ , __ ,
11. Underwater Technology Codes: __ , __ , __ , __ , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    91-I99

F. MATANZO
Evaluator

06/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 92 File No. 92-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire
   ___ Other ___
2. Title/Publisher: Questionnaire, LCDR J. Schrinner, Baltimore OMI
3. Publication Date: 13/5/80
4. Key Words/Descriptors: Bottom Survey, Inspection
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Described five major divisions of drydock inspection.
6. Timeliness: ___ Outdated X Current ___ Future
   Current practice of Baltimore OMI
7. Verity: USCG Inspector with 3½ years experience.
8. Determination: ___ Store X Accept & Code
9. Comments: LCDR Schrinner felt judgement was most important with clear visibility of entire hull bottom.
10. Inspection Requirement Codes: 99, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    92-I99

F. MATANZO — Evaluator

6/2/80 — Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 93 File No. 93-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire ___ Other ___

2. Title/Publisher: Questionnaire, CMDR Casimir, Norfolk OMI

3. Publication Date: 5/23/80

4. Key Words/Descriptors: Hull Gaging, bottom survey.

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Described hull survey procedures.

6. Timeliness: ___ Outdated X Current ___ Future
   Current practice of Norfolk OMI

7. Verity: USCG Inspector with 4 years experience.

8. Determination: ___ Store X Accept & Code

9. Comments: In water survey might require changes in pass/fail criteria which are based on or assume a 2 year drydock interval.

10. Inspection Requirement Codes: 99 , ___ , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    93-I99

F. MATANZO
Evaluator

6/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 94 File No. 94-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire
   ___ Other ___
2. Title/Publisher: Questionnaire, LCDR Butler, USCG Reserve Training Center, Yorktown, VA
3. Publication Date: 23/5/80
4. Key Words/Descriptors: Bottom Survey, Rudder, Tail Shaft
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Described Haul Out Inspection, Walk Around Inspection, and bottom survey.
6. Timeliness: ___ Outdated X Current ___ Future
   Confirmed completeness of Inspection Requirements BID List.
7. Verity: USCG Marine Safety School instructor with ten years experience and thirty years in USCG.
8. Determination: ___ Store X Accept & Code
9. Comments: Stressed importance of inspecting entire rudder assembly.
10. Inspection Requirement Codes: 99 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    94-I99

F. MATANZO
Evaluator

6/3/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 95 File No. 95-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire ___ Other ___
2. Title/Publisher: Questionnaire, LCDR McCord, USCG Reserve Training Center, Yorktown, VA
3. Publication Date: 23/5/80
4. Key Words/Descriptors: Haul Out Inspection, Bottom Survey
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Describes details of a drydock inspection.
6. Timeliness: ___ Outdated X Current ___ Future
   Material and procedures discussed are presently used in training curriculum.
7. Verity: Marine Safety School instructor with nine years experience as an inspector.
8. Determination: ___ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 99
11. Underwater Technology Codes: 00
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
   95-I99

F. MATANZO
Evaluator

6/3/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 96 File No. 96-I99

1. Type: __ Report __ Article __ Advertising __ Trip Report X Questionnaire
   __ Other

2. Title/Publisher: Questionnaire, LCDR North, USCG Reserve Training Center, Yorktown, VA

3. Publication Date: 23/5/80

4. Key Words/Descriptors: Hull Survey, Rudder, Internal Examination

5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: Defined ten separate steps in drydock inspection.

6. Timeliness: __ Outdated X Current __ Future
   Material discussed is presently used in training curriculum.

7. Verity: USCG Marine Safety School instructor with 14 years experience as an inspector.

8. Determination: __ Store X Accept & Code

9. Comments: Referred to internal inspection as the "Engineering Side" of the drydock inspection.

10. Inspection Requirement Codes: 99

11. Underwater Technology Codes: 00

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    96-I99

F. MATANZO
Evaluator

6/3/80
Date

This document contains
blank pages that were
not filmed

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 98 File No. 98-U02.09.10.12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Interview Notes
2. Title/Publisher: Meeting with G. Bohlander, DTNSRDC/ESCO
3. Publication Date: 5/29/80
4. Key Words/Descriptors: Closed Circuit TV, Brush Cleaning Hydro-blasting, Antifouling.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discussed Navy program in underwater hull cleaning with brush and hydroblast units. Also viewed blk & wht CCTV video tapes.
6. Timeliness: ___ Outdated X Current ___ Future
   Discussion centered on underwater technology out of Navy R&D.
7. Verity: Mr. Bohlander has been a central figure in U.S. Navy underwater hull cleaning program.
8. Determination: ___ Store X Accept & Code
9. Comments: Several leads were identified for follow up.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 09 , 10 , 12 , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    98-U02.09.10.12

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 99 File No. 99-U02.15

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Construction Inc., Anchorage, Alaska
3. Publication Date: Sept. 11, 1980
4. Key Words/Descriptors: Underwater TV, Underwater Welding, Water Turbidity.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: This firm has previously provided us a black and white video tape of an underwater inspection. The questionnaire answered questions raised during the viewing of the tape.
6. Timeliness: ___ Outdated X Current ___ Future
   Firm is performing underwater inspections in 1980.
7. Verity: Local ABS representative was present at these underwater inspections.
8. Determination: ___ Store X Accept & Code
9. Comments: Color CCTV is preferable for topside monitoring. Underwater wet welding is performed by ABS certified welders who are also divers.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 15, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    99-U02.15

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 100 File No. 100-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
X Other Fed. Regulations

2. Title/Publisher: "Code of Federal Regulations", published by the Office of the Federal Register, G.S.A. 46 Shipping Parts 30-40

3. Publication Date: October 1, 1979

4. Key Words/Descriptors: Tank Vessels, Inspection, Drydocking

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
Specify: Biennial Inspection by Coast Guard, acceptance of ABS Rules, docking interval 24 months. Contains nothing for drydock inspection except interval.

6. Timeliness: ___ Outdated X Current ___ Future
Currently in use by USCG.

7. Verity: Basic law for USCG.

8. Determination: X Store ___ Accept & Code

9. Comments: Establishes inspection interval requirements for tanker inspection by Coast Guard (31.10-20).

10. Inspection Requirement Codes: 99, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
100-I99

J. METCALF
Evaluator

06/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 101 File No. 101-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Fed. Regulations
2. Title/Publisher: "Code of Federal Regulations" published by the Office of the Federal Register, G.S.A. 46 Shipping Parts 70-89.
3. Publication Date: October 1, 1979
4. Key Words/Descriptors: Inspection and certification, drydocking passenger vessels.
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: 12 month docking interval for passenger vessels. Inspection requirements are referenced to ABS publications.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently in use by USCG.
7. Verity: Basic law used by USCG.
8. Determination: X Store ___ Accept & Code
9. Comments: Annual drydock inspection for passenger vessels is specified without any details.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    101-00

J. METCALF
Evaluator

06/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 102 File No. 102-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Fed. Regulations
2. Title/Publisher: "Code of Federal Regulations" published by the Office of the Federal Register, G.S.A. 46 Shipping Parts 90-109
3. Publication Date: October 1, 1979
4. Key Words/Descriptors: Cargo Vessels, Offshore Drilling Units, Inspection and Certification.
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: 24 month docking interval for general cargo vessels. 24 month docking interval for mobile offshore drilling units. Special examination in lieu of drydocking. No specific details.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG.
7. Verity: Basic law used by USCG.
8. Determination: X Store ___ Accept & Code
9. Comments: Biennial drydock inspection for general cargo vessels and mobile drilling units. Plan for inspection of column supported and jack-up drilling units in lieu of drydock.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 00 , ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    102-00

J. METCALF
Evaluator

06/11/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 103 File No. 103-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Fed. Regulations
2. Title/Publisher: "Code of Federal Regulations" published by the Office of the Federal Register, G.S.A. 46 Shipping Parts 166-199
3. Publication Date: October 1, 1979
4. Key Words/Descriptors: Small Passenger Vessels, Oceanographic Vessels, Inspection and Certification.
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Drydock interval and scope for small passenger vessels. Drydock interval for oceanographic vessels. Contains no specific information.
6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG.
7. Verity: Basic law used by USCG.
8. Determination: X Store ___ Accept & Code
9. Comments: Drydock interval and scope.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    103-00

J. METCALF
Evaluator

05/11/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 104 File No. 104-U02,09,10

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Interview Notes

2. Title/Publisher: Meeting with Mr. Gene Daly, Seaward Marine Service Corp., Alexandria, VA

3. Publication Date: 30 May 1980

4. Key Words/Descriptors: Brush Scrubbing, Hydroblasting Underwater Inspection

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Seaward Marine Services has contract with U.S. Navy to clean hulls underwater.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Visit to Seaward cleaning station confirmed the type of equipment and personnel used.

8. Determination: ___ Store X Accept & Code

9. Comments: The before and after cleaning condition of the hull are documented with color 35mm still photographs.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 02 , 09 , 10 , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    104-U02,09,10

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 105 File No. 105-00

1. Type: __ Report __ Article __ Advertising __ Trip Report __ Questionnaire
   X Other Interview Notes
2. Title/Publisher: Interview Notes/ESCO
3. Publication Date: June 3, 1980
4. Key Words/Descriptors: Merchant Vessel Inspection, Vessel Inspection Information System
5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: A computer system that will assist OMI prepare for inspection.
6. Timeliness: __ Outdated __ Current X Future
   Presently, system does not contain any value to project.
7. Verity: USCG program.
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    105-00

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 106 File No. 106-I07

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Fed. Regs.

2. Title/Publisher: "Code of Federal Regulations", published by The Office of the Federal Register, GSA 46 Shipping Parts 41-69.

3. Publication Date: October 1, 1979

4. Key Words/Descriptors: Marine Engineering, Tests and Inspections, Drydock Examination, Tailshaft Survey.

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Inspections required by Marine Inspector whenever ship drydocked. Requirements for tailshaft survey. Paragraph 61.20-15(c) gives weardown criteria for tailshaft.

6. Timeliness: ___ Outdated X Current ___ Future
   Currently used by USCG.

7. Verity: Basic law for USCG

8. Determination: ___ Store X Accept & Code

9. Comments: Weardown criteria is: 1/4 in. for shafts of 9 inch diameter or less; 5/16 in. for shafts 9 to 12 inch diameter, and 3/8 in. for shafts greater than 12 inch diameter.

10. Inspection Requirement Codes: 07 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: ___ , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    106-I07

J. METCALF
Evaluator

06/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 107 File No. 107-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other
2. Title/Publisher: A New Dimension in Underwater Maintenance/ MATERIALS PERFORMANCE
3. Publication Date: October 1974
4. Key Words/Descriptors: Flakeglas-Polyester Coating/Anticorrosive/ Smoothness (Bottom)/Pitting/Permeability
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Anticorrosive Paints
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: 11 years research/first hand inspection.
8. Determination: ___ Store X Accept & Code
9. Comments: Very informative/graphs
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 12
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    107-U12

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 108 File No. 108-00

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Repairs at Sea

3. Publication Date: Unknown

4. Key Words/Descriptors: Underwater Hull Cleaning

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Does deal with Underwater Technology, but it's a very brief announcement/research still continuing.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: No information given.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    108-00-00

PAUL DEFAYETTE
Evaluator

6/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 109 File No. 109-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Underwater Inspection & Repair of Offshore Structures/Offshore Technology Conference

3. Publication Date: 1975

4. Key Words/Descriptors: Underwater Inspection "Phases"/Records/ Corrosion Damage/Welding Repair/Cost

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify:

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity:

8. Determination: X Store ___ Accept & Code

9. Comments: Lists Guidelines for Underwater Inspection not requirements (of Offshore Structures)

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    109-00-00

PAUL DEFAYETTE
Evaluator

6/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 110 File No. 110-U01.02.05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: In-Water Photographic-Cine and TV Inspections of Underwater Areas of Ships, etc./In Water Maintenance Conference
3. Publication Date: 1975
4. Key Words/Descriptors: Diver Visual Survey/Photographic Survey/ Underwater Vehicles
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater TV and Maintenance
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Inspections carried out that were accepted by classification societies
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 02 , 05 , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    110-U01.02.05

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 111 File No. 111-U01.02.09.10,12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: A Shipowner's Requirements and Experience with In-Water Maintenance/In-Water Maintenance Conference
3. Publication Date: 1975
4. Key Words/Descriptors: Divers/Survey of Underwater Fittings and Structure/Photographic Inspection/Hull Cleaning (Water-Jet; Scrubbing)/Painting
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Diver; Underwater TV; Maintenance
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Procedures in use
8. Determination: ___ Store X Accept & Code
9. Comments: This paper isn't very deep in explanation, it goes over everything briefly.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 02 , 09 , 10 , 12 ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    111-U01.02.09.10.12

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 112 File No. 112-U16

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Developing Blanking Device to Hull Opening at Under-water Inspection for VLCC and ULCC Class Vessel. (ESL)

3. Publication Date: Undated

4. Key Words/Descriptors: Diaphragm to close hull openings for sea water discharge/overhaul of sea valve.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Aid in inspection of sea valves.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Tests conducted

8. Determination: ___ Store X Accept & Code

9. Comments: Although the article is in Japanese, the detailed abstract and English labeled figures provide sufficient information to understand BID.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 16 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
112-U16

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 113 File No. 113-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Structural Integrity Monitoring by Vibration Analysis/Eighth Annual Offshore Technology Conference

3. Publication Date: August 1976

4. Key Words/Descriptors: Vibration Analysis/Accelerated Diving Inspection/Offshore Structures

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: ___

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: Still under R&D.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
113-00

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 114 File No. 114-U99

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Ship Underwater Maintenance, Evaluation, and Repair (Sumer) Master Plan/Dept. of Navy.
3. Publication Date: February 1977
4. Key Words/Descriptors: Underwater Coatings/Corrosion Protection/Cathodic Protection/Fouling Protection/Underwater Hull Inspections/Diver Inspection Systems/Water Borne Cleaning
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Covers wide variety of Underwater Technology.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy
8. Determination: ___ Store X Accept & Code
9. Comments: A lot of information available.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 99, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    114-U99

PAUL DEFAYETTE
Evaluator

06/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 115 File No. 115-U01.02.06.07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other

2. Title/Publisher: Underwater NDT Equipment and Techniques/Naval Coastal Systems Center

3. Publication Date: February 7, 1979

4. Key Words/Descriptors: Stereophotography/Ultrasonic Inspection/Magnetic Particle Inspection/Diver with Minimal NDT Skills.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater photography; ultrasonic and magnetic particle inspection.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: R&D by NCSC; sponsored by NAVSEA. Work was verified by visit to Panama City, Fla.

8. Determination: ___ Store X Accept & Code

9. Comments: In development stage; have not been approved by the Navy. There are, however, commercial units for underwater M.P.I.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 01, 02, 06, 07, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
115-U01.02.06.07

PAUL DEFAYETTE
Evaluator

06/20/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 116 File No. 116-U09.10

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Analysis of Drydock Operations During Normal Maintenance and Inspection Outages/National Maritime Research Center, W.H. Lawder

3. Publication Date: June 1973

4. Key Words/Descriptors: Water Jet/Brush Scrubbing/"Sea-Mesh" System: Explosive Net Removes Marine Growth

5. Pertinence to Project: X Inspection Requirement X Underwater Technology
   Specify: Describes a normal drydocking operation, including the inspection conducted by the USCG and ABS. Describes hull cleaning techniques.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: National Maritime Research Center

8. Determination: ___ Store X Accept & Code

9. Comments: Covers drydock inspection procedures, but under "Problems and Suggested Solutions" there is some reference to underwater cleaning by SCAMP and CAVIJET.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 09 , 10 , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    116-U09.10

PAUL DEFAYETTE
Evaluator

06/20/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 117 File No. 117-U16

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Preliminary Design Report-Mini-Drydock for Very Large Crude-Carrying Ships/National Maritime Research Center, P. R. Corbett
3. Publication Date: May 1974
4. Key Words/Descriptors: Inspection and Maintenance/Hull Cleaning
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: A floating vessel would have 15-20% of its hull surface sealed off in a floating drydock.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: National Maritime Research Center
8. Determination: ___ Store X Accept & Code
9. Comments: This 1974 report on a preliminary design appears to be the only publication on this concept.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 16 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    117-U16

PAUL DEFAYETTE
Evaluator

06/20/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 118 File No. 118-U05.06.07.10

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Inspection and Nondestructive Testing of Offshore Structures/Office of Naval Research
3. Publication Date: June 1978
4. Key Words/Descriptors: Ultrasonic Testing/Magnetic Particle Inspection/Water Jet Cleaning/Ultrasonic Testing with Remote Controlled Submersible.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Cleaning and NDT.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Office of Naval Research, Dept. of Navy
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 05, 06, 07, 10, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    118-U05.06.07.10

PAUL DEFAYETTE
Evaluator

06/20/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 119 File No. 119-U01

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other

2. Title/Publisher: Luminance Requirements and Color Appearances of Colored Displays in Turbid Water, Oceanautics, Inc.

3. Publication Date: May 1979

4. Key Words/Descriptors: Light Transmission Underwater

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Report discusses effects of light transmissions in turbid vs. clean water on color perception. White, green, and yellow light is affected the most between these two environments. Useful information in training divers on color identification.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Experiment conducted for U.S. Navy using highly trained U.S. Navy divers.

8. Determination: ___ Store X Accept & Code

9. Comments: Report is one of a series of reports on underwater light transmission. Recommend review list of other reports on page 45 of this report and ordering some of the others in the series.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 01 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    119-U01

RENUART
Evaluator

09/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 120 File No. 120-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Ship Repair/Dept. of the Navy
3. Publication Date: 1965
4. Key Words/Descriptors: Underwater TV (pages 21-23)/Underwater Welding (Bottom page 75)/Underwater Cleaning (page 214)/ Underwater Painting (page 22).
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater TV; Welding; Cleaning; Painting
6. Timeliness: X Outdated ___ Current ___ Future
7. Verity: Dept. of Navy
8. Determination: X Store ___ Accept & Code
9. Comments: Old source
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    120-00

PAUL DEFAYETTE
Evaluator

06/20/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 121 File No. 121-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire
   ___ Other ___
2. Title/Publisher: Questionnaire, CWO-3 Allen T. Warner, Seattle, Wash.
3. Publication Date: 6/16/80
4. Key Words/Descriptors: Hull Survey
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: CWO Warner reviewed the inspection requirements narrative.
6. Timeliness: ___ Outdated X Current ___ Future
   CWO Warner is Seattle inspector.
7. Verity: Inspector has 17 years experience.
8. Determination: ___ Store X Accept & Code
9. Comments: Identified major inspection items.
10. Inspection Requirement Codes: 99 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    121-I99

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

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BID EVALUATION

BID No. 123 File No. 123-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Determination of Tin (IV) & Organotin Compounds in Natural Waters, Coastal Sediments & Macro Algae by Atomic Absorption Spectrometry/UN. of CA

3. Publication Date: August 1979

4. Key Words/Descriptors: Organotin Compounds, Pollution

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Neither; is a measurement of compounds in environment.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    123-00-00

PAUL DEFAYETTE
Evaluator

7/1/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 123 File No. 123-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Determination of Tin (IV) & Organotin Compounds in Natural Waters, Coastal Sediments & Macro Algae by Atomic Absorption Spectrometry/UN: of CA

3. Publication Date: August 1979

4. Key Words/Descriptors: Organotin Compounds, Pollution

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: Neither; is a measurement of compounds in environment.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
123-00-00

PAUL DEFAYETTE
Evaluator

7/1/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 124 File No. 124-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Underwater Inspection of Fleet Moorings/Dept. of Navy
3. Publication Date: July 1979
4. Key Words/Descriptors: Procedures & Documentation of Underwater Inspection of Fleet Moorings
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Neither; pertains only to Fleet Moorings
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity: ___
8. Determination: X Store ___ Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    124-00-00

PAUL DEFAYETTE
Evaluator

7/1/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 125 File No. 125-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Exterior Damage Photography of Submerged Targets/ Technical Library of the Armed Forces Weapons Project

3. Publication Date: May 1955

4. Key Words/Descriptors: Remote Controlled, Self Propelled Body for Transporting Underwater Surveillance and Exploration.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Remote Controlled Underwater TV.

6. Timeliness: X Outdated ___ Current ___ Future

7. Verity: A.E.C.

8. Determination: X Store ___ Accept & Code

9. Comments: First fully remote controlled underwater TV device.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
125-00

PAUL DEFAYETTE
Evaluator

07/01/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 126 File No. 126-U01.02.06.07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Underwater Nondestructive Examination of Ship Hulls/NCSC

3. Publication Date: 1979

4. Key Words/Descriptors: Stereophotography/Ultrasonics/Magnetic Particle and Electromagnetic Flaw Detection.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Underwater Photography, Magnetic Particle Inspection and Electromagnetic Flaw Detection Ultrasonics.

6. Timeliness: ___ Outdated X Current ___ Future
Report is on recent work by NCSC personnel.

7. Verity: Actually used/R&D sponsored by NAVSEA. Interview trip confirmed work has been performed.

8. Determination: ___ Store X Accept & Code

9. Comments: Although the NCSC R&D includes techniques commerically available, the NCSC work was scientifically controlled and documented.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 01, 02, 06, 07, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
126-U01.02.06.07

PAUL DEFAYETTE
Evaluator

07/01/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 127 File No. 127-U02,06,07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Ship Hull Inspection/NCSC
3. Publication Date: ___
4. Key Words/Descriptors: Stereo Photography/Ultrasonic Thickness Gaging/Magnetic Particle Inspection
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Photography; Ultrasonic Gaging; Magnetic Particle Inspection
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Actually used/R&D sponsored by NAVSEA
8. Determination: ___ Store X Accept & Code
9. Comments: Same author as for BID #126; almost the same.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 06, 07, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    127-U02,06,07

PAUL DEFAYETTE
Evaluator

07/01/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 128 File No. 128-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Report of VLCC Tank Inspection Methodology Conference held at Portland Oregon

3. Publication Date: 7/10/79

4. Key Words/Descriptors: Making vessel and all parts of it reasonably available for inspection/mechanical devices/light-optics system.

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: Neither

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    128-00-00

PAUL DEFAYETTE
Evaluator

7/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 129 File No. 129-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report X Questionnaire
   ___ Other ___
2. Title/Publisher: Questionnaire, LT McGarry/USCG Marine Safety Office, Norfolk, VA
3. Publication Date: 12 June 1980
4. Key Words/Descriptors: Hull Inspection, Sea Chests, Sea Valves, Drawing Tailshaft, Rudder, Propeller
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: Questionnaire response by USCG inspector during inspection of SS Green Harbor. Trip Report dated 24 June 1980 is part of this BID.
6. Timeliness: ___ Outdated X Current ___ Future
   Information reflects current practice.
7. Verity: LT McGarry is a USCG officer with 2 years experience as an inspector.
8. Determination: ___ Store X Accept & Code
9. Comments: Most complete questionnaire obtained in the second revision form. Quantitative criteria exist for hull plate corrosion, tailshaft weardown, and pintle clearance.
10. Inspection Requirement Codes: 99 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    129-I99

PAUL DEFAYETTE
Evaluator

7/2/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 130 File No. 130-U06

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Automap/Reimers Consultants, Falls Church, Va.
3. Publication Date: November 12, 1980
4. Key Words/Descriptors: Ultrasonic Gaging, NDT
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: The Automap is an ultrasonic thickness measuring instrument using a microprocessor to analyze the measured data. Designed for underwater use by divers.
6. Timeliness: ___ Outdated X Current ___ Future
   The system has been designed and tested and the first commercial units are now available.
7. Verity: Telephone conversation with company president disclosed unit is modelled after the similar system developed by Naval Coastal Systems Center.
8. Determination: ___ Store X Accept & Code
9. Comments: The $25,000-$35,000 price tag of this unit may slow its introduction into field use.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 06 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    130-U06

F. MATANZO
Evaluator

11/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 131 File No. 131-U02,05,09, 10,12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Wet Docking of Large Ships/In Water Maintenance Conference 1975
3. Publication Date: 1975
4. Key Words/Descriptors: Hull Cleaning and Painting Afloat/Brush/ Water Jet/Antifouling Paint/Remote Controlled TV
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Remote controlled TV Submersibles/Painting/Hull Cleaning
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Is being used.
8. Determination: ___ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 05, 09, 10, 12,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
131-U02,05,09,10,12

PAUL DEFAYETTE
Evaluator

07/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 132 File No. 132-U13

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Improved Operation and Simplified Maintenance of Stern Gear by Use of Split Stern Bearings/Society of Naval Arch. and Engineers.

3. Publication Date: 1972

4. Key Words/Descriptors: Split Stern Bearings

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Stern Bearings

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Being used with no major problems.

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 13, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
132-U13

PAUL DEFAYETTE
Evaluator

07/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 133 File No. 133-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Method for Coating Wet Surfaces or Surfaces Immersed In Water/U.S. Patent Office
3. Publication Date: May 10, 1977
4. Key Words/Descriptors: Two-Part Epoxy Resin System
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater Painting
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Tests carried out with positive results.
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 12, ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    133-U12

PAUL DEFAYETTE
Evaluator

07/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 134 File No. 134-U02.05.10.12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ______
2. Title/Publisher: The Survey Afloat of Large Ships/Underwater Maintenance Company Limited
3. Publication Date: Unknown
4. Key Words/Descriptors: Hull Cleaning by Water Jet/Painting Vessel by Listing 8-10 degree/In-Water Survey/Scan Survey System
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater TV, Remote Vehicle, Cleaning, Painting
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: In practice
8. Determination: ___ Store X Accept & Code
9. Comments: ______
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 05 , 10 , 12 , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    134-U02.05.10.12

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 135 File No. 135-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: MK12 Surface Supported Diving System/ Navy Experimental Diving Unit
3. Publication Date: December 1978
4. Key Words/Descriptors: Mixed Gas, Hard Hat Diving, Saturation Diving
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Support of underwater working divers
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy report
8. Determination: X Store ___ Accept & Code
9. Comments: The system is for saturation diving which is beyond the water depths of interest in this project. Tested to 380 feet.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    135-00-00

F. MATANZO
Evaluator

11/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 136 File No. 136-U06

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Ultrasonic/Eddy Current Instrumentation for Nondestructive Testing/Nortec
3. Publication Date: January 1980
4. Key Words/Descriptors: Thickness Measurement/Flaws NDT
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Ultrasonic gaging and eddy current crack detection.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Advertisement
8. Determination: ___ Store X Accept & Code
9. Comments: Nortec Manufactures transducers for ultrasonic and eddy current NDT instruments, and the display and recording monitors.
10. Inspection Requirement Codes: 00 ,___,___,___,___,
11. Underwater Technology Codes: 06 ,___,___,___,___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
136-U06

PAUL DEFAYETTE
Evaluator

08/06/80
Date

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DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 138 File No. 138-U02,03,04

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other ____
2. Title/Publisher: Explorer II Underwater TV System/Video Sciences Incorporated
3. Publication Date: Undated
4. Key Words/Descriptors: Underwater Color TV/VTR/Lighting/Communications System
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Underwater TV
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Advertisement
8. Determination: __ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 02, 03, 04, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    138-U02,03,04

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 139 File No. 139-U13

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Stern Bearing/Seal System/The Glacier Metal Company
3. Publication Date: July 1980
4. Key Words/Descriptors: "Fail Safe" Design/Inboard Monitoring of System Behavior
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Shaft Bearing
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Advertisement
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 13
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    139-U13

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 140 File No. 140-I99

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
X Other Photographs

2. Title/Publisher: Drydock Inspection of SS Green Harbor/Newport Shipbuilding and Drydock, Newport Va.

3. Publication Date: June 1980

4. Key Words/Descriptors: Rudder, Propeller, Sea Chests, Bilge Keel

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
Specify: Photos of drydock inspection, including hull, sea chests, propeller and rudder.

6. Timeliness: ___ Outdated X Current ___ Future
Recent drydock inspection.

7. Verity: Photos taken during inspection while contractor was present.

8. Determination: ___ Store X Accept & Code

9. Comments: Photos depict inspection procedures. The contrast between black and white and color photographs is clear.

10. Inspection Requirement Codes: 99

11. Underwater Technology Codes: 00

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
140-I99

PAUL DEFAYETTE
Evaluator

08/05/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 141 File No. 141-U16

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: "Motor Vessel Permanently Repaired" MARINE ENGINEERING/LOG, August 1980, page 80.

3. Publication Date: August 1980

4. Key Words/Descriptors: Underwater Repairs

5. Partinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Article discusses successful permanent repair of a 3.5 m X 1.85 m indentation in a 15,000 ft. vessel hull in the water - Total repair time less than one week.

6. Timeliness: ___ Outdated X Current ___ Future
   Repair took place in November 1979

7. Verity: Repair inspected by Lloyd's Register

8. Determination: ___ Store X Accept & Code

9. Comments: Repair performed in Antwerp by the Hydrex Co. A 4000 liter positive-buoyancy caisson was used to hold the repair patch in position.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 16 , ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    141-U16

RENUART
Evaluator

09/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 142 File No. 142-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Soil Disposal of Organotin-Contaminated Grit Waste/David W. Taylor, Naval Ship Research and Development Center

3. Publication Date: September 1979

4. Key Words/Descriptors: Soil Disposal/ Waste-Contaminated Grit/ Hull Cleaning Operations

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: Does not pertain to either.

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: Deals with disposal of Organotin contaminated soil after use in hull cleaning operations.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
142-00

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 143 File No. 143-U15

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Stray Current Corrosion During Platform Welding Operations Offshore/Offshore Technology Conference
3. Publication Date: May 1977
4. Key Words/Descriptors: Localized corrosion by stray electrical current and corrective methods.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Welding
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Tests conducted and results issued at Offshore Technology Conference
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 15, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    143-U15

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 144 File No. 144-00

1. Type: X Report __ Article __ Advertising __ Trip Report __ Questionnaire
   __ Other __
2. Title/Publisher: Five Year Underwater Inspection Program of a North Sea Steel Platform Jacket/Offshore Technology Conference
3. Publication Date: April 1979
4. Key Words/Descriptors: Inspection of Offshore Platform/Settling/ Marine Buildup/Structural Integrity/Corrosion
5. Pertinence to Project: __ Inspection Requirement __ Underwater Technology
   Specify: No pertinence to project.
6. Timeliness: __ Outdated __ Current __ Future
7. Verity:
8. Determination: X Store __ Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    144-00-00

PAUL DEFAYETTE
Evaluator

8/6/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 145 File No. 145-00

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other
2. Title/Publisher: Necessity for Repairs & Inspection/Northern Executive
3. Publication Date: 1977
4. Key Words/Descriptors: Splash Zone Damage/Welding/Hyperbaric Chamber
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: No pertinence to project.
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity:
8. Determination: X Store ___ Accept & Code
9. Comments: Gives reasons why there is a need for repairs & inspection.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    145-00-00

PAUL DEFAYETTE
Evaluator

8/6/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 146 File No. 146-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Underwater Coatings, A.T. Phillip (Author) of MRL - Source Unknown

3. Publication Date: 1974

4. Key Words/Descriptors: Antifouling Paints, Organotin

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Discussed test results of different types of antifouling coatings. Tests show that chloranates rubber and organotin-polymer coatings are effective for over 2 years.

6. Timeliness: X Outdated ___ Current ___ Future
Article was written in 1974 when testing of coatings began. Test results should be available now.

7. Verity: Tests conducted over two-year period at MRL on Test Rafts. Further testing on ships began in 1974.

8. Determination: X Store ___ Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
146-00

RENUART
Evaluator

09/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 147 File No. 147-U15

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: "Vriens Diving Makes Major Underwater Repair to Greek Bulk Carrier with Philips Welding Electrodes", PHILIPS WELDING REPORTER, 1979-1

3. Publication Date: 1979

4. Key Words/Descriptors: Wet Welding

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Discusses successful application of open water welding in repairing the hull of a ship using Philips 45 electrodes.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Successful repair of the bow on a Greek bulk carrier ship.

8. Determination: ___ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 15 , ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
147-U15

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 148 File No. 148-U02.06.07.08

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Field Experience with Recently Developed Non-destructive Examination Systems/NCSC

3. Publication Date: 1980

4. Key Words/Descriptors: Stereophotography/Ultrasonic Inspection/ Magnetic Particle Inspection

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Stereophotography, ultrasonic and magnetic particle inspection.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Experimentation to gain needed experience has been completed.

8. Determination: ___ Store X Accept & Code

9. Comments: Another report on very pertinent work conducted at NCSC.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 02 , 06 , 07 , 08 , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
148-U02.06.07.08

PAUL DEFAYETTE
Evaluator

08/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 149 File No. 149-U07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Visual Contrasting Magnetic Particle Slurry for Flaw Detection, Paper presented at American Society of Non-destructive Testing, Magnaflux Co.
3. Publication Date: October 21, 1974
4. Key Words/Descriptors: Magnetic Particle Testing
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: May be used on either wet (submerged) or dry surfaces.
6. Timeliness: ___ Outdated X Current ___ Future
   Lab testing is still ongoing; however, underwater tests have been successful.
7. Verity: Method has been successfully applied and processed underwater during laboratory testing by Magnaflux.
8. Determination: ___ Store X Accept & Code
9. Comments: Method may be used overhead on painted surfaces, dark or light colored surfaces, and with minimal surface preparation. No special lighting aids required.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 07
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    149-U07

RENUART — Evaluator

08/29/80 — Date

DTCG23-80-C-20009
Form 1

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BID EVALUATION

BID No. 151 File No. 151-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Coating Surfaces Underwater, Civil Engineering Lab (CEL), Port Hueneme, Calif.
3. Publication Date: N/A
4. Key Words/Descriptors: Antifouling paint, welding agents.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Discusses use of thinner, brushable coatings which may be applied underwater. Also discusses effectiveness of different biocide additives to prevent marine fouling.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Laboratory and field experiments performed by CEL. Naval Coastal Systems Center participated in some of the experiments.
8. Determination: ___ Store X Accept & Code
9. Comments: Surface preparation underwater increases total cleaning time (versus surface preparation in drydock) due to limited visibility from agitation of water.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 12 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
151-U12

RENUART
Evaluator

08/28/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 152 File No. 152-U10

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Diver Operated Cleaning Tools, CAVIJET, Cavico, Inc.

3. Publication Date: July 1980

4. Key Words/Descriptors: Cavitation, Hull Cleaning Underwater work.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Tools used to remove fouling from underwater appendages of ships.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Used by U.S. Navy for over 2 years. NCSC and Naval Experimental Diving Unit performed extensive tests. Authorized for use in Navy by NAVSEA Code OOC.

8. Determination: ___ Store X Accept & Code

9. Comments: Tool has been shown to be effective for preparing surfaces for in-water painting. Current rental fee is $3000/ year and so hindering wide spread use.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 10, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    152-U10

RENUART
Evaluator

08/28/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 153 File No. 153-U13

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other __

2. Title/Publisher: B.F. Goodrich Water Lubricated Cutless Rubber Bearings for Marine and Industrial Applications - Lucian Moffit, Inc.

3. Publication Date: March 1, 1980

4. Key Words/Descriptors: Rubber Bearings

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Possible application of bearings for in-water maintenance (see comment).

6. Timeliness: __ Outdated X Current __ Future

7. Verity: Moffit rubber bearings have been used over 40 years in a wide range of applications, including Naval Vessels.

8. Determination: __ Store X Accept & Code

9. Comments: Not clear in advertising brochure whether the bearing face segments (which are replaceable) can be replaced while ship is in water. Recommend contacting supplier to verify.

10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,

11. Underwater Technology Codes: 13 , __ , __ , __ , __ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    153-U13

RENUART
Evaluator

09/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 154 File No. 154-U09

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: USS Lexington (CVT-16) Waterborne Hull Cleaning Effectiveness Report, Naval Sea Systems Command

3. Publication Date: September 6, 1977

4. Key Words/Descriptors: Brush Hull Cleaning, SCAMP

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Not very informative. Perhaps would be useful as a starting point in developing format for an inspection report.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: U.S. Navy Report

8. Determination: ___ Store X Accept & Code

9. Comments: Report contains color photos of before and after cleaning shots.

10. Inspection Requirement Codes: 00 ,___,___,___,___,

11. Underwater Technology Codes: 09 ,___,___,___,___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
154-U09

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 155 File No. 155-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: "Recent Developments in Marine Antifoulants" paper presented at 20th Annual Marine Offshore Inland Waterways Conference, by M. Gitlity of M&T Chemicals, Inc.

3. Publication Date: March 26, 1980

4. Key Words/Descriptors: Antifouling Paints

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses advances in antifouling coating technology, in particular, new organotin-polymer coatings which will extend lifetime of coating effectiveness to 2-3 years between applications.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Demonstrated successful in Europe and Far East. Only accepted by U.S. EPA in 1978. Must be further tested in U.S. applications.

8. Determination: ___ Store X Accept & Code

9. Comments: Although the organotin-polymer coatings must be applied in drydock, their longer life can extend the drydocking intervals.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    155-U12

RENUART
Evaluator

09/02/80
Date

BID EVALUATION

BID No. 156 File No. 156-U01,05,06, 07,08

1. Type: ___ Report _X_ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: "Underwater Inspection, Testing, and Monitoring of Offshore Structures", OCEAN ENGINEERING, Vol. 6, pages 335-491, R. Frank Busby (author)

3. Publication Date: February 1979

4. Key Words/Descriptors: Visual inspection, magnetic particle inspection, ultrasonic inspection; radiography; corrosion-potential measurements; magnetographic inspection; acoustic holography inspection; acoustic emission monitoring; vibration analysis.

5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: A very thorough survey of current and developing techniques for NDT and monitoring of undersea components of offshore oil drilling structures. Author interviewed 70 U.S., Canadian, and European companies which manufacture NDT equipment or supply services for undersea inspection. The larger companies (continued on attached)

6. Timeliness: ___ Outdated _X_ Current _X_ Future
   Article surveys both current and future techniques for underwater NDT and monitoring of steel structures.

7. Verity: Article funded by NOAA, USGS, and U.S. DOE

8. Determination: ___ Store _X_ Accept & Code

9. Comments: Article lists many U.S. and Canadian suppliers in the underwater NDT and monitoring business; may be useful for further contacts.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 01 , 05 , 06 , 07 , 08 ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    156-U01,05,06,07,08

RENUART
Evaluator

09/02/80
Date

BID EVALUATION

BID No. 156 File No. 156-U01,05,06,07,08

5. Specify: (Cont'd)

are listed along with their capabilities for undersea NDT or monitoring. R&D related to emerging methods for deploying NDT equipment, e.g., remote-controlled vehicles, manned submersible vehicles, etc., are discussed and tabulated. Although article is directed to offshore oil rigs, material is applicable to any application for undersea NDT inspections.

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 157 File No. 157-U02,03,04,05

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other
2. Title/Publisher: Hydro Products, Inc.
3. Publication Date:
4. Key Words/Descriptors: Underwater Television; Light Sources; Underwater Communications; Remote Controlled Vehicles.
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Manufacturer of low-light and bright-light (welding) underwater cameras; high intensity underwater lights; remote controlled vehicles for inspecting underwater; and, underwater communication systems.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Company in business for over 15 years. Many of its products used by U.S. Navy for ship hull and sonar dome inspection.
8. Determination: __ Store X Accept & Code
9. Comments: Company offers complete inspection system which includes CCTV camera, recorder, and communications mask.
10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,
11. Underwater Technology Codes: 02 , 03 , 04 , 05 , __ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    157-U02,03,04,05

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 158 File No. 158-U05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Interim Status Report - Project 4151 - Hazardous Chemical Discharge Prevention and Reduction - Remote Controlled Hull Damage Inspection USCG.

3. Publication Date: July 1980

4. Key Words/Descriptors: Remote Controlled Vehicles: Underwater Television

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Remote Controlled Vehicles used to locate hull damage on USCG Cutters.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: System tested by USCG.

8. Determination: ___ Store X Accept & Code

9. Comments: Tests confirmed that a remote inspection system is feasible. Video image require improvement.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 05 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
158-U05

RENUART
Evaluator

09/03/80
Date

BID EVALUATION

BID No. 159 File No. 159-U14

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other (U.S. Patent)
2. Title/Publisher: Roughness Diagnostic Tool, John Mittleman, inventor, U.S. Patent Office
3. Publication Date: January 9, 1979
4. Key Words/Descriptors: Antifouling measurement; corrosion measurement; coating deterioration measurement
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Tool may be used underwater for measuring and testing the degree of roughness on the hull to be used in determining the degree of fouling, corrosion, and coating deterioration and its effect on the performance of the vessel.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy work
8. Determination: ___ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 14 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    159-U14

RENUART
Evaluator

09/02/80
Date

DTCQ23-80-C-20009
Form 1

BID EVALUATION

BID No. 160 File No. 160-U10

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: R&D of a cavitating water jet cleaning system for hull cleaning for the U.S. Navy conducted by Daedalean Associates. Inc., Authors: S.C. Howard, et. al.
3. Publication Date: June 1978
4. Key Words/Descriptors: Cavitation Hull Cleaning, Underwater work
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Reports on R&D of Cavitation jet cleaning on Naval Vessel Hulls. Concludes the Cavitation method is successful on heavy as well as lightly fouled hulls.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy experimental diving unit, Panama City has evaluated this tool and found it promising.
8. Determination: ___ Store X Accept & Code
9. Comments: Cavitation jet cleaning is especially efficient (versus brush cleaning) on light fouling; therefore, can afford to clean hull more often for fuel efficiency of ship. Effective on propeller and in sea chests.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 10 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    160-U10

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 161 File No. 161-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Evaluation of Protective Coatings Systems for Buoys Battelle Columbus Laboratories (AD-A054279-NTIS)

3. Publication Date: May 31, 1977

4. Key Words/Descriptors: Antifouling Paint; Anit-Corrosive Paint

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Although report focuses on coatings for buoys, results of tests on steel buoys should be applicable to hull coatings of a similar composition.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: U.S. Coast Guard Program

8. Determination: ___ Store X Accept & Code

9. Comments: Report rates 31 different coating systems applied to buoys and monitored for 18 months.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    161-U12

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 162 File No. 162-U02,14

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Field use of the NAVSEA Diver Tool Package/Naval Coastal Systems Center, Panama City, Fla., Authors: J. Mittleman, M. Sheehan

3. Publication Date: N/A

4. Key Words/Descriptors: Underwater Photography; Underwater Corrective Maintenance; Hydraulic Tools; Underwater Drilling

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Discusses a variety of underwater tools and their application to ship surveillance and maintenance as experienced by the U.S. Navy.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Experience at Naval Coastal Systems Center

8. Determination: ___ Store X Accept & Code

9. Comments: Many of the tools described are in R&D stage and thus are future improvements to existing tools.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 02 , 14 , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
162-U02,14

RENUART/METCALF
Evaluator

09/03/80/10/07/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 163 File No. 163-U02

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Underwater Stereo Photography for Hull Inspection, NCSC, Panama City, Florida

3. Publication Date: February 1980

4. Key Words/Descriptors: Underwater Photography, Stereo Photography

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses how one can manufacture an inexpensive 3-D camera and use of 3-D camera for closeup hull exams.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Naval Coastal Systems Center

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 02, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    163-U02

RENUART
Evaluator

10/13/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 164 File No. 164-U15

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: "Metal Working Lasers: Their Time Has Come", published in IRON AGE, September 9, 1974.
3. Publication Date: September 9, 1974
4. Key Words/Descriptors: Lasers
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: Article does not specify that laser welders/cutters may be used underwater. This could be pursued with laser suppliers mentioned in article.
6. Timeliness: ___ Outdated ___ Current X Future
7. Verity: None
8. Determination: X Store ___ Accept & Code
9. Comments: See #5.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 15, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
164-U15

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 165 File No. 165-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: "Effects of Energy, Economics, and Ecology on Marine Coatings", paper presented at International Corrosion Forum by R.W. Drisko of Civil Engineering Laboratory.
3. Publication Date: March 1976
4. Key Words/Descriptors: Antifouling Paint; Anticorrosion Paint
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses types of antifouling coatings available which may be applied underwater; discusses EPA restrictions effecting corrosion control processes.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Tests conducted by CEL over a 6-month period.
8. Determination: ___ Store X Accept & Code
9. Comments: Background material on development of paints that can be applied to a wet surface and also has early considerations on organotin antifouling.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 12, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    165-U12

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 166 File No. 166-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: "A Shipowner's Experience With Reactivating Antifoulings", SW&S-1976 ISPCC, Article by J.E. Wahl of Oivind Lorentzen

3. Publication Date: 1976

4. Key Words/Descriptors: Antifouling Paints, Brush Cleaning Reactivation of Toxin

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Discussion of method to extend life of copper-based antifouling paints whereby at 12-18 month intervals the copper carbonate film is brushed off underwater thereby extending the effectiveness of the paint from 1.5 years to 4-5 years.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Testing not complete at time of article. Testing and monitoring performed on Norwegan Transport Ships for three years with satisfactory results.

8. Determination: ___ Store X Accept & Code

9. Comments. Reactivation of coatings underwater may extend dry-docking to 4-5 year intervals.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
166-U12

RENUART
Evaluator

09/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 167 File No. 167-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: "Underwater Protection: A 15-year Review", MARINE WEEK, January 16, 1976
3. Publication Date: January 16, 1976
4. Key Words/Descriptors: Anticorrosion Paint; Antifouling Paint
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: ___
6. Timeliness: X Outdated ___ Current ___ Future
Information on past practices in coating technology is discussed; however, newer antifouling coatings are on the market and discussed in other BIDs.
7. Verity: Marine Coatings Laboratory, England
8. Determination: X Store ___ Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
167-00

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 168 File No. 168-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: "Photogrammetry in Shipbuilding" prepared for the Maritime Administration by Todd Shipyards Corp., Seattle
3. Publication Date: July 1976
4. Key Words/Descriptors: Photogrammetry, Underwater Photography
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Photogrammetry is a means of making very accurate measurements of large and/or detailed three-dimensional shapes by interpreting photographic images by the use of a computer. Possible applications would be measuring the undamaged symmetric portion of a hull to be used in building a template to repair the damaged section.
6. Timeliness: ___ Outdated ___ Current X Future
Application to underwater measurements yet to be determined.
7. Verity: None for underwater applications.
8. Determination: X Store ___ Accept & Code
9. Comments: Requires special cameras. Need to determine if cameras made for underwater use.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 11, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
168-00-11

RENUART
Evaluator

09/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 169 File No. 169-U18

1. Type: X Report __ Article __ Advertising __ Trip Report __ Questionnaire
   __ Other

2. Title/Publisher: Parameters for a Ship Hull Cleaning System using the Cavitating Water Jet method prepared for National Maritime Research Center by Hydronautics, Inc. (inventor of CAVIJET)

3. Publication Date: July 1975

4. Key Words/Descriptors: Cavitation Cleaning

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Report discusses using CAVIJET cleaners to clean hulls of fouling (up to 1000 ft^2/hr) or rust (up to 120 ft^2/hr) underwater - Automatic Systems under development.

6. Timeliness: X Outdated __ Current __ Future
   More recent data presenting up-to-date lab and field tests should be available.

7. Verity: Six years lab testing - requires large scale testing (at time of publication) - Evaluation by Todd Research indicated some of lab results are overstated.

8. Determination: X Store __ Accept & Code

9. Comments: Further research planned at time of publication. Lab results appear promising for large scale applications at reduced costs compared to sandblasting or brushing methods with less pollution.

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 18

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    169-U18

RENUART
Evaluator

09/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 170 File No. 170-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Computer-Assisted Naval Applications of Holography 132-4 prepared for Office of Naval Research by Computer Command and Control Co., Washington, D.C.
3. Publication Date: February 9, 1973
4. Key Words/Descriptors: Holography
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: None - Discusses holographic techniques with Naval Fire Control Systems as an aid in Aircraft Detection.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: ___
8. Determination: X Store ___ Accept & Code
9. Comments: Try to obtain report no. 132-2 with the same title, dated February 13, 1970. This report discusses applications of holography in close-range acoustic underwater imaging.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 00 , ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    170-00

RENUART
Evaluator

09/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 171 File No. 171-I01,06,07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Classification of Steel Ship Regulations/Det Norske Veritas, Norway
3. Publication Date: January 1980
4. Key Words/Descriptors: Hull Inspection; Tailshaft Inspections; Bottom Inspection.
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
Specify: Discusses periodic inspection requirements of ships in Norway. Hull inspections 3-4 years; Bottom Surveys 1-2.5 years; Tailshaft Survey 2.5-5 years.
6. Timeliness: ___ Outdated X Current ___ Future
Chapters 1 and 2 of Part 1 are both 1980 publications.
7. Verity: Society Det Norske Veritas is equivalent to ABS.
8. Determination: ___ Store X Accept & Code
9. Comments: Hull surveys required in drydock. If a ship is designated "Built for In-water Survey" bottom survey may be performed in water.
10. Inspection Requirement Codes: 06, 07, ___, ___, ___,
11. Underwater Technology Codes: ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
171-I06,07

RENUART
Evaluator

09/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 172 File No. 172-U01.05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: State-of-the-Art Survey of Hardware Delivery and Damage Inspection Methods for Bulk Carriers of Hazardous Chemicals in the Marine Environment, USCG R&D Center.
3. Publication Date: April 1980
4. Key Words/Descriptors: Hull Inspection; Submersibles, Manned and Remote Controlled
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discuss state-of-the-art technologies useful in vessel hull damage inspection, damage patching/plugging, sampling, and in-site analysis, using divers, manned submersibles, and unmanned submersibles.
6. Timeliness: ___ Outdated X Current ___ Future
   Very thorough and current survey at ROV's manufactured in U.S. and abroad.
7. Verity: USCG R&D Center
8. Determination: ___ Store X Accept & Code
9. Comments: Various manned and unmanned systems were evaluated for overall effectiveness. The unmanned remote vehicles (ROV) scored highest. Names of MCH's, specifications, and costs for 50 ROV systems provided in report.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 05 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    172-U01.05

RENUART
Evaluator

09/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 173 File No. 173-U13

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire __ Other __

2. Title/Publisher: Trelleborg Underwater Hull Cleaning System Trellclean, Trelleborg A.B. Marine Dept., Trelleborg, Sweden

3. Publication Date: August 1980

4. Key Words/Descriptors: Brush Scrubbing

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Underwater remote controlled hull cleaning system that cleans both the sides and bottom of a ship at a rate faster than SCAMP units.

6. Timeliness: __ Outdated X Current __ Future

7. Verity: Successful on Norwegian Ships and a cleaning station established in Houston, Texas.

8. Determination: __ Store X Accept & Code

9. Comments: Will clean entire hull in less than 24 hours of very thick marine growth with little diver support.

10. Inspection Requirement Codes: 00 , __ , __ , __ , __ ,

11. Underwater Technology Codes: 13 , __ , __ , __ , __ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    173-U13

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 174 File No. 174-U03,07

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Blackbirn Underwater "Black Light" for Metal Flaw Detection; Birns Oceanographics, Inc.
3. Publication Date: August 1980
4. Key Words/Descriptors: Light Sources; Magnetic Particle NDT
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Modular system which contains white light for diver vision, magnetic probe to align metal particles, and a "Black" light for visual detection of flaws located by fluorescent metal particles.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Unsolicited letter from Monsanto; Searchlights used by many underwater inspection companies worldwide.
8. Determination: ___ Store X Accept & Code
9. Comments: Company also MGH Underwater TV and Search Lights.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 03 , 07 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    174-U03,07

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 175 File No. 175-U01,05,06, 10,15

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Taylor Diving and Salvage Company

3. Publication Date: N/A

4. Key Words/Descriptors: Dry Underwater Welding; Hyperboric Welding; Life Support Systems; Remote Controlled TV; Wet Welding; Ultrasonic Gaging; Underwater Lights; Water Jet Hull Cleaning.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Company offers a variety of underwater inspection and maintenance tools.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: None

8. Determination: ___ Store X Accept & Code

9. Comments:

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 01, 05, 06, 10, 15

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    175-U01,05,06,10,15

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 176 File No. 176-U01,02,03,04,14

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other
2. Title/Publisher: Aqua-Air Industries
3. Publication Date: August 1980
4. Key Words/Descriptors: Life Support Systems; Underwater TV; Underwater Lights; Underwater Communications; Underwater Hydraulic Tools
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Company offers extensive line of underwater tools and life support systems plus underwater color closed circuit television.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Verified by visit to company in Harvey Louisanna and discussions with their customers.
8. Determination: __ Store X Accept & Code
9. Comments:
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 01, 02, 03, 04, 14,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    176-U01,02,03,04,14

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 177 File No. 177-U11

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Global Cathodic Protection, Inc.

3. Publication Date: 1979

4. Key Words/Descriptors: Cathodic Protection, Passive, Galvanic, Sacrificial Anodes

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Company provides a complete line of cathodic protectors

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Advertising material was obtained during a visit to the firms offices in Houston, Texas.

8. Determination: ___ Store X Accept & Code

9. Comments: Company located in England and provides services worldwide. Company in service on 2 years.

10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,

11. Underwater Technology Codes: 11 , ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
177-U11

RENUART — Evaluator

09/03/80 — Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 178 File No. 178-U12,14

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Working Manual BALTOFLAKE, Glass Reinforced Polyester Coating, Jotun-Baltimore Copper Paint Company
3. Publication Date: 1980
4. Key Words/Descriptors: Antifouling paint; Anticorrosion paint; antifouling paint reactivation
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Company offers full line of paints for both topside and hull applications including antifouling paint that may be applied underwater.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Company services worldwide for over 10 years.
8. Determination: ___ Store X Accept & Code
9. Comments: Using reactivation system every 12-14 months may extend drydocking intervals up to 5 years.
10. Inspection Requir ment Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Tech ·logy Codes: 12 , 14 , ___ , ___ , ___ ,
12. Create File No.: ᴊID No. - IR Code No(s) - UT Code No(s)
    178-U12,14

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 179 File No. 179-U10

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other __

2. Title/Publisher: WOMA Co.

3. Publication Date: September 1980

4. Key Words/Descriptors: Water Jet Cleaning; Sand Injection

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Underwater hull cleaning with high pressure water, with or without sand injection.

6. Timeliness: __ Outdated X Current __ Future
   The underwater sand injection system is a recent addition to their established high pressure cleaning system.

7. Verity: The WOMA system was observed while witnessing an underwater hull cleaning job by Seaward Marine in Norfolk, Va.

8. Determination: __ Store X Accept & Code

9. Comments: The underwater sand injection system permits complete preparation of a metal surface prior to a welding repair or painting.

10. Inspection Requirement Codes: 00 , __ , __ , __ , __ , __ ,

11. Underwater Technology Codes: 10 , __ , __ , __ , __ , __ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    179-U10

RENUART
Evaluator

10/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 180 File No. 180-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: A Guide for the Nondestructive Testing of Non-Butt Welds in Commercial Ships - Part 2, Naval Ordnance Laboratory, published in White Oak, Md.
3. Publication Date: December 1974
4. Key Words/Descriptors: ___
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: None
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy
8. Determination: X Store ___ Accept & Code
9. Comments: Does not discuss any NDT techniques for underwater applications.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 00, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    180-00

RENUART
Evaluator

09/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 181 File No. 181-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: A Guide to the Nondestructive Testing of New Butt Welds in Commercial Ships
3. Publication Date: December 1974
4. Key Words/Descriptors: ___
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: None
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: ___
8. Determination: X Store ___ Accept & Code
9. Comments: Does not discuss any NDT techniques for underwater applications.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    181-00

RENUART
Evaluator

09/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 182 File No. 182-U12

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Organotin-Based Antifouling Systems, Published by the Tin Research Institute, Middlesex, England
3. Publication Date: 1975
4. Key Words/Descriptors: Antifouling Paints (Organotins)
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Complete literature survey of success with Organotin Antifouling Coatings through 1975. Discusses development of coatings to minimize environmental impact.
6. Timeliness: ___ Outdated X Current ___ Future
   Organotins still very much in testing and evaluation stage at time of publication (1975)
7. Verity: Tin Research Institute
8. Determination: ___ Store X Accept & Code
9. Comments: Article is ambitious that organotin antifouling coatings will have less environmental impact than cuprous based coatings.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    182-U12

RENUART
Evaluator

09/16/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 183 File No. 183-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Antifouling Organometallic Structural Plastics, NAVAL ENGINEERS JOURNAL
3. Publication Date: April 1974
4. Key Words/Descriptors: Antifouling Paints (Organotins)
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses experimental results of different formulations of organometallic polymers to control and minimize leaching to provide environmentally acceptable long-lasting antifouling paints.
6. Timeliness: ___ Outdated X Current ___ Future
   Although information is dated and newer and more recent test results should be available, material is of interest in evaluating antifouling paints.
7. Verity: U.S. Navy
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 12, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    183-U12

RENUART
Evaluator

09/16/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 184 File No. 184-U12

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Articles presented at the Marine Coatings Symposium, JOURNAL OF PAINT TECHNOLOGY, Vol. 47, No. 600
3. Publication Date: January 1975
4. Key Words/Descriptors: Antifouling Paints; Antifouling Systems
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Articles discuss: Environmental and Safety Imports of Organotin; Methods for Extending the Effectiveness of Antifouling Coatings by use of a Hydrophilic topcoats to control release of agent while vessel is underway; comparison of advantages and disadvantages of antifouling systems; demonstration of effects of different coating film thickness.
6. Timeliness: ___ Outdated X Current ___ Future
   Studies to determine environmental effects of organotins were ongoing at time of publication.
7. Verity: None
8. Determination: ___ Store X Accept & Code
9. Comments: Articles conclude organotins are safe to user if handled properly, have no cancinogenic effects, and initial indications show little environmental effect from tin released in water.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    184-U12

RENUART
Evaluator

09/16/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 185 File No. 185-U00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Evaluation of Cathodic Protection Criteria/ Engineering and Services Laboratory, A.F. Engineering and Services Center
3. Publication Date: April 1979
4. Key Words/Descriptors: ___
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Although conducted for U.S. Air Force, material useful to project since principles are the same. Report compares different techniques used to determine optimum placement of cathodic protectors.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Air Force
8. Determination: X Store ___ Accept & Code
9. Comments: Appendix A is a useful summary of the references referred to in the report.
10. Inspection Requirement Codes: 00 ,___,___,___,___,
11. Underwater Technology Codes: 00 ,___,___,___,___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    185-U00

RENUART
Evaluator

10/02/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 186 File No. 186-U15

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Future Trends of Materials and Welding Technology for Marine Structures. Paper presented at June 1976 SNAME Conference.

3. Publication Date: June 1976

4. Key Words/Descriptors: Welding

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses difficulties and problems of welding different materials expected in Marine applications. Section on underwater welding developments included.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: ___

8. Determination: ___ Store X Accept & Code

9. Comments: Recommend obtaining "Fundamental Research in Underwater Welding", THE WELDING JOURNAL, Vol. 54, No. 6, 1975 which is referenced in the article.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 15, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    186-U15

RENUART
Evaluator

10/03/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 187 File No. 187-U12

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: International Paint Co.

3. Publication Date: August 1980

4. Key Words/Descriptors: Antifouling Paint, Organotin, Self Polishing Copolymer.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology

Specify: Newer antifouling paints may extend drydocking intervals. Self Polishing Copolymer with organotin toxin is only EPA approved formulation.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Used on over 400 vessels including USCG and USN vessels since 1974. Office in Baltimore visited and was given color photographs of test patches on commerical vessels.

8. Determination: ___ Store X Accept & Code

9. Comments: Self-polishing antifouling paint which may extend drydock intervals up to 4 years wihtout reactivation. Water flow removes matrix which has leached out all its toxin.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___, ___,

11. Underwater Technology Codes: 12, ___, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
187-U12

RENUART
Evaluator

09/04/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 188 File No. 188-I07

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Coast Guard Amends Tailshaft Examination Regulations
3. Publication Date: August 1980
4. Key Words/Descriptors: Tailshaft Examinations
5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: USCG Tailshaft Examination Regulations, ref. Part 61, CFR 46. Specifies inspection intervals for different types of tailshafts.
6. Timeliness: ___ Outdated X Current ___ Future
   Very recent USCG publication
7. Verity: USCG publication
8. Determination: ___ Store X Accept & Code
9. Comments: Provides In Test USCG Tailshaft Exam. Intervals, and bearing wear limits which are the same as specified by ABS.
10. Inspection Requirement Codes: 07 ,___,___,___,___,
11. Underwater Technology Codes: ___,___,___,___,___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    188-I07

RENUART
Evaluator

10/07/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 189 File No. 189-U11

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Design Guidelines for Impressed-Current Cathodic Protection Systems on Surface-Effect Ships NSRDS
3. Publication Date: May 1975
4. Key Words/Descriptors: Cathodic Protection (active)
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Report discusses test results of impressed-current cathodic protectors on surface ships. Design guidelines for optimizing applications are given.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: U.S. Navy
8. Determination: ___ Store X Accept & Code
9. Comments: Active systems have been shown to have advantages over passive systems (sacrificial anodes) due to weight, drag, and required maintenance of passive systems.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 11 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    189-U11

RENUART
Evaluator

10/07/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 190 File No. 190-J01,02,09,15

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Trip to Peters Divers, Aruba/ESCO
3. Publication Date: 1 November 1980
4. Key Words/Descriptors: SCAMP, Brush Scrubbing, Underwater Welding, Underwater TV
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Brush scrubbing of ship hulls with SCAMP units is routine work at this clear water location in the Caribbean. Welding repairs have also been done.
6. Timeliness: ___ Outdated X Current ___ Future
   Peters Divers cleans about 70 vessels each year.
7. Verity: Contractor visit to facility and completed questionnaire by firm manager.
8. Determination: ___ Store X Accept & Code
9. Comments: Crude oil tankers anchored to discharge their cargo are cleaned with SCAMP units supported by two work boats and with SCUBA divers.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 01 , 02 , 09 , 15 , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    190-U01,02,09,15

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 191 File No. 191-U00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: "Underwater Drilling Rig Inspection in Lieu of Drydocking Survey", Continental Diving Servia, Inc.

3. Publication Date: N/A

4. Key Words/Descriptors: ___

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Presents procedure approved by ABS to inspect offshore oil rigs which are now also the responsibility of the USCG.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Company was visited and the ABS office is New York City also verified procedures acceptance.

8. Determination: ___ Store X Accept & Code

9. Comments: Provides inspection requirements for underwater drilling rigs.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
191-U00

RENUART
Evaluator

10/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 192 File No. 192-U13,15

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Deep Weld/Dimetrica Inc.
3. Publication Date: November 1980
4. Key Words/Descriptors: Underwater Automatic Welding, Tailshaft Repair
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology

   Specify: The literature describes equipment which can perform underwater welds inside a dry cofferdam and can be used to build up a worn tailshaft. A second piece of equipment can then turn the shaft diameter back down to specification.
6. Timeliness: ___ Outdated ___ Current X Future

   Systems have been used above water and have completed R&D for underwater use.
7. Verity: Personal knowledge of contractor's project engineer who has performed work on this system.
8. Determination: ___ Store X Accept & Code
9. Comments: BID contains four separate brochures and a memo describing proposed method of underwater welding and tailshaft repair.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 13 , 15 , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    192-U13,15

F. MATANZO
Evaluator

11/22/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 193 File No. 193-U12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other
2. Title/Publisher: Coatings Make For Smooth Sailing/CHEMICAL WEEK
3. Publication Date: July 1979
4. Key Words/Descriptors: Antifoulants, Self Polishing Copolymer
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: New antifouling coatings are extending the required drydocking interval for coatings to three years.
6. Timeliness: ___ Outdated X Current ___ Future
   Coatings are now commercially available.
7. Verity: Literature from paint manufacturers and a visit to International Paint Co., in Baltimore verifies the information in the article.
8. Determination: ___ Store X Accept & Code
9. Comments: Self-polishing copolymers depend on water motion to renew toxic surface. Another improvement is the use of thicker films that are reactivated by hull cleaning.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 12
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    193-U12

F. MATANZO
Evaluator

11/15/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 194 File No. 194-U02

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Edo Western Wellhand Inspection TV System
3. Publication Date: 1980
4. Key Words/Descriptors: Underwater TV System
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Complete package underwater TV system (B&W)
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: The USCG R&D Center at Groton, Conn. is using this system for inspecting the hull of a grounded or crippled vessel.
8. Determination: ___ Store X Accept & Code
9. Comments: The picture on the Edo Western monitor was unsatisfactory due to lighting or camera resolution.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    194-U02

RENUART
Evaluator

10/10/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 195 File No. 195-U02,03,04,14

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: MAR VEL Diving Specialities/M&E Marine Supply, Camden, N.J.
3. Publication Date: 1980
4. Key Words/Descriptors: SCUBA Gear, Underwater Closed Circuit TV, Underwater Communications, Hard Hat Diving Underwater Lights, Saturation Diving
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Catalog describes many pieces of underwater instruments, tools, and diver support gear.
6. Timeliness: ___ Outdated X Current ___ Future
   This 1980 catalog confirms that we have identified most mfg. of underwater related equipment.
7. Verity: Availability of many catalog items confirmed by material received directly from mfg.
8. Determination: ___ Store X Accept & Code
9. Comments: Besides providing technical specifications on equipment this catalog also gives the price of many items.
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 03, 04, 14, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    195-U02,03,04,14

F. MATANZO
Evaluator

11/22/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 196 File No. 196-U02

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Fathom Underwater Video Systems/Fathom 36, Salem, Oregon
3. Publication Date: 1980
4. Key Words/Descriptors: Underwater TV
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Advertising on Fathom System 36 Color Video TV System.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Fathom 36 exhibit at the Marine Technology Conference 1980 was visited to examine equipment and see a video tape.
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    196-U02

RENUART
Evaluator

10/14/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 197 File No. 197-U02

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other __

2. Title/Publisher: Benthosaurus, Underwater Photography Symposium/ Benthos, Inc.

3. Publication Date: June 1980

4. Key Words/Descriptors: Underwater 35mm Photography

5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Discusses complete line of underwater 35mm still photography equipment.

6. Timeliness: __ Outdated X Current __ Future

7. Verity: Benthos exhibit at Marine Technology Conference in Washington, D.C. was visited to see their equipment and discuss its applicability.

8. Determination: __ Store X Accept & Code

9. Comments: The 35mm color film, with proper lighting and lenses can provide better detail for a permanent record. Information not immediately available.

10. Inspection Requirement Codes: 00, __, __, __, __,

11. Underwater Technology Codes: 02, __, __, __, __,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    197-U02

RENUART
Evaluator

10/16/80
Date

This document contains
blank pages that were
not filmed

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 199 File No. 199-U12

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other OTC Paper
2. Title/Publisher: "Protective Coatings and Antifouling Paint That Can Be Applied Underwater", OFFSHORE TECHNOLOGY CONFERENCE, Paper 3020
3. Publication Date: May 1977
4. Key Words/Descriptors: Antifouling Paint, Underwater
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Preservation of the hull by painting damaged or repaired surfaces would contribute to extending the drydock interval.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Source is NCEL, a U.S. Navy facility.
8. Determination: ___ Store X Accept & Code
9. Comments: Paper describes development of a paint which can be applied in the water. Tests showed that with a 6% organotin content fouling was controlled for 12 months.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 12 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    199-U12

F. MATANZO
Evaluator

10/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 200 File No. 200-00

1. Type: ___ Report _X_ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Glass Laminates of New Antifouling Polymer Systems
3. Publication Date: ___
4. Key Words/Descriptors: Antifouling, Polymers, Glass Laminates
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: Fabrication of underwater ship parts with the material described in this report would be inherently foul proof for 18 months and never corrode.
6. Timeliness: ___ Outdated ___ Current _X_ Future
7. Verity: Worked performed by Dept. of Material/Science & Engr. at Washington State University and sponsored by U.S. Navy, DTNSRDC
8. Determination: _X_ Store ___ Accept & Code
9. Comments: This material is now in development and will not soon replace steel in ship construction.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    200-00-00

F. MATANZO
Evaluator

10/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 201 File No. 201-U09.16

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Periodic Hull Cleaning Stretches Intervals Between Recoating, MARINE ENGINEERING LOG

3. Publication Date: February 1978

4. Key Words/Descriptors: Hull Cleaning, Recoating

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology

   Specify: Describes hull cleaning as a means of reactivating the antifouling paint and as a means of preparing the hull for a new paint film.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: The information presented is in agreement with information obtained from other sources.

8. Determination: ___ Store X Accept & Code

9. Comments: Describes the use of ballasting to list a ship from port to starboard and forward to aft in order to expose the hull.

10. Inspection Requirement Codes: 00

11. Underwater Technology Codes: 09, 16

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    201-U09.16

F. MATANZO
Evaluator

10/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 202 File No. 202-U04

1. Type: ___ Report ___ Article _X_ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Diver Communication/Sound-Wave Systems Inc.
3. Publication Date: May 1, 1980
4. Key Words/Descriptors: Underwater Communication, Diver Navigation.
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: "Wet-Phone", "Wet-Tape, and Wet-Beacon" all contribute to a divers ability to work underwater.
6. Timeliness: ___ Outdated _X_ Current ___ Future
7. Verity: Mfg. advertising only.
8. Determination: ___ Store _X_ Accept & Code
9. Comments: The three items could improve the inspection procedure, allowing constant communication, recording, and plotting of diver location.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 04 , ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    202-U04

F. MATANZO
Evaluator

10/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 203 File No. 203-U06

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Nondestructive Testing Equipment/DETEK, Inc.
3. Publication Date: October 23, 1980
4. Key Words/Descriptors: Ultrasonics, Eddy Current, Crack Detector. Also describes ultrasonic thickness gage which could be made watertight.
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Unit will allow diver to both locate and map cracks. UT gage can permit measuring plate thickness.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Mfg. literature.
8. Determination: ___ Store X Accept & Code
9. Comments: This unit could be used in the inspection of the propeller, rudder, and tailshaft. The UT gage could be used on hull plating. Check w/mfg.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 06 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    203-U06

F. MATANZO
Evaluator

10/29/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 204 File No. 204-U14

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other
2. Title/Publisher: Magnetic Handle/Magnetic Tools, Inc.
3. Publication Date: 1980
4. Key Words/Descriptors: Permanent Magnets
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Underwater work with metal parts would benefit from these magnetic handles; increasing divers grip and safety.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Mfg. literature
8. Determination: __ Store X Accept & Code
9. Comments: Hull plate repairs requiring cutting, drilling and welding could benefit from these portable magnetic handles which could act as vises.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 14
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    204-U14

F. MATANZO
Evaluator

10/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 205 File No. 205-U11

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Cathodic Protection of Ship Hulls and Related Parts/NACE in Materials Protection and Performance
3. Publication Date: November 1973
4. Key Words/Descriptors: Cathodic Protection, Ship Hulls, Corrosion
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Cathodic protection would improve the preservation of the ships underwater body and so contribute to extended dry-docking.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: NACE, the National Assoc. of Corrosion Engineers is composed of experienced professional engineers.
8. Determination: ___ Store X Accept & Code
9. Comments: Report describes value of cathodic protection and how it interacts with the anticorrosive paint film and the metal itself.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 11 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    205-U11

F. MATANZO
Evaluator

10/30/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 206 File No. 206-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Modern Electrical Methods for Determining Corrosion Rates, NACE Publication 3D170

3. Publication Date: ___

4. Key Words/Descriptors: ___

5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
Specify: None

6. Timeliness: ___ Outdated ___ Current ___ Future

7. Verity: ___

8. Determination: X Store ___ Accept & Code

9. Comments: Describes laboratory techniques for measuring corrosion rates.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 00, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
206-00

F. MATANZO
Evaluator

11/09/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 207 File No. 207-00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Recommended Practical, Surface Preparation of Steel & Other Hard Materials by Water Blasting Prior to Coating or Recording.
3. Publication Date: January 1972
4. Key Words/Descriptors: ___
5. Pertinence to Project: ___ Inspection Requirement ___ Underwater Technology
   Specify: None
6. Timeliness: ___ Outdated ___ Current ___ Future
7. Verity: ___
8. Determination: X Store ___ Accept & Code
9. Comments: Describes standard drydock techniques.
10. Inspection Requirement Codes: ___, ___, ___, ___, ___,
11. Underwater Technology Codes: ___, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)

F. MATANZO
Evaluator

11/9/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 208 File No. 208-U04

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other ____
2. Title/Publisher: Personnel Beacon - Telstar Electronics Corp.
3. Publication Date: 1980
4. Key Words/Descriptors: Diver Locaters
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Possible use for locating divers with respect to hull location.
6. Timeliness: __ Outdated __ Current X Future
   Need to perform tests to determine applicability for diver locating (see comments).
7. Verity: ____
8. Determination: __ Store X Accept & Code
9. Comments: Company offers compact diver beacons that can be attached to diver's suit. Topside receivers available for signal detection. Need to study if can be used to pinpoint diver location using two or three receivers and triangulation methods.
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 04, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    208-U04

RENUART
Evaluator

10/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 209 File No. 209-U01,02,03,04,14

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other ___
2. Title/Publisher: Sport Diver's 1980 Buyer's Guide
3. Publication Date: 1980
4. Key Words/Descriptors: Diving Equipment, Submersible Gear
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Contains description and mfg. name of underwater equipment used by divers in their work, and equipment to support the diver while he works.
6. Timeliness: ___ Outdated X Current ___ Future
   Latest edition of an annual publication.
7. Verity: Technical literature is to be obtained from each manufacturer.
8. Determination: ___ Store X Accept & Code
9. Comments: Use the marked manufacturers as information sources. Request literature.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 01, 02, 03, 04, 14,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    209-U01,02,03,04,14

F. MATANZO
Evaluator

10/28/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 210 File No. 210-U14

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other __
2. Title/Publisher: Hydraulic Tool Catalog 1979/80 / Stanley
3. Publication Date: August 1979
4. Key Words/Descriptors: Underwater Tools, Hydraulic Tools
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Stanley manufactures fifteen different underwater hydraulic tools for cutting, grinding, tightening, and drilling.
6. Timeliness: __ Outdated X Current __ Future
   Most recent catalog.
7. Verity: Equipment is also described in other Marine equipment literature
8. Determination: __ Store X Accept & Code
9. Comments: December 1980 prices for representative items are: Grinder GR24, $1100.00, Impact Wrench IW22, $2300.00, and Scaler SC10, $800.00
10. Inspection Requirement Codes: 00, __, __, __, __, __,
11. Underwater Technology Codes: 14, __, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    210-U14

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 211 File No. 211-U09

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Sea Scrubber/Sub Enterprises, Inc.

3. Publication Date: October 1980

4. Key Words/Descriptors: Brush Cleaning

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Describes single and multiple brush head units for cleaning ship hulls.

6. Timeliness: ___ Outdated X Current ___ Future
Provides a rate schedule for hull cleaning, based on world wide locations, as of January 1980.

7. Verity: Mfg., claims U.S. Navy has approved their system, but provides only questionable evidence.

8. Determination: ___ Store X Accept & Code

9. Comments: The Sea Scrubber system appears to be very similar to the Brush Kart system marketed by Phousmarine. Even the illustrations are identical.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 09 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
211-U09

F. MATANZO
Evaluator

11/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 212 File No. 212-00

1. Type: ___ Report _X_ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Performance of Platinum Anodes in Impressed Current Cathodic Protection/The Welding Institute
3. Publication Date: March 1976
4. Key Words/Descriptors: Cathodic protection, platinum anodes impressed current
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: Cathodic protection of hull plating and other metal surfaces extends service life, but are prone to damage by brush cleaning equipment.
6. Timeliness: ___ Outdated _X_ Current ___ Future
7. Verity: Published by professional organization.
8. Determination: _X_ Store ___ Accept & Code
9. Comments: Technical discussion of laboratory experiments studying the dissolution of platinum in different aqueous solutions.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    212-00-00

F. MATANZO
Evaluator

11/6/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 213 File No. 213-U02.05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: "Improving the Performance of a Remote Control Vehicle - published in OCEAN INDUSTRY

3. Publication Date: April 1978

4. Key Words/Descriptors: Remote Control Vehicle, Underwater TV

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses problems experienced during operational use of Hydroproducts RCV-225 and the corrections the company has taken to improve system reliability.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Operational use by offshore platform industry.

8. Determination: ___ Store X Accept & Code

9. Comments: ___

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 02, 05, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    213-U02.05

RENUART
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 214 File No. 214-I01,02,05,06

1. Type: __ Report __ Article __ Advertising X Trip Report __ Questionnaire
   __ Other

2. Title/Publisher: Trip to Baltimore Harbor by F. Matanzo

3. Publication Date: May 13, 1980

4. Key Words/Descriptors: Ship Inspection, Drydocking

5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: USCG LT. John Schriner described the Drydock Inspection Requirements as he understood them and through his office library was able to identify publications which document inspection requirements. LT. Ellis Davidson, the inspector at Maryland Drydock was accompanied during the initial hull survey for a ship.

6. Timeliness: __ Outdated X Current __ Future
   Existing drydock inspection procedures were observed.

7. Verity: Publications are either from the Code of Federal Regulations or USCG. The inspection procedures observed first hand are actual practice in Baltimore.

8. Determination: __ Store X Accept & Code

9. Comments: This initial trip to observe a USCG inspection of a drydocked ship formed a basis for revising our questionnaire for future trips.

10. Inspection Requirement Codes: 01, 02, 05, 06, __,

11. Underwater Technology Codes: 00, __, __, __, __,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    214-I01,02,05,06

F. MATANZO
Evaluator

11/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 215 File No. 215-I99-U09

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: Trip to Norfolk and Yorktown, VA. by Frank Matanzo
3. Publication Date: May 23, 1980
4. Key Words/Descriptors: Inspection Requirements, Drydocking, Hull Cleaning
5. Pertinence to Project: X Inspection Requirement X Underwater Technology
   Specify: The OMI at Norfolk and three instructors at the USCG Marine Safety School described the drydock inspection. At Seaward Marine the current underwater hull cleaning practice with SCAMP was discussed.
6. Timeliness: ___ Outdated X Current ___ Future
   Existing drydock inspection procedures and hull cleaning practice are described.
7. Verity: The inspection requirements are based on Federal or USCG publications. Seaward Marine does have the only U.S. Navy contract for cleaning Navy ships.
8. Determination: ___ Store X Accept & Code
9. Comments: The questionnaire completed by the USCG officers and documents they provided completes the picture on inspection requirements. Seaward Marine should be visited again to observe a hull cleaning.
10. Inspection Requirement Codes: 99, ___, ___, ___, ___,
11. Underwater Technology Codes: 09, ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    215-I99-U09

F. MATANZO
Evaluator

11/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 216 File No. 216-U02

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: Trip to Long Beach USCG Office by Art Nelson.

3. Publication Date: May 29, 1980

4. Key Words/Descriptors: Closed Circuit TV, Underwater Inspection

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: Closed circuit TV was used to inspect the hull of a 164,000 ton tanker (Brookes Range).

6. Timeliness: ___ Outdated X Current ___ Future
Diver's survey report attached to BID is dated May 7, 1980

7. Verity: CCTV tape was shown to USCG to demonstrate the feasibility of underwater inspection.

8. Determination: ___ Store X Accept & Code

9. Comments: Trip report identifies a Mr. Leo Frost with Inter Ocean Management Corp. who is interested in cooperating with this effort.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 02 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
216-U02

F. MATANZO
Evaluator

11/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 217 File No. 217-I99

1. Type: __ Report __ Article __ Advertising X Trip Report __ Questionnaire
   __ Other ____
2. Title/Publisher: Trip to Norfolk Shipbuilding & Drydock by John Metcalf.
3. Publication Date: June 24, 1980
4. Key Words/Descriptors: Ship Inspection, Drydock, Sea Chests
5. Pertinence to Project: X Inspection Requirement __ Underwater Technology
   Specify: A normal drydock inspection was observed and questionnaires and photographs were obtained to support this report.
6. Timeliness: __ Outdated X Current __ Future
   Existing USCG practice.
7. Verity: Inspection was for official certificate renewal of the SS Green Harbor, a barge carrier.
8. Determination: __ Store X Accept & Code
9. Comments: Both color and black and white photographs were taken of this inspection. The questionnaire was completed by the USCG inspector.
10. Inspection Requirement Codes: 99, __, __, __, __,
11. Underwater Technology Codes: 00, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    217-I99

F. MATANZO
Evaluator

11/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 218 File No. 218-U01.02.06.09

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   X Other Interview Notes

2. Title/Publisher: Meeting with Mr. Warren and Mr. Malder, NAVSEA OOC, Washington, DC

3. Publication Date: 24 June 1980

4. Key Words/Descriptors: Color Photography, TV, Ultrasonic Gaging, Divers

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: The NAVSEA OOC office funds the R&D projects in underwater cleaning and inspection. Ultrasonic gaging underwater is considered reliable.

6. Timeliness: ___ Outdated X Current ___ Future
   Results of cleaning program are now fleet practice.

7. Verity: U.S. Navy

8. Determination: ___ Store X Accept & Code

9. Comments: U.S. Navy is setting seven years as the goal between drydocking. Underwater TV is considered misleading. Divers should not be asked to make decisions during inspection.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 01 , 02 , 06 , 09 , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    218-U01.02.06.09

F. MATANZO
Evaluator

11/23/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 219 File No. 219-U02

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Trip to USCG R&D Center, Groton, Conn./ESCO
3. Publication Date: 23 July 1980
4. Key Words/Descriptors: Underwater Inspection, Closed Circuit TV, Hull Damage
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Trip Report describes underwater TV system being evaluated by USCG to permit inspection of damage to a grounded or crippled vessel.
6. Timeliness: ___ Outdated X Current ___ Future
   Although the USCG system is still in development the components are commercially available.
7. Verity: Contractor participated in field test.
8. Determination: ___ Store X Accept & Code
9. Comments: The EDO Western Black & White Closed Circuit TV unit provided a good picture, but reliability was poor due to overheating of some electronic component.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 02 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    219-U02

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 220 File No. 220-U01.04.09.10

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire
   ___ Other ______
2. Title/Publisher: Trip to Seaward Marine Services to observe Underwater Hull Cleaning/ESCO
3. Publication Date: 1 August 1980
4. Key Words/Descriptors: Brush Scrubbing, Hydroblasting, Diver, Communication
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: The underwater brush scrubbing of ship hull was observed and all equipment involved was examined, including underwater communications.
6. Timeliness: ___ Outdated X Current ___ Future
   Present practice of firm.
7. Verity: Contractor was present.
8. Determination: ___ Store X Accept & Code
9. Comments: Underwater brush scrubbing and hydroblasting with high pressure water lance were used to clean a ship hull while docked along a pier. Discussions with the prime cleaning contractor and subcontractors provided useful information. Location is an important consideration.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___, ___,
11. Underwater Technology Codes: 01 , 04 , 09 , 10 , ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    220-U01.04.09.10

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 221 File No. 221-U02.06.07.
09,10,11

1. Type: ___ Report ___ Article ___ Advertising _X_ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Trip to Gulf Coast Facilities/ESCO
3. Publication Date: 20 August 1980
4. Key Words/Descriptors: Underwater Tools, In Water Surveys, Color Closed Circuit TV, Brush Scrubbing
5. Pertinence to Project: ___ Inspection Requirement _X_ Underwater Technology
   Specify: Report contains information gathered on underwater inspection tools and procedures, including NDT, Color CCTV, cathodic protection, and brush scrubbing.
6. Timeliness: ___ Outdated _X_ Current _X_ Future
   Most items described are now available. Some future improvements are also identified.
7. Verity: Report prepared by contractor.
8. Determination: ___ Store _X_ Accept & Code
9. Comments: Besides obtaining new information from the persons visited, new sources of information were identified.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 06 , 07 , 09 , 10 , 11
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    221-U02.06.07.09.10.11

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 222 File No. 222-I03.07-U07.13

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire
___ Other ___
2. Title/Publisher: Trip to American Bureau of Shipping/ESCO
3. Publication Date: 26 September 1980
4. Key Words/Descriptors: In-water Surveys, Tailshaft Maintenance
5. Pertinence to Project: X Inspection Requirement X Underwater Technology
Specify: Underwater hull inspection was discussed with respect to ABS and USCG requirements.
6. Timeliness: ___ Outdated X Current ___ Future
Information includes items on new construction which facilitates in-water survey.
7. Verity: Contractor visit to ABS office.
8. Determination: ___ Store X Accept & Code
9. Comments: ABS would like to attend the next review meeting on this project.
10. Inspection Requirement Codes: 03, 07, ___, ___, ___,
11. Underwater Technology Codes: 07, 13, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
222-I03.07-U07.13

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 223 File No. 223-U13,15,16

1. Type: __ Report __ Article __ Advertising X Trip Report __ Questionnaire
   __ Other __
2. Title/Publisher: Trip to San Francisco & Portland/ESCO
3. Publication Date: 22 September 1980
4. Key Words/Descriptors: Tailshaft Maintenance, Rudder
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Drydock repairs were observed for the purpose of identifying problems with an in-water repair.
6. Timeliness: __ Outdated X Current __ Future
   Repair procedures described can be performed with existing equipment.
7. Verity: Proposed in-water repairs have been performed by the U.S. Navy and some commercial ship owners.
8. Determination: __ Store X Accept & Code
9. Comments: Underwater repairs will require preparation work at a previous drydocking or during construction.
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 13, 15, 16, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    223-U13,15,16

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 224 File No. 224-U02

1. Type: __ Report __ Article __ Advertising X Trip Report __ Questionnaire
   __ Other
2. Title/Publisher: Trip to Tetra Tech Inc./ESCO
3. Publication Date: 9 September 1980
4. Key Words/Descriptors: Pollution, Underwater Visibility
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Firm has experience and capabilities to determine potential pollution from hull cleaning and to develop a visibility scale for different harbors.
6. Timeliness: __ Outdated X Current __ Future
   Underwater capabilities have been demonstrated.
7. Verity: Contractor visit to facilities
8. Determination: __ Store X Accept & Code
9. Comments: The visibility scale in any particular harbor would not only depend on the type and concentration of turbidity, but also on the colors being transmitted.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 02
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    224-U02

F. MATANZO
Evaluator

11/24/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 225 File No. 225-U02

1. Type: __ Report __ Article __ Advertising X Trip Report __ Questionnaire
   __ Other __
2. Title/Publisher: Hydro Products, San Diego, CA
3. Publication Date: 10-25-80
4. Key Words/Descriptors: Underwater CCTV, UDATS
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Hydro Products has manufactured UDATS for many years and is now under a Navy contract to manufacture surveyor, one of the latest designs in underwater color CCTV.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Visit by contractor and discussion with U.S. Navy.
8. Determination: __ Store X Accept & Code
9. Comments: Proprietary information on surveyor can be obtained directly by the U.S. Coast Guard from a Mr. George Clauson at Hydro Products.
10. Inspection Requirement Codes: 00, __, __, __, __,
11. Underwater Technology Codes: 02, __, __, __, __,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    225-00-U02

F. MATANZO
Evaluator

11-28-80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 226 File No. 226-U12

1. Type: ___ Report ___ Article ___ Advertising X Trip Report ___ Questionnaire
___ Other ___

2. Title/Publisher: Trip to International Paint Co., Baltimore, Md., by Frank Matanzo

3. Publication Date: October 13, 1980

4. Key Words/Descriptors: Antifouling Paints, Self-Polishing Copolymer, Organotin, Hull Cleaning.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
Specify: The International Paint Co. is the only U.S. firm with an EPA registered Self-Polishing Antifouling Paint that contains organotin.

6. Timeliness: ___ Outdated X Current ___ Future
The SPC Organotin is now commercially available.

7. Verity: Contractor generated report based on visit and facts confirmed by photographic evidence and review of other publications.

8. Determination: ___ Store X Accept & Code

9. Comments: Photographic evidence was provided that not only shows the antifouling properties of this SPC paint, but also its ability to withstand underwater brush cleaning of the hull.

10. Inspection Requirement Codes: 00, ___, ___, ___, ___,

11. Underwater Technology Codes: 12, ___, ___, ___, ___,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
226-U12

F. MATANZO
Evaluator

11/19/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 227 File No. 227-U02.05

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: "Underwater Television - It's Development and Future", UNDERWATER JOURNAL
3. Publication Date: December 1973
4. Key Words/Descriptors: Remote Control Vehicle; Underwater TV
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses developments in RCV technology for use in underwater TV applications.
6. Timeliness: ___ Outdated ___ Current X Future
   Although article is dated, it discusses an interesting RCV design which utilizes "head coupled" video presentation, which involves slaving the RCV/camera orientation to the surface operators head attitude. To my knowledge this system is still under development.
7. Verity: ___
8. Determination: ___ Store X Accept & Code
9. Comments: Once developed, system could improve significantly the ability to be able to maintain orientation of an RCV.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 02 , 05 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    227-U02.05

RENUART
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 228 File No. 228-U03

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___

2. Title/Publisher: "Innovation in Underwater Illumination: The Ballastless Gas Discharge Light"- Presented at Offshore Technology Conference

3. Publication Date: May 1978

4. Key Words/Descriptors: Underwater Lighting

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discusses advantages and disadvantages of major categories of light sources available for underwater use. Discusses how the new ballastless gas discharge lamp offers advantages over older designs.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Lamps are standard designs used for quite some time.

8. Determination: ___ Store X Accept & Code

9. Comments: Excellent comprehensive discussion of various underwater lighting available on todays market - Summary of the more detailed, technical discussion in BID 130.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 03 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    228-U03

RENUART
Evaluator

11/07/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 229 File No. 229-U02.05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire ___ Other ___
2. Title/Publisher: The Performance of Low Light Cameras and Underwater RCV's and Towed Sensor Platforms, OCEAN OPTIC'S, Vol. 64
3. Publication Date: 1975
4. Key Words/Descriptors: Underwater TV, Remote Controlled Vehicles
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology

   Specify: Discusses improvements in underwater TV for inspecting in low-light turbid water conditions. System may be mounted on a RCV for remote viewing.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Hydro Products System
8. Determination: ___ Store X Accept & Code
9. Comments: ___
10. Inspection Requirement Codes: 00, ___, ___, ___, ___,
11. Underwater Technology Codes: 02, 05, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)

    229-U02.05

RENUART
Evaluator

11/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 230 File No. 230-U03

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: "Facts on Underwater Illumination", Hydro Products, Inc.
3. Publication Date: Unknown
4. Key Words/Descriptors: Underwater Lighting
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Discussion on advantages/disadvantages of different underwater lights, their uses and applications, and their performance.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: None
8. Determination: ___ Store X Accept & Code
9. Comments: Detailed technical discussion on different types of underwater lighting available.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 03 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    230-U03

RENUART
Evaluator

11/07/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 231 File No. 231-U05

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: "Remote Controlled Vehicle Update", Paper presented at the International Diving Symposium.
3. Publication Date: 1979
4. Key Words/Descriptors: Remote Controlled Vehicle
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Application of RCV's in offshore oil platform industry.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: RCV discussed (Hydro Products' RCV-225) has over 35,000 operational hours - Used extensively by Taylor Salvage and Diving Co.
8. Determination: ___ Store X Accept & Code
9. Comments: Discusses applications of RCV in Offshore Oil Platform Inspection and Maintenance - many applications useful for hull surveys.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 05 , ___ , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    231-U05

RENUART
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 232 File No. 232-U16

1. Type: ___ Report ___ Article X Advertising ___ Trip Report ___ Questionnaire ___ Other

2. Title/Publisher: Trelleborg Blank Flanging System Makes Sea Connections Available While Ship is Afloat; Trelleborg, Sweden

3. Publication Date: October 1980

4. Key Words/Descriptors: Blank flanges, sea connections, underwater inspection and repair.

5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology

   Specify: Blank flanges permit closing sea water connections so internal parts can be inspected or repaired while the vessel is in the water.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Use of this system has received recognition by Lloyds Registry and Det Norske Veritas.

8. Determination: ___ Store X Accept & Code

9. Comments: This underwater technology makes possible access to sea water valves, sea chests and the tailshaft bearing after propeller removal.

10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 16 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    232-U16

F. MATANZO
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 233 File No. 233-I01

1. Type: ___ Report X Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___

2. Title/Publisher: Regulatory Requirements and Guidelines for the Construction, Operation and Maintenance of Fixed OTEC Ocean Energy Facilities.

3. Publication Date: Undated

4. Key Words/Descriptors: Ocean Thermal Energy Conversion, U.S. Coast Guard Regulations, Licensing

5. Pertinence to Project: X Inspection Requirement ___ Underwater Technology
   Specify: OTEC facilities have been added to USCG inspection responsibility and such units cannot be drydocked.

6. Timeliness: ___ Outdated X Current ___ Future

7. Verity: Cited in Federal Register

8. Determination: ___ Store X Accept & Code

9. Comments: OTEC units can only be inspected underwater since they are on station for thirty years.

10. Inspection Requirement Codes: 01 , ___ , ___ , ___ , ___ ,

11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,

12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    233-I01

F. MATANZO
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 234 File No. 234-U00

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Prefailure Evaluation Techniques for Marine Coatings/General Dynamics for Maritime Administration.
3. Publication Date: February 1975
4. Key Words/Descriptors: Marine Coatings
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Describes tests for checking the preparation of surfaces, the wet paint film, and the dry paint film.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Work performed by Battelle Columbus Laboratory and New York University.
8. Determination: ___ Store X Accept & Code
9. Comments: Painting in a drydock requires close inspection to assure a good job. Painting underwater inside a cofferdam will require even more close inspection.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 00 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    234-U00

F. MATANZO
Evaluator

11/06/80
Date

DTCC23-80-C-20009
Form 1

BID EVALUATION

BID No. 235 File No. 235-U15

1. Type: ___ Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Underwater Dry Environment Habitat Welding
3. Publication Date: Undated
4. Key Words/Descriptors: Underwater Welding, Shielded Manual Arc, Hyperbaric
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: Underwater welding will permit permanent repairs and refastening of parts removed to allow access to inspection surfaces.
6. Timeliness: ___ Outdated X Current ___ Future
7. Verity: Prepared by Taylor Diving & Salvage Co., a respected offshore work firm.
8. Determination: ___ Store X Accept & Code
9. Comments: The report describes the different properties of a weld affected by having been formed underwater.
10. Inspection Requirement Codes: 00 , ___ , ___ , ___ , ___ ,
11. Underwater Technology Codes: 15 , ___ , ___ , ___ , ___ ,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    235-U15

F. MATANZO
Evaluator

11/06/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 236 File No. 236-U14

1. Type: X Report ___ Article ___ Advertising ___ Trip Report ___ Questionnaire
   ___ Other ___
2. Title/Publisher: Development of a Sea Water Hydraulic Vane Motor for Diver Tools/Westinghouse Oceanic Div.
3. Publication Date: April 1980
4. Key Words/Descriptors: Diver Tools, Hydraulic Motors, Materials
5. Pertinence to Project: ___ Inspection Requirement X Underwater Technology
   Specify: A seawater motor to drive underwater divers tools would simplify underwater repairs.
6. Timeliness: ___ Outdated ___ Current X Future
   This April 1980 report documents a research study of a motor still to be developed.
7. Verity: Sponsored by Naval Civil Engineering Laboratory
8. Determination: ___ Store X Accept & Code
9. Comments: The results of this study identified a 5 pound motor with 1,000 psi at six gallons per minute delivering 3.3 hp at 1585 rpm with 80% efficiency.
10. Inspection Requirement Codes: 00 , ___, ___, ___, ___,
11. Underwater Technology Codes: 14 , ___, ___, ___, ___,
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    236-U14

F. MATANZO
Evaluator

11/08/80
Date

DTCG23-80-C-20009
Form 1

BID EVALUATION

BID No. 237 File No. 237-U02

1. Type: __ Report __ Article X Advertising __ Trip Report __ Questionnaire
   __ Other
2. Title/Publisher: Closed Circuit Television, Catalog, Technical Data Sheets, Low Light Applications Data/Cohu, Inc., Electronics Div., San Diego, Ca.
3. Publication Date: 12/79 / 12/78 / April 1980
4. Key Words/Descriptors: Television Cameras, Closed Circuit TV, Color Television, Monochrome
5. Pertinence to Project: __ Inspection Requirement X Underwater Technology
   Specify: Cohu cameras can be housed for operation up to 200 feet underwater and can be purged.
6. Timeliness: __ Outdated X Current __ Future
7. Verity: Extent of underwater application is unknown except for mfgs. illustrations.
8. Determination: __ Store X Accept & Code
9. Comments: The local distributor should be contacted to verify underwater use and cost of systems for underwater ship inspections.
10. Inspection Requirement Codes: 00
11. Underwater Technology Codes: 02
12. Create File No.: BID No. - IR Code No(s) - UT Code No(s)
    237-U02

F. MATANZO
Evaluator

11/15/80
Date

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