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ADVANCE OVERHAUL PLANNING FOR USS GRAPPLE (ARS-7) AND USS BOLST--ETC(U)  
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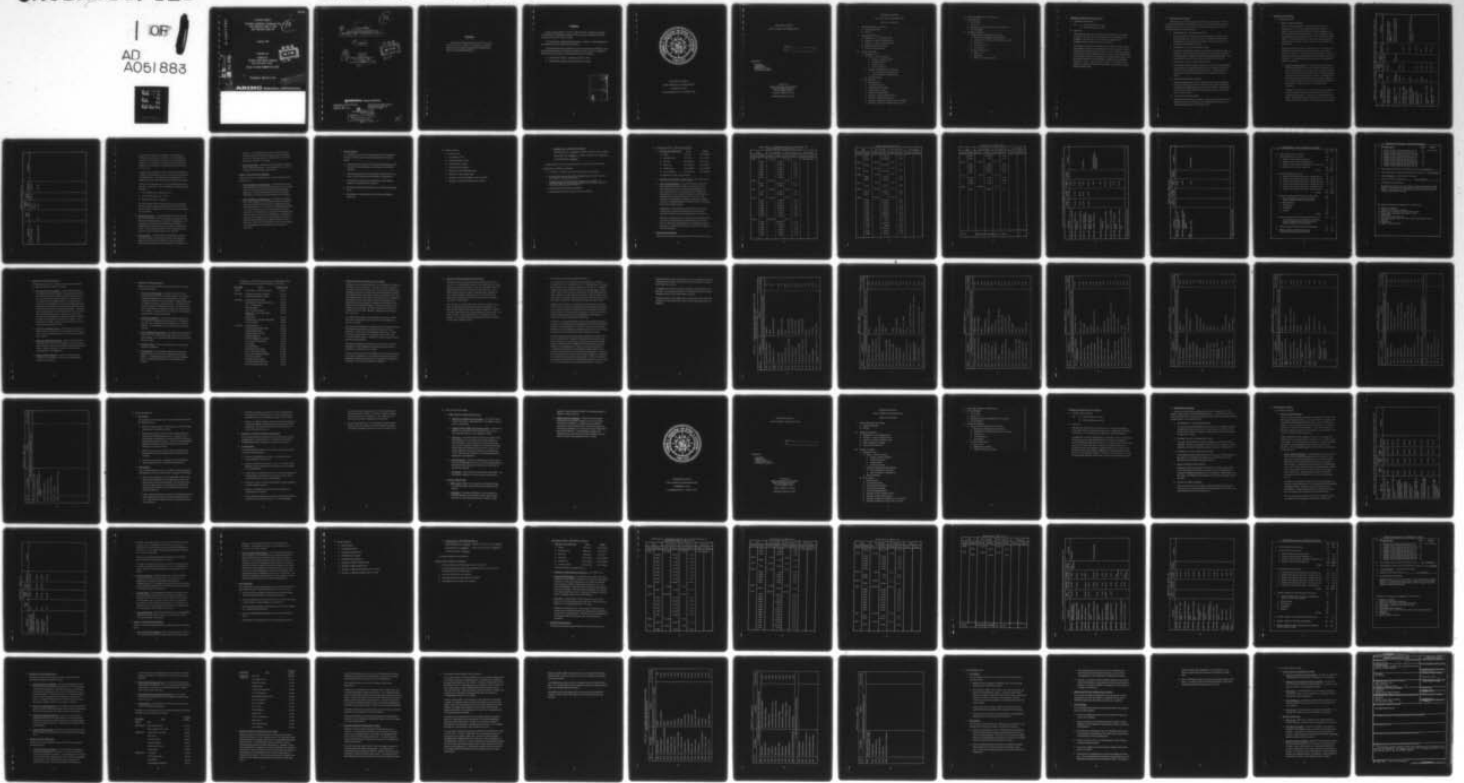
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Summary Report:

ADVANCE OVERHAUL PLANNING FOR  
USS GRAPPLE (ARS-7) AND  
USS BOLSTER (ARS-38)

August 1975

Prepared for

PERA(CSS)  
Hunters Point Naval Shipyard  
San Francisco, Calif.

Under Contract N00604-74-C-0234

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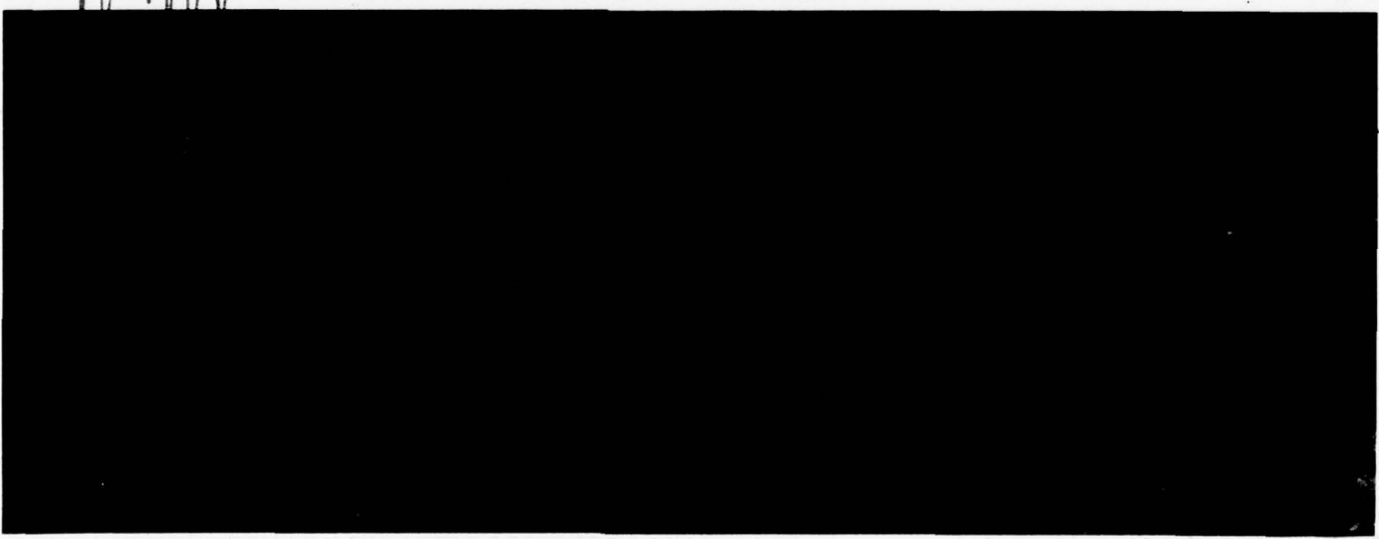
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## ABSTRACT

Postoverhaul analysis reports of two fleet ocean tugs of the Service Force, Pacific, are presented. The reports relate to the 1975 regular overhauls of the USS GRAPPLE (ARS-7) and USS BOLSTER (ARS-38).

## SUMMARY

Under Contract N00604-74-C-0234, ARINC Research Corporation performed selected tasks for PERA(CSS) in support of the 1975 regular overhauls of two fleet ocean tugs of the Service Force, Pacific.

The Corporation's support included assistance in advance overhaul planning and the preparation of postoverhaul analysis reports.

The postoverhaul reports, prepared to a format prescribed by PERA(CSS), were individually submitted to that activity as completed. These reports are compiled in this document in the sequence in which they were issued, as follows:

- a. USS GRAPPLE (ARS-7), publication 1620-01-3-1375A
- b. USS BOLSTER (ARS-38), publication 1620-01-3-1375B

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USS GRAPPLE (ARS-7)

POST OVERHAUL ANALYSIS REPORT

OVERHAUL DATES

3 SEPTEMBER 1974 - 31 JANUARY 1975

USS GRAPPLE (ARS-7)  
POST OVERHAUL ANALYSIS REPORT

Approved: \_\_\_\_\_

Date: \_\_\_\_\_

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PERA (CSS)  
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USS GRAPPLE (ARS-7)

Prepared by  
ARINC RESEARCH CORPORATION  
Ships and Ordnance Division  
Honolulu Support Office  
Contract N00604-74-C-0234  
Publication 1620-01-3-1375A

USS GRAPPLE (ARS-7)  
POST OVERHAUL ANALYSIS REPORT

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I. GENERAL INFORMATION AND PREFACE

A. GENERAL INFORMATION

Ref: (a) Contract N00604-74-C-0234  
(b) PERA(CSS) Milestone Charts

B. PREFACE

USS GRAPPLE (ARS-7) was overhauled from 3 September 1974 through 31 January 1975 under the direction of the Supervisor of Shipbuilding (SUPSHIP), Pearl Harbor. The overhaul was accomplished at Dillingham Shipyard and Pacific Marine & Supply Co.

In planning the overhaul of USS GRAPPLE, PERA(CSS), acting as maintenance management agent for NAVSHIPS and the type commander, established advance planning milestones (References a and b) which commenced 10 months prior to the overhaul start date. The goal of the planning effort was to identify in advance any potential and existing problem areas, and to provide the detailed preoverhaul guidance, planning, and coordination necessary to achieve a successful yard overhaul. The purpose of this report is to evaluate the management judgments and decisions associated with the planning effort.

## II. MANAGEMENT SUMMARY

References a and b list the management milestones in planning the FY 1975 regular overhaul (ROH) of USS GRAPPLE (ARS-7). Deviations from the milestones that affected the overhaul, and unanticipated factors that contributed to the final overhaul outcome, are discussed below.

### A. AUTHORIZED VS. ACCOMPLISHED WORK

The repair portion of the GRAPPLE work package was essentially completed as authorized. Minor items were not complete at the end of the overhaul because of late delivery of material. Repair material is to be forwarded to the ship when received.

### B. PLANNED VS. ACTUAL COMPLETION TIME

The start of the GRAPPLE overhaul was initiated on 3 September 1974, as scheduled. However, the completion was delayed 29 days due to difficulties encountered in repairing the starboard propeller shaft bearings. Poor weather conditions and a 3-day strike also contributed to this delay.

### C. PLANNED VS. ACTUAL COMPLETION COSTS

The SUPSHIP departure report had not been released as of the preparation of this report, so a comparison of actual versus estimated costs for the GRAPPLE overhaul cannot be presented herein. A supplement to this report will be prepared and forwarded after receipt of the departure report.

### D. MAJOR CONFIGURATION CHANGES

Significant configuration changes to GRAPPLE included the replacement of two 10 kW motor generator sets with 30 kW sets, and the installation of additional firefighting equipment and a fuel oil purifier. Improvements were also made to the shipboard communication and electronics equipment, and to the galley.

### E. FOLLOW-ON WORK REQUIRED

Required follow-on work is to complete repairs outstanding when required parts are received, and to plan for the accomplishment of items in the Long Range Maintenance Plan of Section III.C.

### III. DETAILS OF OVERHAUL

#### A. PLANNING PROCESS

##### 1. Ideal Vs. Actual Milestones

Advance overhaul planning for USS GRAPPLE commenced in November 1973. The overhaul planning procedures used for GRAPPLE are defined in the PERA(CSS) "Combatant Support Ship Overhaul Advance Planning Milestones". These milestones provide for accomplishment of 56 tasks, of which 39 are PERA action responsibility. The ideal target dates for these tasks range from start of overhaul minus 13 months (A-13) to completion of overhaul plus two months (C+2).

With the GRAPPLE overhaul scheduled to start on 3 September 1974, ARINC Research commenced advance planning for the overhaul at about A-10 months. All required tasks were completed. Table III. A-1 shows the dates for the accomplishment of the principal milestones for GRAPPLE. The following paragraphs summarize the advance planning for the overhaul.

- a. Advance Overhaul Planning. Overhaul planning was initiated by ARINC Research with a survey of the available maintenance history of USS GRAPPLE as contained in the Current Ships Maintenance Project (CSMP) and the Maintenance and Material Management (3M) Program Material History Report. Programmed ship alterations and TYCOM alterations were reviewed, along with other pertinent maintenance history documents such as last overhaul records, departure reports, and casualty reports (CASREPs).

During the same time frame, an ARINC Research representative briefed GRAPPLE personnel on the Corporation's role in the overhaul planning process. Subsequently, while the ship was in Sasebo, Japan, ARINC Research assisted ship's force in developing the overhaul work package. The package was then screened,

TABLE III.A-1. IDEAL VS. ACTUAL MILESTONES FOR ROH OF USS GRAPPLE (ARS-7) (Sheet 1 of 2)

Milestone	Target Date	Contract Target Date	Actual Start	Completion	Remarks
PERA Contract Start Date		11/15/74	11/15/74		
Obtain Historical Data; Review Alt Package	Immed.	Immed.		1/2/74	CSMP, 3M material history reports, shipalts, AERs, CASREPs.
Brief Ship on Overhaul Preparation	Prior to deployment		See Remarks		Ship briefed by PERA(CSS) personnel prior to contract award.
Receive Work Package	Immed.	4/8/74			
NAVSHIPS Issue Tentative K-Alts; Task First-Time Alt Drawings	A-10	1/30/74		1/15/74	
Screen Work Package; Determine Known Work; Conduct Shipcheck	A-9 to A-6			3/18/74	Complete work package less POT&I items delivered to SUPSHIP on 5/21/74.
Determine POT&I Requirements	A-6	2/1/74		1/29/74	
Conduct POT&I	A-6 to A-3	4/25/74		6/74	
NAVSHIPS Issue 180-Day Letter	A-6	3/6/74		3/29/74	
Conduct Work Definition Conference	A-2	7/31/74		8/7/74	

TABLE III.A-1. (Sheet 2 of 2)

Milestone	Target Date	Contract Target Date	Actual Start	Completion	Remarks
Perform Overhaul		9/2/74 to 1/2/75	9/3/74	1/31/75	
Complete Final Report	C+2	3/2/75		3/25/75	

and with the exception of Preoverhaul Test and Inspection (POT&I) items, delivered to SUPSHIP. The initial package, transmitted 27 March 1974, represented 75% of the total work package. A second delivery, on 21 May 1974, represented an additional 15%; and delivery was completed with a transmittal on 2 July 1974.

A shipcheck was conducted by ARINC Research representatives in Sasebo, Japan during the week of 18 March 1974, and included a habitability study. The shipcheck team brought back a substantial portion of the ship overhaul work package from the ship.

POT&Is were conducted by the U.S. Naval Ship Repair Facility, Subic Bay, in June 1974. The NAVSHIPREPFAC Design Division inspected:

- 1) The ventilation air conditioning system
- 2) Main reduction gears Nos. 1 and 2
- 3) Shipboard electronics equipment

The ship's weaponry was not inspected since the sole existing piece of ordnance equipment was scheduled for removal. Additional electronics equipment tests and inspections were conducted at Pearl Harbor.

- b. Tradeoff Conference. The tradeoff conference for the drydock phase of the GRAPPLE overhaul was held on 7 August 1974, and the topside tradeoff conference was held the following day. The conference was attended by representatives of SUPSHIP 14, COMSERVGRU FIVE, PERA(CSS), and ARINC Research Corporation. The total planning estimate for the drydock phase was \$216,258, and for the topside phase was \$1,066,502.
- c. Overhaul Phase. The main planning responsibility of ARINC Research during the overhaul was to monitor its progress and assist in the management of SERVGRU resources in light of additional requirements developed during and as a result of the

overhaul. To accomplish these objectives, ARINC Research personnel attended the SUPSHIP weekly progress conferences and provided liaison between the COMSERVGRU FIVE maintenance staff, SUPSHIP, and the ship.

- d. Postoverhaul Phase. ARINC Research Corporation's responsibilities following completion of the overhaul were to analyze the overhaul records and prepare a final report.

## 2. Impact of Planning Milestone Slippages

Actions or occurrences impacting on the overhaul schedule are discussed below.

- a. Late Authorization of Repair Work. Late authorization of new work contributed to the delay of the topside phase. One example of this was the modification of the dual task light/navigation lights array, which necessitated the addition of a stub mast. Additionally, more than 125 as-found reports were submitted.
- b. Late Availability of Specifications. The fact that no specifications – only estimates – were available for the work definition conference hindered ARINC Research in conducting the work-item tradeoff analysis. A review of the estimates indicated that in several cases the intent of the work request had not been carried out. Conversations were conducted with individual estimators in lieu of a review of the specifications. Specifications were not made available to the overhaul manager, the ship, or ARINC Research until after the invitation for bid was issued. This made review of the specifications, and any desired changes of the specification articles, difficult and in some cases impossible.



3. Recommendations

As a result of the review of the planning process for the GRAPPLE overhaul, ARINC Research recommends that efforts be directed toward:

- a. Ensuring that the development of ship alteration drawings and the ordering of material progresses according to the PERA(CSS) milestones.
- b. Reviewing applicable Fleet Modernization Program (FMP) documents to ensure that all required shipalts are programmed.
- c. Developing both estimates and specifications early enough to support the overhaul tradeoff conference.
- d. Increasing PERA (CSS) participation in the overhaul management phase.
- e. Establishing a firm budget figure before the work definition conference.

B. WORK PACKAGE

1. Summary Sheet
2. Cost Summary Sheet
3. Alteration Summary Sheet
4. TYCOM Repair Package
5. PERA Screening Summary
6. Narrative of Major Alteration Items
7. Narrative of Major Repair Items
8. Narrative of Material Condition Prior to Overhaul
9. Narrative of Material Condition After Overhaul

1. Summary Sheet - USS GRAPPLE (ARS-7)

Scheduled Start Date: 3 Sept 74 Scheduled Completion Date: 2 Jan 75

Actual Start Date: 3 Sept 74 Actual Completion Date: 31 Jan 75

Overhaul Extended:\* 29 days

\*Overhaul extended due to the extra time needed to work on the starboard shaft.

SIGNIFICANT CAPABILITY CHANGES:

- a. A rebuilt A. A. Johnson series 250 towing machine was installed.
- b. An AFFF/PKP (aqueous film foam firefighting/purple-K powder) system was installed in the machinery spaces.
- c. A secure voice system and nonsecure teletypes were installed. An AN/SPS-53 radar was installed and the obsolete TBL-13 radio communication set was replaced by an AN/WRT-1B.
- d. Two 30-kW MG sets (260D) were installed.
- e. New 20mm/50-caliber gun mounts (247D) were installed.

2. Cost Summary Sheet - USS GRAPPLE (ARS-7)

a. <u>Summary of Overhaul Costs</u>	<u>K-Alt</u>	<u>Repair</u>
1) Budget	\$115,920*	Not Available
2) Estimated Cost	\$ 35,937	\$1,075,509
3) Bid Price	Not Available	\$1,181,062
4) Total Cost	Not Available	Not Available
5) Growth Cost	Not Available	Not Available
6) Percent Growth	Not Available	Not Available

\*According to 180-Day Letter estimate.

b. Estimated Overhaul Costs by EIC Category. See Table III. B-1.

c. Cost Avoidance Summary. For the GRAPPLE overhaul, 466 work requests were received from the ship and screened by PERA (ARINC Research). Of this total, approximately 27% (125 work requests) were screened as deferred, duplicated, disapproved, etc., as a result of shipchecks, discussions with ship personnel, and analysis of the work requested. This represents a substantial cost avoidance to the type commander as well as a considerably lightened workload for the overhauling activity and overhaul manager.

Additionally, a large number of work requests were diverted to ship's force or tenders during initial ship visits, which reduced the number of work requests that had to be screened.

During the screening process, a large number of additional work requests were screened for intermediate maintenance activity (IMA) or ship's force accomplishment. This allowed overhaul funding to be concentrated on those work requests that a shipyard can best accomplish.

3. Alteration Summary Sheet

The alteration summary sheet for GRAPPLE is shown in Table III. B-2.

TABLE III. B-1. ESTIMATED COSTS BY EIC CATEGORY FOR  
ROH OF USS GRAPPLE (ARS-7) (Sheet 1 of 3)

EIC		Est. Cost (\$)		Pct. Total Cost		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
1000		85,337		7.93		(Not Available)	
	1100		2,111		0.2		
	1500		54,552		5.07		
	1600		5,349		0.50		
	1800		2,275		0.21		
	1A00		10,873		1.01		
	1B00		7,976		0.74		
	1C00		2,201		0.20		
3000		157,537		14.65			
	3100		152,169		14.15		
	3300		5,368		0.50		
4000		31,793		2.96			
	4100		13,284		1.24		
	4700		18,509		1.72		
A000		77,648		7.22			
	A100		1,900		0.18		
	A500		24,015		2.23		
	A600		11,870		1.10		
	A900		14,962		1.39		
	AB00		8,431		0.78		
	AD00		9,640		0.90		
	AE00		6,830		0.64		
C000		270,304		25.13			
	C100		150,022		13.95		
	C300		47,731		4.44		
	C400		4,289		0.39		
	C600		3,280		0.30		
	C700		9,217		0.86		
	C800		5,996		0.56		

TABLE III. B-1. (Sheet 2 of 3)

EIC		Est. Cost (\$)		Pct. Total Cost		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
	C900		6,009		0.56		
	CC00		43,760		4.07		
G000		26,595		2.47			
	GD00		26,595		2.47		
L000		17,849		1.66			
	LJ00		17,849		1.66		
M000		4,648		0.43			
	M500		2,523		0.23		
	M700		2,125		0.20		
P000		3,105		0.29			
	P600		3,105		0.29		
Q000		37,383		3.48			
	Q000		35,603		3.31		
	Q300		1,780		0.17		
T000		285,954		26.59			
	T100		10,879		1.01		
	T300		30,829		2.87		
	T400		3,059		0.28		
	T500		13,228		1.23		
	T700		2,861		0.27		
	T800		39,094		3.63		
	T900		34,122		3.17		
	TA00		5,214		0.48		
	TB00		415		0.04		
	TF00		28,509		2.65		
	TH00		1,160		0.12		
	TK00		11,029		1.03		
	TL00		5,000		0.46		
	TM00		86,360		8.03		

TABLE III. B-1. (Sheet 3 of 3)

EIC		Est. Cost (\$)		Pct. Total Cost		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
U000	TS00		13,767		1.28		
	TT00		428		0.04		
		48,574		4.52			
	U500		2,569		0.24		
	U600		10,658		1.00		
	U700		32,797		3.05		
Y000	U800		2,550		0.23		
		8,782		0.82			
	Y600		4,234		0.39		
	YA00		882		0.09		
Z000	YC00		3,666		0.34		
		20,000		1.85			
	Z000		20,000		1.85		
Total		1,075,509	1,075,509	100.0	100.0		

TABLE III. B-2. ALTERATION SUMMARY SHEET - USS GRAPPLE (ARS-7) (Sheet 1 of 2)

Alteration	FMP Est. (\$)*	NAVSHIP Est. (\$)	SUPSHIP (\$)	Actual Cost (\$)	Remarks
ARS 204K Single Sideband Equipment			7,654		
ARS 213K Install LF/MF Comm. Equipment	29,321	9,200	4,946		
ARS 217K Improve Antenna System	N/A	46,000	23,003		
ARS 251K General Weight and Moment Compensation	10,573	11,088	4,500		Design only
ARS 254K Install AFFF Fire-fighting Equipment	96,574	97,776	33,605		
ARS 262K AN/SSR-1 Equipment			5,738		Tiger team money. Separate funding from NAVSEAPAC.
ARS 297K Deep Fat Fryer Protection			2,332		
ARS 246D Install Dual Task Light Array			11,311		
ARS 247D Install 20mm Gun Mounts			26,595		
ARS 248D Install Wind Indicator System			5,416		
ARS 260D Replace Motor Generator Sets			18,509		

\*FMP based on complete installation.



TABLE III. B-2. (Sheet 2 of 2)

Alteration	FMP Est. (\$)*	NAVSHIP Est. (\$)	SUPSHIP (\$)	Actual Cost (\$)	Remarks
ARS 264D Install Additional Fuel Oil Purifier			17,666		
ARS 304D Install High Temperature and Sprinkler Alarm System			2,523		
AER ARS-111 Saf-T Climb			6,830		Added staging

\*FMP based on complete installation.

4. TYCOM Repair Package - USS GRAPPLE (ARS-7)

	<u>No.</u>	<u>Pct.</u>
1. Total Automated Work Requests	0	
2. Total Work Requests Screened	466	
a. Number of Work Requests Deferred	121	26.0
b. Number of Work Requests Disapproved	0	0.0
c. Number of Work Requests Duplicated, Cancelled, etc.	4	0.9
d. Number of Work Requests Approved	341	73.1
TOTAL	466	100.0
3. Total Work Requests Approved	341	
a. Number Work Requests Screened: Priority One (1)	21	6.2
b. Number Work Requests Screened: Priority Two (2)	130	38.1
c. Number Work Requests Screened: Priority Three (3)	98	28.7
d. Number Work Requests Screened: Priority Four (4)	89	26.1
e. Number Work Requests Screened: Priority Five (5)	3	0.9
f. Number Work Requests Screened: Priority Six (6)	0	0.0
TOTAL	341	100.0
4. Number of Approved Work Requests by Type Work	341	
a. Repair (including Remove, Replace, Manufacture, Drydock, POT&I, and Calibrate)	299	
b. Ship Alteration	12	
c. TYCOM AER	2	
d. Habitability	18	
e. Routines	10	
TOTAL	341	
5. Number of Approved Work Requests Insurance Items:	NA	NA
As insurance items were identified, the ship was advised to include them in the work package. Separate identity was not maintained.		
6. Number of Approved Work Requests Accomplished	NA	NA
7. Number of Approved Work Requests Not Accomplished and Not Entered in CSMP	NA	NA

5. PERA Screening Summary - USS GRAPPLE (ARS-7)

1. <u>Screening Action*</u>	<u>PERA</u>	<u>TYCOM</u>
a. Number of Work Requests Screened One (1)	293	See Comments
b. Number of Work Requests Screened Two (2)	15	
c. Number of Work Requests Screened Three (3)	3	
d. Number of Work Requests Screened Four (4)	0	
e. Number of Work Requests Screened Five (5)	30	
f. Number of Work Requests Screened Six (6)	0	
g. Number of Work Requests Screened Seven (7)	0	
h. Number of Work Requests Screened Eight (8)	121	
i. Number of Work Requests Screened Nine (9)	0	
j. Number of Work Requests Screened Zero (0)	4	

2. Total Number Work Requests TYCOM Concurred: See Comments

3. Total Number Work Requests TYCOM Screened Otherwise: See Comments

4. See Comments % Agreement in Screening

5. Analysis of Screening Differences: See Comments

6. Comments/Recommendations:

Screening actions were reviewed with the overhaul manager prior to being finalized. No distinction was made between PERA and TYCOM screening actions. It can be generally stated that the overhaul manager concurred with the recommended screening.

\*LEGEND: Screening Action (Appendix 17, OPNAV 43P2)

1. Shipyard accomplish
2. Tender or repair ship accomplish
3. Ship's force - (tender or repair ship/yard) assist
4. Accomplish as alteration equivalent to a repair
5. Ship to shop
6. Accomplish with modification
7. Yard open inspect - advise TYCOM - proceed with minimum repairs
8. Deferred
9. Disapproved
0. Other - specify in remarks

6. Narrative of Major Alteration Items

The following comments are offered concerning major alterations accomplished during the GRAPPLE overhaul.

- a. Increased AC Power Capability. The work specifications for this shipalt called for the removal of the existing 10 kW motor-generator sets and the installation of 30 kW motor-generator sets, including motor starters, controllers, power panel, circuit breakers, and associated cabling. The Design Division, Pearl Harbor Naval Shipyard, rewrote the original work specifications, plans, and test memos covering the installation of the 30 kW MG sets to provide for paralleling capability. Problems were encountered, however, when the MG sets were sent to the shop for preinstallation testing. Although the ship requires continuous parallel capability, NAVSHIPYD/Pearl had designed the units to be paralleled only when load was shifted. This problem was eventually resolved, and the 30 kW MG sets can be continuously paralleled at this time.
- b. AFFF Fire Protection System. The machinery space fire protection system was improved by the installation of the twinned agent, aqueous film-forming foam (AFFF) and purple-K powder (PKP) system.
- c. Upgraded Communication System. Progress was made toward improving GRAPPLE's radio transmitting and receiving capability through the replacement of existing antennas and associated cables, couplers, connectors, supports, connection boxes, grounding boxes, and foundations.
- d. Upgraded Ship's Armament. GRAPPLE's armament was improved by the installation of 20mm cannon and additional 50-caliber machine guns.

7. Narrative of Major Repair Items

Repair items of major importance during the GRAPPLE overhaul are summarized below.

- a. Nos. 2 and 3 Main Engines. A complete overhaul was performed on two of the Nos. 2 and 3 main engines. The repairs included disassembly of all engine components, a thorough inspection of all parts for wear and defects, replacement of worn or defective components, and reassembly. New pumps and fuel injector nozzles were installed on the ship. The air start system on each engine was cleaned and checked, and defective parts were replaced. The gear trains were inspected. The hydraulic governors were cleaned and inspected.
- b. Four Main Generators. The four main propulsion generators were completely disassembled and refurbished. All windings and coils were reconditioned and all journals were rolled and polished. The commutators were resurfaced and the mica was undercut.
- c. Major Habitability Improvements. All existing wood paneling was removed from the bulkheads and replaced with new Type I bulkhead sheathing. The suspended ceiling system was replaced with fireproof ceiling.
- d. Four Main Motors. The four main motors were removed and completely overhauled.
- e. Towing Machine. All mechanical components and electrical equipment was removed from the towing machine and refurbished. The direct-acting tension controller unit was shipped back to the manufacturer for repair. New bearings were installed.

Following is a list of the major repair work accomplished during the GRAPPLE overhaul, grouped according to cost range.

<u>Cost Range</u>	<u>Item</u>	<u>Estimated Cost</u>
>\$100K	Repair Nos. 2 and 3 main engines	\$118,691
>\$50-\$100	Overhaul main prop. generators	88,121
	Bhd paneling and false ceilings	52,351
>\$25-\$50K	DD SB/paint/tst FW tanks	48,388
	DD SB/paint UW hull and freeboard	45,927
	Nos. 1-4 main motors	43,760
	Towing machine	43,702
	Nos. 1-4 speed reducers	33,107
	Repair Nos. 1 and 4 main engine components	28,540
	20mm gun alt	26,595
	SB/paint/test 2 void tanks (cancelled)	25,922
	Anchor windlass	25,083
\$10-\$25K	S/B paint topside	23,741
	Alt 217K impr antenna system	23,003
	Prop/shafting/rudders	21,958
	Alt 260D replace MG sets	18,509
	Docking/undocking	17,773
	Alt 264D additional FO purifier	17,666
	Nos. 1 and 2 S/S generator	16,404
	No. 2 SSDG	15,787
	Circuit breakers	15,504
	Clean/insp/test FO tanks	14,962
	Nos. 1 and 2 cargo winches	13,510
	Renew ovbd discharge hull ftgs	12,924
	FO and LO purifiers	11,992
	SB/paint/rpr chain locker	11,852
	Alt 246D dual task light array	11,311
	Renew sup/exhaust vent ducts	10,476

8. Narrative of Material Condition Prior to Overhaul

Significant areas of material deficiency were identified in the INSURV inspection report for GRAPPLE. The gears of the speed reducers were galled and pitted; rust was observed on the main reduction gear assembly and bull gear, and the bull gear journal bearing was pitted. All mechanical and remote-mounted electric tachometers on the main and auxiliary engines were faulty or inoperative; and some equipment complementary to the main engines, such as air starting valves, duplex fuel-oil pressure gauges, turbocharger heat shields, safety shields for fuel oil strainers/filters, and pyrometers had not been installed or were missing. The ship's evaporators appeared to be working at only 40% to 60% efficiency, though they were less than three years old.

The ship's low-pressure air and ventilation systems were contaminated with foreign matter, and many areas of vent ducting were rusted or corroded.

The towing winch foundation was corroded and in need of preservation, the towing machine manual-or-automatic selection wheel was inoperative, and the drum clutch engagement was frozen. Most of the salvage equipment was in need of minor repair, as were the 8- and 10-ton boom winches. Apparatus was missing from the beach gear and diving equipment.

The INSURV inspectors also found dead-end cables in the wireways throughout the ship, stuffing tubes improperly packed, and many electronic test equipment items missing.

The ship required a Tempest recertification of the secure processing system due to installation of a new crypto unit; did not meet current habitability standards; had a great deal of combustible sheathing and carpeting; and had no pollution abatement equipment.

9. Narrative of Material Condition After Overhaul

During the overhaul, most of the problems mentioned above were corrected. New installations included a fuel oil purifier for the main engine, several antenna systems, a stub mast, task lights, new fire-fighting equipment, and two 30-kW motor generator sets. Other improvements included a rebuilt and modernized tow machine and other salvage-capability improvements. The 40mm mount was removed and replaced by two 20mm mounts placed on an extended deck abaft the bridge wings.

Due to the age of the ship, ship's force will have to maintain a program of replacing steam-and-drain piping and bilge piping. The existing cable-replacement program should be continued. Extensive fire main replacement will be required during the next overhaul. The galley and food services shipalts should be completed as soon as possible. The electrical power generating plant needs to be studied and corrective shipalts developed.



### C. LONG RANGE MAINTENANCE REQUIREMENTS

An essential element of overhaul maintenance planning is assuring continuity from one overhaul to the next. An influential factor in attaining this continuity is the Long Range Maintenance Plan (LRMP). Taking the completion date of the GRAPPLE overhaul as a starting point, and utilizing the records of that overhaul, PERA prepared a plan identifying long-range maintenance requirements for GRAPPLE. This plan addresses the period between overhauls, and specifies major maintenance requirements that should be targeted for accomplishment during the next overhaul.

Together with the LRMP, a second group of work (that deferred during the overhaul) was identified and the associated information was provided to the ship for inclusion in and updating of the Current Ships Maintenance Projects (CSMP). The LRMP does not discuss the work entered into the CSMP, although planning for and accomplishment of that work is an integral part of long-range maintenance planning.

Probably the most important aspect of long-range maintenance planning is ship's force scheduling and accomplishment of 3M Planned Maintenance Subsystem (PMS) requirements. If ship's force pursues this program thoroughly and conscientiously, maintenance problem areas can be identified promptly and corrected before major deficiencies develop.

The long-range maintenance requirements identified for GRAPPLE are shown in Table III. C-1. Section A of that table lists work defined and deferred during the recent overhaul. Ship's force and/or the overhaul manager (COMSERVPAC/COMSERVGRU) should start now to plan and budget for its accomplishment. Section B is work recommended for accomplishment during the next overhaul that requires actions by the overhaul manager early in the requirements planning phase. Long-lead-time material must be ordered, or preoverhaul testing and inspection has to be scheduled to firm up repair requirements. Section C is work that should be given high priority for accomplishment during the next overhaul. For most of this work, preoverhaul testing should not be required.

Section D identifies PMS-related actions whose accomplishment during the period between overhauls is considered especially important in preparation for the next overhaul.

No attempt has been made to include programmed ship alterations into this plan. It is considered that these are adequately handled by existing programs under the Fleet Modernization Program.

The deferred work had no impact on the overall quality of the GRAPPLE overhaul, or on the ability of the ship to perform its assigned tasks and missions.

TABLE III. C-1. DEFERRED WORK/LONG-RANGE MAINTENANCE ACTIONS,  
USS GRAPPLE (ARS-7) (Sheet 1 of 8)

EIC	Description	Remarks	Est. Cost (\$)
A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL			
1103	Gravity Davit Safety Bars	Fabricate	415
1103	Heavy Weather Lifelines	Install	859
1105, 1804	Storage Lockers	Fabricate and install	437
1108	Phone Booth	Modify	2,500
1300	Reefer Box	Install 3-way switch	466
1503	Metal Joiner Doors	Renew	6,091
1701	Decorative Bulkhead Sheathing	Fabricate and install	3,677
1800	Cable Stowage Reels	Fabricate and install	5,546
1807	Diver's Amplifiers	Class "B" repairs	2,331
1807	Recompression Chamber	Install light fixtures	1,373
1807	Miscellaneous Diving Lockers	Fabricate and install	1,895
1807	Deck Covering - Diving Locker	Renew	1,228
1804	Deck Tile	Renew	993
190V	Welding Machine	Overhaul	3,049
190V	Salvage Welder Engines Nos. 23 and 24	Repair and test	8,325

TABLE III. C-1. (Sheet 2 of 8)

EIC	Description	Remarks	Est. Cost (\$)
A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL (Cont.)			
191N	Electric Workbench	Renew	2,278
191N	Storeroom Bins and Shelves		3,033
1B01	Serving Line Window Covers	Install	3,014
1B01	Dish Stowage Racks and Lockers	Fabricate and install	6,035
1B01	Charbroiler	Install new	4,116
1C01	Carpeting, Fire Retardant	Install	7,221
1C01	Wardroom Rearrangement		2,625
1C01	CIC Operator's Chair	Install	939
1C01	Drinking Fountain	Provide and install	1,694
1D03	Operating Table	Install	3,146
3100	Pyrometer	Ship's service engine	707
3100	Generator Portable Covers	Renew	1,398
3100	Renew Globe Valves	Nos. 1 and 2 ship's service generator	624
3104	Main Generator Exhaust Thermometer Wells	Install new thermo well plates and thermometers	1,257
3300	Replace Strainer	No. 3 emergency generator engine	3,706
3300	2.5 kW Emergency Generator	Install new 3 kW generator	1,283

TABLE III. C-1. (Sheet 3 of 8)

EIC	Description	Remarks	Est. Cost (\$)
A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL (Cont.)			
3300	Emergency Generator Alarm	Install in B-2 lower	2,152
A000	Chafing Plate for Cable Guard	Fabricate and install	870
A501	Tile Deck Coverings	Renew	5,526
A809	Lube Oil Settling Tank	Install sight glass	1,322
A900	Salvage Chair Locker	Sandblast, preserve and repair	10,920
A904	Fresh Water Tanks	Chlorinate	1,801
A904	Lube Oil Settling Tank	1-1/2" gate valve	928
AD06	Scuttles	Renew #'s 1-103-1 and 1-103-2	2,589
AE01	Fore and Main Mast	Sandblast and preserve	2,507
AE34	TBL-13 Radio Transmitter	Class "B" overhaul	9,586
C101	Fuel Oil Gages	Install on main engine	5,560
C101	Pyrometers	Main engine	2,498
C301	Reduction Gear Vent Piping	Renew	857
C701	Diesel Oil Overflow Piping	Renew	723
C701	Fuel Oil Transfer Pump	Renew	3,045
C701	Fuel Oil Storage Tanks	Clean and test	4,769

TABLE III, C-1. (Sheet 4 of 8)

EIC	Description	Remarks	Est. Cost (\$)
<b>A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL (Cont.)</b>			
C801	Reduction Gear Combination Pumps/Motors	Overhaul Nos. 1 and 2	13,305
C901	Reduction Gear Cooling System	Install 5 valves	2,746
C903	Butterfly Valves	Main engine	1,500
K701	Shore Steam Piping	Install	2,027
LB0B	Gyro Motor Generator	Overhaul	1,461
LF1A	Install Pipe Sheathing	Whistle and siren wire ropes	2,872
M301	Shipboard Announcing System	Overhaul	4,590
M303	Intercommunication System	Test	2,272
M501	Deck Covering	Battery locker	927
M60F	Shaft Revolution Indicator	Disassemble/repair	4,258
Q703	AM-215/U	Install tube sockets, shields and covers	983
QFIE	Sliding Shelf Foundation	Install for TSEC/KWR-37	2,547
T000	Fire Monitors and Valves	Clean and inspect	2,266
T104	Salt Water Pumps and Motors	Overhaul	3,767
T104	Boiler Magnets and Pump Motors	Overhaul	2,076
T104	Ship's Service Boiler Gauges	Replace and relocate	1,300

TABLE III. C-1. (Sheet 5 of 8)

EIC	Description	Remarks	Est. Cost (\$)
A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL (Cont.)			
T109	Re-Heater Core	Install new	1,699
T10A	Steam Piping	Renew	4,117
T10A	Evaporator Steam Heater Valves	Two new 300 psi globe valves	1,866
T300	Supply Vent System	Install rheostat	2,000
T300	Provide Vent Screens		424
T300	Vent Supply Insert	Fabricate and install	464
T30D	Vent Closure	Clean and inspect	1,460
T800	Bilge Screens	Fabricate	1,500
T900	CO <sub>2</sub> Remote Release	Install	1,383
TB00	Fresh Water Meter	Replace	1,056
TB00	Fresh Water Piping	Install	8,000
TC00	Sanitary Soil, Waste & Deck Drains	Clean	1,617
TC00	Sanitary Drain Valves	Repair	1,086
TC06	Drain Coamings	Fabricate and install	1,170
TD09	Lube Oil Transfer Pump	Recondition	3,568
TK00	Evaporator Relief Valve	Clean and inspect	400

TABLE III. C-1. (Sheet 6 of 8)

EIC	Description	Remarks	Est. Cost (\$)
<b>A. WORK DEFINED AND DEFERRED DURING 1974 REGULAR OVERHAUL (Cont.)</b>			
TM01	Starboard Boat Winch	Install	1,701
TM01, TM06	Miscellaneous Structures	Sandblast and preserve	687
TM05	Mooring Line Reels	Modify to double reel capacity	1,979
UF04	Miscellaneous Fittings	Sandblast and preserve	3,954
UF06	Compartments	Repaint	13,405
UG03	Fiberglass Insulation and Lagging	Replace	10,212
YC04	Davit Limit Switches	Install new	3,845
YC04, YC05	Boat Davit Trackways, Arms and Winches	Sandblast and paint	8,218
YC04, Y606	Leg Grip Pads	Renew and relocate	1,864
	Main Engine Remote Air Starting System	AER ARS-89	2,037
	S/A ARS 290F - Electric Hand Dryers	Install	2,500



TABLE III. C-1. (Sheet 7 of 8)

EIC	Description	Remarks	Est. Cost (\$)
<b>B. REPAIRS RECOMMENDED FOR NEXT ROH REQUIRING LLTM</b>			
CC01	Main Motors	Install lube oil pressure and alarms	2,000
4108	Switchboard 120V	Replace obsolete breakers	3,000
T300	B1 Engine	Ventilation survey	2,000
T300	Vent Survey	Vent exhaust system in CPO mess	4,000
1C00	Hand Dryers	Install electric hand dryers in heads	7,000
LJ0D	Ship Task Lights	Install dual task lights	6,000
T400	Radar Room	Design study for cooling system	2,000
1B00	Refrigerator	Provide new refrigerator in galley	1,500
1800	Drainage System	Install drainage in magazines	4,000
TB00	Pump Fresh Water Distribution	Overhaul pumps	1,500
M500	Small Arms Ammo Stowage	Install security alarms in case of break-in	2,500
<b>C. PMS ITEMS (SHIP'S FORCE ACCOMPLISHMENT)</b>			
1806	Salvage Equipment		
1807	Diving Equipment		
310U	Ship Service Diesel Generator		
4000	Electrical Safety Devices		

TABLE III. C-1. (Sheet 8 of 8)

EIC	Description	Remarks	Est. Cost (\$)
C. PMS ITEMS (SHIP'S FORCE ACCOMPLISHMENT) (Cont.)			
4400	Power Distribution Cabling		
C000	Main Propulsion Diesel, Reduction Gears, Generators, Motors		
T100	Auxiliary Boiler		
T500	Refrigeration System		
TF00	Compressed Air System		
TK00	Evaporators		
TM00	Deck Machinery, Tow Machine		

## D. RECOMMENDATIONS

### 1. For the Ship

It is recommended that ship's force personnel of USS GRAPPLE take the following actions:

- a. Maintain an active program of replacing steam, drain, and bilge piping and power distribution cabling.
- b. Ensure that the CSMP is up to date and accurately reflects the condition of the ship following overhaul. Completed action reports should be submitted for previously deferred work items accomplished during the overhaul. Work items not accomplished should be reviewed and revised as necessary to reflect their status at the end of the overhaul.
- c. *Follow-up on and ensure receipt of updated record plans and documents that reflect the condition of the ship at the end of overhaul.*
- d. Take action as necessary to accomplish deferred work/long range maintenance items, as discussed in Section III. C.

### 2. For the Class

It is recommended that for ARS-7 class ships, the type commander, with assistance from PERA and the ships, accomplish the following:

- a. Plan for and accomplish a series of habitability studies if they have not been accomplished, and incorporate the results into future alteration and overhaul planning. The objective of this action is to update priority of accomplishment and obtain the necessary data to authorize early development of plans and ordering of material.
- b. Review existing alterations to determine new equipment/material requirements and take action as needed to obtain these items, e.g., replacement of auxiliary ship-service generator sets and air compressors.

- c. Take follow-up actions as required to resolve electrical power requirements and availability for these ships, and provide for accomplishment of any modifications during the next overhaul.
- d. Analyze, as required, Board of Inspection and Survey reports and requests that shipalts or alterations equivalent to repair (AERs) be prepared. Several Part I INSURV discrepancies have been noted on all ships of the class.

3. Standardized ROH Work Requests (Form 4790.2K)

It is recommended that the standardized work requests and overhaul specifications for ARS class ships be coordinated with the various SUPSHIP organizations and utilized as extensively as possible.

4. For PERA(CSS)

It is recommended that PERA take the following actions with respect to advance overhaul planning:

- a. Revise the planning milestone tasks to incorporate the most recent procedures and techniques.
- b. Analyze the reports and documents required to support overhaul planning, and issue appropriate specifications for their preparation and distribution.
- c. Actively pursue relationships with various SUPSHIP organizations to develop better understanding of the PERA functions and the need for interchange of advance planning data.
- d. Review the need for more active participation of PERA during the overhaul management phase.
- e. Increase the emphasis on advance material definition and procurement for overhauls.
- f. Select and task an organization to develop and maintain alteration equivalent to repair (AER) drawings. One of the difficulties

encountered in the planning process was obtaining drawings for the type commander's AERs. No activity is tasked to maintain class drawings for these alterations. This situation leads to delays and unnecessary expenditure of design funds.

- g. Increase distribution of the Fleet Integrated Logistics Support (FILS) report, for example to the Naval Material Management Field Office and Supply Operations Assistance Program teams.

## E. EVALUATION/USEFULNESS

### 1. PERA Products to Ship/Industrial Activity

- a. Ship Systems Definition and Index (SSDI). The SSDI was found useful by ship's force, supporting them in assembling a comprehensive work package.
- b. Integrated Work Package (IWP) Summary Report. The IWP was utilized by the ship and the type commander as a record of screening action and as a tool in updating the CSMP.
- c. POT&I Plan. The limited POT&I performed on GRAPPLE was not conducted fully in accordance with the plan prepared by ARINC Research. As a consequence, certain untested items were subject to complete overhauls, where proper preoverhaul testing might have indicated the need for lesser repair. It is recommended that, to overcome problems in accomplishing POT&I, PERA consider tasking the overhaul planning agent to accomplish preoverhaul tests.
- d. Tradeoff Analysis. Result of a tradeoff analysis were provided to the overhaul manager prior to the overhaul tradeoff conference, giving him the data necessary to authorize the most effective overhaul work package.
- e. FILS Report. FILS reports were developed for transmittal. It is felt that more effective use of this document could be made.

### 2. Resource Effectiveness

- a. Ship's Force. Ship's force, being the most valuable element in overhaul planning, cooperated fully in generating the work package.
- b. SUPSHIP 14. Personnel of SUPSHIP 14 were cooperative in providing estimates and discussing unwritten specifications. Estimates were provided as they became available. Better

rapport is required between SUPSHIP 14 and planning agents to optimize overhaul resources.

- c. ARINC Research Corporation. ARINC Research personnel screened the work package in groups as it was received and forwarded it to SUPSHIP 14. ARINC Research conducted several major tasks in behalf of the overhaul manager for his concurrence, including a screened work package, a POT&I plan, and a tradeoff analysis. This contribution, together with continuous liaison, permitted the overhaul manager to concentrate his efforts on the management of the overhaul.



USS BOLSTER (ARS-38)

POST OVERHAUL ANALYSIS REPORT

OVERHAUL DATES

24 FEBRUARY 1975 — 29 JULY 1975



USS BOLSTER (ARS-38)  
POST OVERHAUL ANALYSIS REPORT

Approved: \_\_\_\_\_

Date: \_\_\_\_\_

Distribution:

PERA (CSS)  
COMSURFPAC  
COMSERVRON FIVE  
USS BOLSTER (ARS-38)

Prepared by  
ARINC RESEARCH CORPORATION  
Ships and Ordnance Division  
Honolulu Support Office

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USS BOLSTER (ARS-38)  
POST OVERHAUL ANALYSIS REPORT

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I. GENERAL INFORMATION AND PREFACE

A. GENERAL INFORMATION

- Ref: (a) Contract N00640-74-C-0234  
(b) PERA(CSS) Milestone Charts

B. PREFACE

USS BOLSTER (ARS-38) was overhauled from 24 February 1975 through 29 July 1975 under the direction of the Supervisor of Shipbuilding (SUPSHIP), Pearl Harbor. The overhaul was accomplished at Dillingham Shipyard.

In planning the overhaul of USS BOLSTER, PERA(CSS), acting as maintenance management agent for NAVSHIPS and the type commander, established advance planning milestones (References a and b) which commenced 13 months prior to the overhaul start date. The goal of the planning effort was to identify in advance any potential and existing problem areas, and to provide the detailed preoverhaul guidance, planning, and coordination necessary to achieve a successful yard overhaul. The purpose of this report is to evaluate the management judgments and decisions associated with the planning effort.

## II. MANAGEMENT SUMMARY

References a and b list the management milestones in planning the FY 1975 regular overhaul (ROH) of the USS BOLSTER (ARS-38). Deviations from the milestones that affected the overhaul, and unanticipated factors that contributed to the final overhaul outcome, are discussed below.

### A. AUTHORIZED VS. ACCOMPLISHED WORK

The repair portion of the BOLSTER work package was essentially completed as authorized. Minor items were not complete at the end of the overhaul because of late delivery of material. Repair material is to be forwarded to the ship when received.

### B. PLANNED VS. ACTUAL COMPLETION TIME

The start of the BOLSTER overhaul was initiated on 24 February 1975, as scheduled. However, the completion was delayed 35 days because of various difficulties encountered during the overhaul and because of growth work.

### C. PLANNED VS. ACTUAL COMPLETION COSTS

The SUPSHIP departure report had not been released as of the preparation of this report, so a comparison of actual versus estimated costs for the BOLSTER overhaul cannot be presented herein.

### D. MAJOR CONFIGURATION CHANGES

Significant configuration changes to BOLSTER included the replacement of two 10-kW motor generator sets with 30-kW sets, and the installation of additional firefighting equipment and a fuel oil purifier. Improvements were also made to the shipboard communication and electronics equipment, and to the galley.

### E. FOLLOW-ON WORK REQUIRED

Follow-on work needed is to complete repairs outstanding when required parts are received, and to plan for the accomplishment of items in the Long Range Maintenance Plan (see Section III. C).

### III. DETAILS OF OVERHAUL

#### A. PLANNING PROCESS

##### 1. Ideal Vs. Actual Milestones

Advance overhaul planning for BOLSTER commenced in December 1973. The overhaul planning procedures used for BOLSTER are defined in the PERA(CSS) "Combatant Support Ship Overhaul Advance Planning Milestones". These milestones provide for accomplishment of 56 tasks, of which 39 are PERA action responsibility. The ideal target dates for these tasks range from start of overhaul minus 13 months (A-13) to completion of overhaul plus two months (C+2).

With the BOLSTER overhaul scheduled to start on 24 February 1975, ARINC Research commenced advance planning for the overhaul at about A-13 months. All required tasks were completed. Table III.A-1 shows the dates for the accomplishment of the principal milestones for BOLSTER. The following paragraphs summarize the advance planning for the overhaul.

- a. Advance Overhaul Planning. Overhaul planning was initiated with a survey of the available maintenance history of BOLSTER as contained in the Current Ships Maintenance Project (CSMP) and the Maintenance and Material Management (3M) Program Material History Report. Programmed ship alterations and TYCOM alterations were reviewed, along with other pertinent maintenance history such as last overhaul records, departure reports, and casualty reports (CASREPs). During the same timeframe, BOLSTER personnel were briefed on PERA's role in the overhaul planning process.

A shipcheck was conducted by ARINC Research representatives in Yokosuka, Japan during the week of 20 September 1974, and included a habitability study. Assistance was provided ship's force in developing the overhaul work package and a substantial portion of this work package was brought back by the shipcheck team.

The work package was screened, and with the exception of certain Preoverhaul Test and Inspection (POT&I) items, delivered to

TABLE III.A-1. IDEAL VS. ACTUAL MILESTONES FOR ROH OF USS BOLSTER (ARS-38) (Sheet 1 of 2)

Milestone	Target Date	Contract Target Date	Actual Start	Completion	Remarks
PERA Contract Start Date	A-600	11/15/73	11/15/73	8/24/75	
Obtain Historical Data; Review Alts	A-600	12/1/73	11/15/73	12/1/73	
Receive Ship Work Request Package	A-175	9/2/74	9/22/74	9/30/74	
Screen Work Requests; Determine Known Work; Identify LLT Items	A-310	5/1/74	9/30/74	12/18/74	
Brief Ship, Shipcheck Selected Work Items	A-390	7/29/74	9/22/74	9/30/74	
Determine POT&I Requirements	A-210	7/29/74	7/29/74	7/29/74	
Submit Screened Work Requests to SERVGRU and SUPSHIP	A-275	7/1/74	10/9/74	10/9/74	
Receive New Work Requests, Screen, Submit to SERVGRU and SUPSHIP	A-60	1/1/75	12/18/74	12/18/74	
Conduct POT&I	A-85	12/30/74	1/23/75	1/30/75	
Complete Drydock Phase Tradeoff Analysis, and Work Definition Conference	A-50	1/24/75	2/25/75	2/25/75	

TABLE III.A-1. (Sheet 2 of 2)

Milestone	Target Date	Contract Target Date	Actual Start	Completion	Remarks
Complete Topside Phase Tradeoff Analysis, and Work Definition Conference	A-50	1/24/75	2/25/75	2/25/75	
Perform Overhaul - Drydock Phase	A-0	2/24/75	2/24/75	3/24/75	
Perform Overhaul - Topside Phase	A-0	3/24/75	6/24/75	7/29/75	
Complete Final Report	C+60	8/24/75	-	8/24/75	



SUPSHIP. The initial package, delivered to SUPSHIP/Pearl Harbor in October 1974, represented 70% of the total work package. A second delivery on 12 November 1974 represented an additional 10%; and delivery was essentially completed with transmittals during the week of 16 December 1974.

POT&Is were conducted by the Mobile Training Unit in Yokosuka and by Columbia Sentinal Engineers of Honolulu.

The ship's armament was not inspected since the sole existing piece of ordnance equipment was scheduled for removal. Additional electronics equipment tests and inspections were conducted at Pearl Harbor.

- b. Tradeoff Conference. The tradeoff conference for the BOLSTER overhaul was held on 25 February 1975. The conference was attended by representatives of SUPSHIP/Pearl Harbor, COMSERVRON FIVE, PERA (CSS), and ARINC Research Corporation. The total planning estimate for the drydock phase was \$192,000, and for the topside phase was \$1,071,339.
- c. Overhaul Phase. The main planning responsibility during the overhaul was to monitor its progress and assist in the management of COMSERVRON FIVE resources in light of additional requirements developed during and as a result of the overhaul. To accomplish these objectives, the SUPSHIP weekly progress conferences were attended and in this way provided liaison between the COMSERVRON FIVE maintenance staff, SUPSHIP, and the ship.
- d. Postoverhaul Phase. ARINC Research Corporation's responsibilities following completion of the overhaul were to analyze the overhaul records and prepare a final report.

## 2. Impact of Planning Milestone Slippages

Actions or occurrences impacting on the overhaul schedule are discussed below.

- a. Late Availability of Estimates. Many work estimates were released very close to the date of the tradeoff conference, and others after

that date. This precluded an effective tradeoff analysis for BOLSTER. This situation is in general a contributing factor to increased cost of ship overhauls.

- b. Late Availability of Specifications. The fact that no specifications, only estimates, were available for the work definition conference hindered ARINC Research in conducting the work-item tradeoff analysis. A review of the estimates indicated that in several cases the intent of the work request had not been carried out. Specifications were not made available to the overhaul manager, the ship, or ARINC Research until after the invitation for bid was issued. This made review of the specifications, and any desired changes of the specification articles, difficult and in some cases not possible. The untimely availability of specifications for review purposes severely hindered the effectiveness of the overhaul planning process.

3. Recommendations

As a result of the review of the planning process for the BOLSTER overhaul, ARINC Research recommends that efforts be directed toward:

- a. Ensuring that the development of ship alteration drawings and the ordering of material adhere to PERA (CSS) milestones.
- b. Reviewing applicable Fleet Modernization Program (FMP) documents to ensure that all required shipalts are programmed.
- c. Developing both estimates and specifications early enough to support the overhaul tradeoff conference.
- d. Increasing PERA (CSS) participation in the overhaul management phase.
- e. Establishing a firm budget before the work definition conference.

B. WORK PACKAGE

1. Summary Sheet
2. Cost Summary Sheet
3. Alteration Summary Sheet
4. TYCOM Repair Package
5. PERA Screening Summary
6. Narrative of Major Alteration Items
7. Narrative of Major Repair Items
8. Narrative of Material Condition Prior to Overhaul
9. Narrative of Material Condition After Overhaul

1. Summary Sheet - USS BOLSTER (ARS-38)

Scheduled Start Date: 24 Feb 75 Scheduled Completion Date; 24 Jun 75

Actual Start Date: 24 Feb 75 Actual Completion Date: 29 July 75

Overhaul Extended:\* 35 days

\*Overhaul extended due to growth work.

**SIGNIFICANT CAPABILITY CHANGES:**

- a. A CHT (collecting and holding tank) system was installed.
- b. An AFFF/PKP (aqueous film foam firefighting/purple-K powder) system was installed in the machinery spaces.
- c. Three 30-kW MG sets were installed.
- d. New 20mm/50-caliber gun mounts were installed.
- e. An additional fuel oil purifier was installed.

2. Cost Summary Sheet – USS BOLSTER (ARS-38)

a. <u>Summary of Overhaul Costs</u>	<u>K-Alt</u>	<u>Repair</u>
1) Budget	\$573,653	Not Available
2) Estimated Cost	\$262,865	\$1,000,474
3) Bid Price	\$229,024*	\$871,716*
4) Total Cost	Not Available	Not Available
5) Growth Cost	Not Available	Not Available
6) Percent Growth	Not Available	Not Available

\*Prorated estimate from total bid price.

b. Estimated Overhaul Costs by EIC Category. See Table III. B-1.

c. Cost Avoidance Summary. For the BOLSTER overhaul, 641 work requests were received from the ship and screened by PERA (ARINC Research). Of this total, approximately 36% (229 work requests) were screened as deferred, duplicated, disapproved, etc., as a result of shipchecks, discussions with ship personnel, and analysis of the work requested. This represents a substantial cost avoidance to the type commander as well as a considerably lightened workload for the overhauling activity and overhaul manager.

Additionally, a large number of work requests were diverted to ship's force or tenders during initial ship visits, which reduced the number of work requests that had to be screened.

During the screening process, a large number of additional work requests were screened for intermediate maintenance activity (IMA) or ship's force accomplishment. This allowed overhaul funding to be concentrated on those work requests that a shipyard can best accomplish.

3. Alteration Summary Sheet

The alteration summary sheet for BOLSTER is shown in Table III. B-2.

TABLE III. B-1. ESTIMATED COST BY EIC CATEGORY FOR ROH OF  
USS BOLSTER (ARS-38) (Sheet 1 of 4)

EIC		Est. Cost (\$)		Pct. Total Cost		Final Cost	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
A000		310,467		27.52		(Not available)	
	AD00		30,585		2.70		
	AE00		6,915		0.60		
	A000		2,106		0.19		
	A400		11,006		0.98		
	A500		4,945		0.44		
	A600		77,101		6.84		
	A700		11,255		1.00		
	A800		6,652		0.59		
	A900		159,902		14.18		
B000		9,537		0.85			
	B400		9,537		0.85		
C000		166,656		14.78			
	CD00		25,285		2.24		
	CE00		14,692		1.30		
	C100		38,258		3.40		
	C300		8,547		0.76		
	C400		38,554		3.42		
	C700		41,320		3.66		
K000		17,417		1.54			
	KA00		17,417		1.54		
L000		22,415		1.99			
	LB00		2,456		0.22		

TABLE III. B-1. (Sheet 2 of 4)

EIC		Est. Cost (\$)		Pct. Total Cost		Final Cost	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
	LF00		2,466		0.22	(Not available)	
	LG00		1,024		0.09		
	LJ00		16,469		1.46		
M000		7,124		0.63			
	M500		7,124		0.63		
P000		14,854		1.32			
	P100		14,854		1.32		
Q000		25,385		2.25			
	QA00		653		0.06		
	QD00		11,720		1.04		
	QE00		2,902		0.26		
	Q000		8,481		0.75		
	Q100		1,629		0.14		
R000		5,451		0.50			
	R500		5,451		0.50		
T000		220,521		19.55			
	TA00		21,582		1.91		
	TB00		3,153		0.27		
	TD00		5,055		0.44		
	TF00		33,080		2.95		
	TJ00		4,805		0.43		
	TK00		8,440		0.75		
	TM00		44,441		3.94		
	TN00		17,084		1.51		
	TS00		3,771		0.33		
	T100		7,972		0.71		
	T300		22,879		2.03		
	T400		1,100		0.10		
	T500		13,168		1.17		
	T700		2,166		0.19		

TABLE III. B-1. (Sheet 3 of 4)

EIC		Est. Cost (\$)		Pct. Total Cost		Final Cost				
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.			
U000	T800	43,625	31,825	3.87	2.82					
	UC00		12,853		1.14					
	UE00		6,082		0.54					
	UH00		2,946		0.26					
	UJ00		16,513		1.46					
	U000		2,265		0.20					
	U500		2,966		0.27					
Y000		5,960		0.53						
	YA00		5,243		0.46					
	Y600		717		0.07					
Z000		70,060		6.2						
	Z000		70,060		6.2					
1000		177,916		15.77						
	1B00		12,069		1.07					
	1C00		0,095		0.09					
	1000		8,075		0.72					
	1100		36,709		3.25					
	1300		36,889		3.27					
	1400		4,689		0.42					
	1600		17,295		1.53					
	1800		51,608		4.58					
	1900		9,487		0.84					
	3000				21,897		1.94			
			3100			5,513		0.48		
			3300			16,384		1.46		
4000		2,989		0.26						
	4700		2,989		0.26					



TABLE III. B-1. (Sheet 4 of 4)

EIC		Est. Cost (\$)		Pct. Total Cost		Final Cost	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
6000		3,104		0.27			
	6700		3,104		0.27		
8000		2,601		0.23			
	8C00		2,601		0.23		
TOTAL		1,127,979	1,127,979	100	100		

TABLE III. B-2. ALTERATION SUMMARY SHEET, USS BOLSTER (ARS-38) (Sheet 1 of 2)

Alteration	FMP Est. (\$)	NAVSHIP Est. (\$)	SUPSHIP Cost (\$)	Actual Cost (\$)	Remarks
ARS-251K General Weight and Moment Compensation	10,573	11,088	4,500	(Not available)	Design only
ARS-254K Install AFFF Firefighting Equipment	96,574	101,808	60,576		
ARS-262K AN/SSR-1 Equipment			8,175		
ARS-265K CHT Installation	149,984	111,888	99,236		
ARS-266K Fire Bilge & Flushing Piping	10,573	11,088	*		
ARS-267K Oily Waste Holding Tank		83,664	27,650*		*Includes ARS-266K
ARS-268K Tank Level Indicator System	78,698	25,200	5,917		
ARS-271K Bilge Hi Level	5,232	5,355	3,567		
ARS-276K H/I Improve Sanitary Space Vent & Sheathing	106,057	111,888	43,937		
ARS-278K Install Standard Radar Display	5,014	6,048	3,365		
ARS-292K Install 30-kW MG Sets		57,456	(Not available)		
ARS-297K Fire Extinguishing System		3,125	1,894		
ARS-310K H/I Crew Galley Mods		50,400	(Not available)		

TABLE III. B-2. (Sheet 2 of 2)

	Alteration	FMP Est. (\$)	NAVSHIP Est. (\$)	SUPSHIP Est (\$)	Actual Cost (\$)	Remarks
ARS-240D	Install AN/SPS-53A			14,059		
ARS-246D	Install Dual Task Light Array			11,311		
ARS-247D	Install 20mm Gun Mounts			38,006		
ARS-248D	Install Wind Indicator System			5,416		
ARS-260D	Replace Motor Generator Sets			18,509		
ARS-264D	Install Additional Fuel Oil Purifier			22,202		
ARS-283D	H/I Sanitary Spaces Fixtures			39,908		
ARS-304D	High Temperature & Sprinkler Alarm System			7,124		
ARS-355D	Navigation Lights			16,469		
ARS-290F	Install Electric Hand Dryers			1,095		
AER ARS-107	Stern Capstans			3,475		
AER ARS-111	SAF-T-Climb			7,042		
AER ARS-117	High Security Locks			7,933		

4. TYCOM Repair Package - USS BOLSTER (ARS-38)

	<u>No.</u>	<u>Pct.</u>
1. Total Automated Work Requests	311	48.5
2. Total Work Requests Screened	641	
a. Number of Work Requests Deferred	72	11.2
b. Number of Work Requests Disapproved	61	9.5
c. Number of Work Requests Duplicated, Cancelled, etc.	96	15.0
d. Number of Work Requests Approved	<u>412</u>	<u>64.3</u>
TOTAL	641	100.0
3. Total Work Requests Approved	412	
a. Number Work Requests Screened: Priority One (1)	65	15.8
b. Number Work Requests Screened: Priority Two (2)	171	41.5
c. Number Work Requests Screened: Priority Three (3)	140	34.0
d. Number Work Requests Screened: Priority Four (4)	25	6.1
e. Number Work Requests Screened: Priority Five (5)	9	0.6
f. Number Work Requests Screened: Priority Six (6)	<u>2</u>	<u>0.0</u>
TOTAL	412	100.0
4. Number of Approved Work Requests by Type Work	412	
a. Repair (including Remove, Replace, Manufacture, Drydock, POT&I, and Calibrate)	352	
b. Ship Alteration	29	
c. TYCOM AER	10	
d. Habitability	11	
e. Routines	<u>10</u>	
TOTAL	412	
5. Number of Approved Work Requests Insurance Items:	21	5.1
6. Number of Approved Requests Accomplished	NA	NA
7. Number of Approved Work Requests Not Accomplished and Not Entered in CSMP	NA	NA

5. PERA Screening Summary - USS BOLSTER (ARS-38)

1. <u>Screening Action</u>	<u>PERA</u>	<u>TYCOM</u>
a. Number of Work Requests Screened One (1)	284	See Comments
b. Number of Work Requests Screened Two (2)	9	
c. Number of Work Requests Screened Three (3)	110	
d. Number of Work Requests Screened Four (4)	0	
e. Number of Work Requests Screened Five (5)	9	
f. Number of Work Requests Screened Six (6)	0	
g. Number of Work Requests Screened Seven (7)	0	
h. Number of Work Requests Screened Eight (8)	72	
i. Number of Work Requests Screened Nine (9)	61	
j. Number of Work Requests Screened Zero (0)	96	
2. Total Number Work Requests TYCOM Concurred:	<u>See Comments</u>	
3. Total Number Work Requests TYCOM Screened Otherwise:	<u>See Comments</u>	
4. <u>See Comments</u> % Agreement in Screening		
5. Analysis of Screening Differences:	<u>See Comments</u>	
6. Comments/Recommendations:		
<p>Screening actions were reviewed with the overhaul manager prior to being finalized. No distinction was made between PERA and TYCOM screening actions. It can be generally stated that the overhaul manager concurred with the recommended screening.</p>		
<p>*LEGEND: Screening Action (Appendix 17, OPNAV 43P2)</p>		
<p>1. Shipyard accomplish                  2. Tender or repair ship accomplish                  3. Ship's force - (tender or repair ship/yard) assist                  4. Accomplish as alteration equivalent to a repair                  5. Ship to shop                  6. Accomplish with modification                  7. Yard open inspect - advise TYCOM - proceed with minimum repairs                  8. Deferred                  9. Disapproved                  0. Other - specify in remarks</p>		

6. Narrative of Major Alteration Items

The following comments are offered concerning major alterations accomplished during the BOLSTER overhaul.

- a. Increased AC Power Capability. The work specifications for this shipalt called for the removal of the existing 10 kW motor-generator sets and the installation of 30 kW motor-generator sets, including motor starters, controllers, power panels, circuit breakers, and associated cabling. The Design Division, Pearl Harbor Naval Shipyard, rewrote the original work specifications, plans, and test memos covering the installation of the 30 kW MG sets to provide for paralleling capability, and the sets are being so modified.
- b. AFFF Fire Protection System. The machinery space fire protection system was improved by the installation of the twinned agent, aqueous film-forming foam (AFFF) and purple-K powder (PKP) system.
- c. Upgraded Communication System. Progress was made toward improving BOLSTER's radio transmitting and receiving capability through the replacement of existing antennas and associated cables, couplers, connectors, supports, connection boxes, grounding boxes, and foundations.
- d. Upgraded Ship's Armament. BOLSTER's armament was improved by the installation of 20mm cannon and additional 50-caliber machine guns.

7. Narrative of Major Repair Items

Repair items of major importance during the BOLSTER overhaul are summarized below.

- a. Four Main Engine Components. The major engine components on all four main engines were overhauled. The repairs included disassembly of all engine components, a thorough inspection of all parts for wear and defects, replacement of worn or defective components, and reassembly. New freshwater and saltwater pumps were installed on the ship. The air start system on each engine was

cleaned and checked, and defective parts were replaced. The gear trains were inspected. The hydraulic governors were cleaned and inspected.

- b. Major Habitability Improvements. All existing wood paneling was removed from the bulkheads. Deck covering was renewed in various compartments. The vessel was completely fumigated. Sanitary space improvements were made.
- c. Four Main Motors and Four Main Generators. The four main motors and four main generators were completely cleaned in place aboard the vessel.
- d. Towing Machine. The towing winch motor was removed from the vessel and completely refurbished.

Following is a list of the major work accomplished during the BOLSTER overhaul, grouped according to cost range.

<u>Cost Range</u>	<u>Item</u>	<u>Estimated Cost</u>
>\$100K	None	
>\$50K-\$100K	Blast and paint sides	\$51,162
	Blast and paint F.W. tanks	50,812
>\$25K-\$50K	Repair stbd. main shaft	37,601
	Beach gear	31,292
	Tile A-202-AEL	30,375
	Exhaust manifold	29,358
	Temporary services	28,090
	Motor cables	25,285
	>\$10K-\$25K	Fuel tanks
FF/B pump casing		21,582
Vent motors		21,496
Blast/paint deck/bulwark		21,247

<u>Cost Range</u>	<u>Item</u>	<u>Estimated Cost</u>
>\$10K-\$25K (Continued)	ASF funds	\$20,000
	SW cooling valves	17,417
	Stateroom carpet	17,295
	Drydock ship	16,513
	Propulsion switchboard	14,692
	Tow winch system	14,494
	Blast/paint after paint bins	13,470
	HP air compressor	13,438
	Access openings	12,853
	W. T. doors	12,155
	Heat exchangers	11,793
	20-ton boom	11,344
	Preserve foundations	11,255
	Main reefers	11,048
	Repair shell plating	11,006
	W. T. hatches	10,480

8. Narrative of Material Condition Prior to Overhaul

Significant areas of material deficiency were identified in the POT&I reports for BOLSTER. In the electronics area, it was noted that certain equipment should be relocated in the interests of operational and maintenance efficiency. The AN/SPS-21D radar was found to be in poor operating condition and had multiple discrepancies. Improper or insufficient maintenance was apparent on almost all antennas, as evidenced by the presence of paint on insulators and corrosion between the baseplate of whip antennas (35") and insulation bowls. The receiving long-wire antenna was jury-rigged. The 40mm gun mount would not operate in the single-fire mode without repositioning of the cocking lever after each round.



In the diesel generator room, it was observed that the present exhaust ventilation requirements were not being met, causing excessively high ambient temperatures at the upper level of the compartment.

The main motor cables were in a poor condition and in need of replacement.

Further areas of discrepancy were reported in the 3 October 1973 report of the Navy Sub-Board of Inspection and Survey. The ventilation system in the forward and after engine room was contaminated with oil and foreign matter. The HP, MP and LP air compressors required excessive time to build up pressure and did not operate correctly. Numerous reach rods were frozen and deteriorated beyond repair. Numerous watertight doors and hatches were warped, sprung, or had defective operating mechanisms.

The anchor windlass whelps on the wildcat were worn excessively and the mechanical brake drums were corroded and pitted.

In general the INSURV board found the alternating current distribution system to be totally inadequate, insufficiently protected, and jury-rigged to a single circuit breaker.

9. Narrative of Material Condition After Overhaul

During the overhaul, most of the problems mentioned above were corrected. New installations included a fuel oil purifier for the main engine, several antenna systems, task lights, new firefighting equipment, and three 30 kW motor-generator sets. The 40mm mount was removed and replaced by two 20mm mounts placed on an extended deck abaft the bridge wings.

Due to the ship's age, ship's force will have to maintain a program of replacing steam-and-drain and bilge piping. The existing cable-replacement program should be continued. Extensive fire main replacement will be required during the next overhaul. The electrical power generating plant needs to be examined and corrective shipalts developed.

### C. LONG-RANGE MAINTENANCE REQUIREMENTS

An essential element of overhaul maintenance plan is assuring continuity from one overhaul to the next. An influential factor in attaining this continuity is the Long-Range Maintenance Plan (LRMP). Taking the completion date of the BOLSTER overhaul as a starting point, and utilizing the records of that overhaul, PERA prepared a plan identifying long-range maintenance requirements for BOLSTER. This plan addresses the period between overhauls, and specifies major maintenance requirements that should be targeted for accomplishment during the next overhaul.

Together with the LRMP, a second group of work (that deferred during the overhaul) was identified and the associated information was provided to the ship for inclusion in and updating of the Current Ships Maintenance Projects (CSMP). The LRMP does not discuss the work entered into the CSMP, although planning for and accomplishment of that work is an integral part of long-range maintenance planning.

Probably the most important aspect of long-range maintenance planning is ship's force scheduling and accomplishment of 3M Planned Maintenance Subsystem (PMS) requirements. If ship's force pursues this program thoroughly and conscientiously, maintenance problem areas can be identified promptly and corrected before major deficiencies develop.

The long-range maintenance requirements identified for BOLSTER are shown in Table III.C-1. Section A of that table lists work defined and deferred during the recent overhaul. Ship's force and/or the overhaul manager (COMSERVPAC/COMSERVGRU) should start now to plan and budget for its accomplishment. Section B is work recommended for accomplishment during the next overhaul that requires actions by the overhaul manager early in the requirements planning phase. Long-leadtime material must be ordered, or preoverhaul testing and inspection has to be scheduled to firm up repair requirements.

Section C identifies PMS-related actions whose accomplishment during the period between overhauls is considered especially important in preparation for the next overhaul.

No attempt has been made to include programmed ship alterations into this plan. It is considered that these are adequately handled by existing programs under the Fleet Modernization Program.

The deferred work had no impact on the overall quality of the BOLSTER overhaul, or on the ability of the ship to perform its assigned tasks and missions.

TABLE III. C-1. DEFERRED/LONG RANGE MAINTENANCE ACTIONS,  
USS BOLSTER (ARS-38) (Sheet 1 of 3)

EIC	Description	Remarks	Est. Cost (\$)
A. WORK DEFINED AND DEFERRED DURING 1975 REGULAR OVERHAUL			
1A04	Barbershop Sink	Install	500
1C01	Flammable Material	Remove remaining	10,000
1C01	Irons and Boards, Writing Table	Install	2,000
4000	Switchboard Meters	Install	5,000
A801	Dirty Laundry Locker	Install	8,000
A809	Emergency FW Tank	Rebuild	1,700
C804	L.O. Transfer Pump Meter	Overhaul	5,000
C804	L.O. Transfer Pump	Overhaul	2,000
M514	Security Alarm	Install system	15,000
N40V	Degaussing System	Test and repair	10,000
Q000	Secure Voice	Install system	17,000
T106	CIC Steam Heater	Replace with electric	4,000
T300	Vent System	Modernize	25,000
TD05	D.O. Transfer Pump Meter	Overhaul	5,000
TD05	D.O. Transfer Pump	Overhaul	2,000
TF03	Divers L.P. Air	Replace system	25,000

TABLE III. C-1. (Sheet 2 of 3)

EIC	Description	Remarks	Est. Cost (\$)
<b>B. REPAIRS RECOMMENDED FOR NEXT ROH REQUIRING LLTM</b>			
CC01	Main Motors	Install lube oil pressure and alarms	2,000
4108	Switchboard 120V	Replace obsolete breakers	3,000
T300	B1 Engine	Ventilation survey	2,000
T300	Vent Survey	Vent exhaust system in CPO mess	4,000
1C00	Hand dryers	Install electric hand dryers in heads	7,000
LJ0D	Ship Task Lights	Install dual task lights	6,000
T400	Radar Room	Design study for cooling system	2,000
1B00	Refrigerator	Provide new refrigerator in galley	1,500
1800	Drainage System	Install drainage in magazines	4,000
TB00	Pump Fresh Water Distribution	Overhaul pumps	1,500
<b>C. PMS ITEMS (SHIP'S FORCE ACCOMPLISHMENT)</b>			
1806	Salvage Equipment		
1807	Diving Equipment		
310U	Ship Service Diesel Generator		
4000	Electrical Safety Devices		
4400	Power Distribution Cabling		

TABLE III. C-1. (Sheet 3 of 3)

EIC	Description	Remarks	Est. Cost (\$)
C. PMS ITEMS (SHIP'S FORCE ACCOMPLISHMENT) (Cont)			
C000	Main Propulsion Diesel, Reduction Gears, Generators, Motors		
T100	Auxiliary Boiler		
T500	Refrigeration System		
TF00	Compressed Air System		
TK00	Evaporators		
TM00	Deck Machinery, Two Machine		

## D. RECOMMENDATIONS

### 1. For the Ship

It is recommended that ship's force personnel of BOLSTER take the following actions:

- a. Maintain an active program of replacing steam, drain, and bilge piping and power distribution cabling.
- b. Ensure that the CSMP is up to date and accurately reflects the condition of the ship following overhaul. Completed action reports should be submitted for previously deferred work items accomplished during the overhaul. Work items not accomplished should be reviewed and revised as necessary to reflect their status at the end of the overhaul.
- c. Follow up and ensure receipt of updated record plans and documents that reflect the condition of the ship at the end of overhaul.
- d. Take action as necessary to accomplish deferred work/long-range maintenance items, as discussed in Section III.C.

### 2. For the Class

It is recommended that for ARS-class ships, the type commander, with assistance from PERA and the ships, accomplish the following:

- a. Plan for and accomplish a series of habitability studies if they have not been conducted, and incorporate the results into future alteration and overhaul planning. The objective of this action is to update priority of accomplishment and obtain the necessary data to authorize early development of plans and ordering of material.
- b. Review existing alterations to determine new equipment/material requirements and take action as needed to obtain these items, e.g., replacement of auxiliary ship-service generator sets and air compressors.

- c. Take followup actions as required to resolve electrical power requirements and availability for these ships, and provide for accomplishment of any modifications during the next overhaul.
- d. Analyze, as required, Board of Inspection and Survey reports and requests that shipalts or alterations equivalent to repair (AERs) be prepared. Several Part I INSURV discrepancies have been noted on all ships of the ARS class.

3. Standardized ROH Work Requests (Form 4790.2K)

It is recommended that the standardized work requests and overhaul specifications for ARS-class ships be coordinated with the various SUPSHIP organizations and utilized as extensively as possible.

4. For PERA(CSS)

It is recommended that PERA take the following actions with respect to advance overhaul planning:

- a. Revise the planning milestone tasks to incorporate the latest procedures and techniques.
- b. Analyze the reports and documents required to support overhaul planning, and issue appropriate specifications for their preparation and distribution.
- c. Actively pursue relationships with various SUPSHIP organizations to develop better understanding of the PERA functions and the need for interchange of advance planning data.
- d. Review the need for more active participation of PERA during the overhaul management phase.
- e. Increase the emphasis on advance material definition and procurement for overhauls.
- f. Select and task an organization to develop and maintain AER drawings. One of the difficulties encountered in the planning process was obtaining drawings for the type commander's AERs. No activity is



tasked to maintain class drawings for these alterations. This situation leads to delays and unnecessary expenditure of design funds.

- g. Increase distribution of the Fleet Integrated Logistics Support (FILS) report, for example to the Naval Material Management Field Office and Supply Operations Assistance Program teams.

E. EVALUATION/USEFULNESS

1. PERA Products to Ship/Industrial Activity

- a. Ship Systems Definition and Index (SSDI). The SSDI was found useful in helping ship's force assemble a comprehensive work package.
- b. Integrated Work Package (IWP) Summary Report. The IWP was utilized by the ship and the overhaul manager as a record of screening action and as a tool in updating the CSMP.
- c. POT&I Plan. The POT&I problem has been largely resolved by utilizing the services of local contractors to accomplish the tests. This practice should be continued.
- d. Tradeoff Analysis. An effective tradeoff analysis could not be performed on BOLSTER since job estimates were not available in a timely manner.
- e. FILS Report. FILS reports were developed for transmittal. It is felt that more effective use of this document could be made.

2. Resource Effectiveness

- a. Ship's Force. Ship's force, being the most valuable element in overhaul planning, cooperated fully in generating the work package.
- b. SUPSHIP/Pearl Harbor. Personnel of SUPSHIP were generally cooperative in providing estimates and discussing unwritten specifications. Estimates were not always provided as they became available. Better rapport is required between SUPSHIP and planning agents to optimize overhaul resources.
- c. ARINC Research Corporation. ARINC Research personnel screened the work package in groups as it was received and forwarded it to SUPSHIP. Several major tasks were conducted in behalf of the overhaul manager for his concurrence, including a screened work package, a POT&I plan, and a tradeoff analysis. This contribution, together with continuous liaison, permitted the overhaul manager to concentrate his efforts on the management of the overhaul.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Postoverhaul analysis reports of two fleet ocean tugs of the Service Force, Pacific, are presented. The reports relate to the 1975 regular overhauls of the USS GRAPPLE (ARS-7) and USS BOLSTER (ARS-38).		

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