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ANALYSIS OF FY 1974 REGULAR OVERHAUL OF USS DELIVER (ARS-23).(U)
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ANALYSIS OF FY 1974 REGULAR OVERHAUL OF USS DELIVER (ARS-23)

November 1974

Prepared for

COMMANDER SERVICE FORCE, PACIFIC
Honolulu, Hawaii

Under Contract N00604-73-C-0482

Publication 1614-01-1-1337

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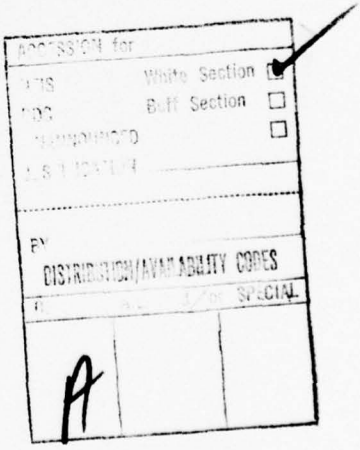
ABSTRACT

Engineering services provided by ARINC Research Corporation for the fiscal year 1974 overhaul of USS DELIVER (ARS-23) are discussed. The services included assistance in advanced planning, and preparation of the post-overhaul analysis report.

This document has been prepared to a Navy format for ship overhaul reports.



USS DELIVER (ARS-23)

POST OVERHAUL ANALYSIS REPORT

TABLE OF CONTENTS

I. GENERAL INFORMATION AND PREFACE

A. GENERAL INFORMATION

Ref: (a) Contract N00604-73-C-0482

ARINC Research Corporation provided the Commander Service Force, Pacific, with specialized engineering services relating to the 1974 regular overhaul of USS DELIVER (ARS-23). These services involved performing advance planning for the overhaul, evaluating the effectiveness of the planning program in light of the final results of the overhaul, and recommending means for increasing the effectiveness of future overhaul planning for similar Navy ships. This report addresses the activities associated with advance planning; it does not attempt to evaluate the results of the overhaul itself.

B. PREFACE

The advance planning milestones of Appendix A of reference (a) were followed in preparation for the overhaul, with ARINC Research acting as the type commander's maintenance management agent. Planning commenced eleven months prior to the overhaul start date. The goal of the planning effort was to identify in advance any existing and potential 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, to present a Long-Range Maintenance Plan for USS DELIVER, and to make certain maintenance recommendations for this ship and its class.

DELIVER was overhauled under the direction of SUPSHIP 14 at Dillingham Shipyard, Honolulu, from 19 April to 15 October 1974.

II. MANAGEMENT SUMMARY

Following is a summarization of the FY 1974 regular overhaul of USS DELIVER, including comments on deviations from the planning milestones and on nonprogrammed factors that influenced the completion time or overall quality of the overhaul.

A. AUTHORIZED VS. ACCOMPLISHED WORK

The repair portion of the DELIVER work package was essentially completed as authorized.

B. PLANNED VS. ACTUAL COMPLETION TIME

The overhaul was planned for 123 days: 18 days for the drydock phase and 105 days for the topside phase. Actual overhaul time was 179 days: 16 days for the drydock phase and 163 days for the topside phase.

C. PLANNED VS. ACTUAL COMPLETION COSTS

A comprison of planned vs. actual costs for the DELIVER overhaul cannot be made herein since the SUPSHIP departure report had not been released as of the issuance of this document. A supplement to this report will be prepared and forwarded after receipt of the departure report.

D. MAJOR CONFIGURATION CHANGES

DELIVER completed the overhaul with the following major configuration changes:

1. Newly installed AFFF/PKP fire protection system in engineering spaces B-1 and B-2.
2. New pollution abatement features.
3. Extensive upgrading of mess facilities, including installation of fire protection hoods in the galley; a new sink in the scullery; reconditioned dishwasher; and new ovens, steam kettles, and food mixer.
4. Enhanced communications, including upgraded MF/HF and LF/MF equipment, and an improved antenna arrangement.

5. Improved ventilation in sanitary spaces.

6. Substitution of two 20mm cannons for an obsolete 40mm cannon; and the addition of 50-cal machine guns.

E. FOLLOW-ON WORK REQUIRED

In addition to completing the items noted in the Long-Range Maintenance Plan, the development of a shipalt for upgrading the divers' air system would greatly enhance the ability of the ship to fulfill its mission.

III. DETAILS OF OVERHAUL

A. PLANNING PROCESS

1. Ideal Vs. Actual Milestones

The COMSERVPAC milestones for regular overhauls specify 50 tasks, of which 26 were the responsibility of ARINC Research for the DELIVER overhaul. The ideal target dates for these tasks range from the start of overhaul minus 13 months (A-13) to the completion of overhaul plus two months (C+2). ARINC Research began advance planning for DELIVER in May 1973, eleven months prior to the scheduled start date of the overhaul (April 1974). This made it necessary to compress the time-frame of the planning milestones, and to combine some of the tasks. Scheduled and actual start/completion dates for the DELIVER overhaul are shown in Table III.A-1.

a. Advance Overhaul Planning. Overhaul planning was initiated by ARINC Research with a survey of the available maintenance history of DELIVER as contained in the Current Ships Maintenance Project (CSMP) and the Maintenance and Material Management (3M) program material history report. Programmed ship alterations (shipalts) and type commander alterations were reviewed, along with other pertinent maintenance history documents such as last overhaul records, departure reports, Board of Inspection and Survey (INSURV) reports, and casualty reports (CASREPs).

Based on the data review, ARINC Research developed a shipcheck package and visited DELIVER at Pearl Harbor to assist ship's force in conducting the shipcheck and writing work requests.

The first completed package of work requests was received by ARINC Research from DELIVER on 6 December 1973. These requests were screened; and beginning on 16 January 1974, those scheduled for accomplishment by the shipyard were delivered to SUPSHIP 14.

Accomplishment of the customary Preoverhaul Test and Inspection (POT/I) program was not approved by Pearl Harbor Naval Shipyard.

TABLE III.A.1. IDEAL VS. ACTUAL MILESTONES FOR ROH OF USS DELIVER

Milestone	COMSERVPAC Target Date	Contract Target Date	Actual Start	Completion	Remarks
Contract Start Date			5/1/73	9/30/74	
Obtain Historical Data, Review Alt Package	Immed.	5/1/73	5/1/73	5/4/73	
Receive Ship Work-Request Package	Immed.	7/6/73	12/6/73	12/6/73	
Screen Work Requests: Determine Known Work; Identify LLT Items	Immed.	10/3/73	12/11/73	12/12/73	
Brief Ship, Shipcheck Selected Work Items	Immed.	10/10/73	12/12/73	12/14/73	
Determine Preoverhaul Test and Inspection Requirements	12/14/73	12/14/73	12/15/73	12/28/73	
Submit Screened Work Requests to SERVGRU and SUPSHIP	1/74	12/21/73	12/29/73	1/4/74	
Receive New Work Requests; Screen, Submit to SERVGRU and SUPSHIP	11/73	1/2/74	3/3/74	4/4/74	
Conduct Preoverhaul Tests and Inspections	2/2/74	1/28/74	3/2/74	3/22/74	
Complete Tradeoff Analysis and Work Definition Conf.	2/19/74	3/5/74	3/24/74	5/1/74	Start date reflects topside tradeoff date.
Overhaul	4/25/74	4/22/74	4/19/74	10/10/74	
Complete Final Report	12/31/74	9/30/74	10/10/74	12/10/74	

Personnel of COMSERVGRU FIVE, COMSERVPAC, DELIVER, and ARINC Research subsequently held a conference on 12 February to purge minor preoverhaul test items and to identify the major tests to be accomplished by ship's force before the commencement of overhaul, or to be changed into insurance work items.

Job specifications were reviewed from 1 February to 25 April 1974. Upon receipt and examination in the latter part of April of the work specifications for the drydock phase, ARINC Research recommended that the drydock phase be placed at the beginning of the overhaul to allow more time to compile a complete repair package for the topside phase, and to permit sufficient time to complete cost estimates for the topside phase tradeoff conference.

b. Tradeoff Conference. No tradeoff conference was held until 24 April 1974 (the first had been scheduled for 19 February), at which time SUPSHIP 14 and COMSERVGRU FIVE firmed up a contractor work package for availability on 26 April 1974 for the contractor's prebid conference. As the result of the tradeoff conference, the following work was authorized:

	Estimate
Topside Phase	$ 930,574
Drydock Phase	183,626
Design/Farm Out	203,000
Contingency	278,553
Total	$1,595,753

Bids were opened on 30 April, the contract was let on 1 May, and topside work commenced on 6 May 1974. No tradeoff conference was required for the drydock phase.

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's responsibility following completion of the overhaul was to analyze the overhaul records and prepare the postoverhaul analysis report.

2. Impact of Planning Milestone Slippages

a. Overhaul Extension. The scheduled overhaul interval was extended by 56 days as a result of the late receipt of design drawings, the addition of new work items, numerous changes in specifications, the lack of a POT/I program, delays in receiving specifications from the shipyard Planning Department, and correction of sea trial deficiencies. The drydock phase was moved up to April from August to provide additional time for preparation of topside specifications.

b. Late Availability of Specifications. Job specifications were not available to the overhaul manager, the ship, or ARINC Research until after the tradeoff conference. This made review of and any desired changes to the specifications difficult, and in some cases impossible. For several of those that could be reviewed, the intent of the work request had not been carried out.

c. Late Availability of Estimates. Many work estimates were released very close to the date of the tradeoff conference, and others after that date. This made a realistic tradeoff analysis impossible, and was a contributing factor in the extension of the overhaul.

3. Recommendations, Advanced Planning

Based on a review of the overall planning process for DELIVER, ARINC Research offers the following recommendations for increasing the effectiveness of future overhauls for similar Navy ships:

a. That COMSERVPAC continue to emphasize early submittal of ship work packages to SUPSHIP so as to facilitate development of

accurate cost estimates and work specifications in support of the work definition conference.

b. That COMSERVPAC continue to work for early definition and firming-up of the ship alteration package, and for early authorization to develop required drawings.

c. That COMSERVPAC increase the level of management attention it devotes to the actual overhaul period.

d. That estimates for growth, farm-out, and new work be forwarded to the overhaul manager as they occur. This would allow a realistic estimate to be maintained of the total cost of the overhaul, and of where the added costs were incurred.

B. WORK PACKAGE

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

1. Summary Sheet – USS DELIVER (ARS-23)

Scheduled Start Date: 22 Apr 74 Scheduled Completion Date: 23 Aug 74

Actual Start Date: 19 Apr 74 Actual Completion Date: 15 Oct 74

Overhaul Extended: 56 days

SIGNIFICANT CAPABILITY CHANGES:

a. Pollution abatement features.

b. Habitability improvements in laundry, galley, mess decks, and sanitary spaces.

c. Machinery space AFFF/PKP installation.

d. Upgraded communications/radar/antenna systems

e. Improved armament.

2. Cost Summary Sheet – USS DELIVER (ARS-23)

a. Summary of Overhaul Costs

	K-Alt	Repair
1) Budget	$572,544	Not Available
2) Estimated Cost	166,527	$1,075,868
3) Bid Price	171,785	1,197,351
4) Total Cost	Not Available	Not Available
5) Growth Cost	Not Available	Not Available
6) Percent Growth	Not Available	Not Available

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

c. Cost Avoidance Summary. For the DELIVER overhaul, 447 work requests were received from the ship and screened by ARINC Research. Of this total, approximately 10 percent were screened as deferred, duplicated, disapproved, etc., as a result of ship-checks, 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 overhaul 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 considerably 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 USS DELIVER is shown in Table III. B-2.

TABLE III.B-1. ESTIMATED COSTS BY EIC CATEGORY
FOR ROH OF USS DELIVER (ARS-23) (Sheet 1 of 4)

EIC		Est. Cost ($)		Pct. Total		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
A000		144,348		8.5		Not Available	
	AD00		11,890		0.7		
	AE00		33,502		1.98		
	A000		13,812		0.82		
	A500		27,851		1.65		
	A600		34,878		2.06		
	A800		1,242		0.07		
	A900		21,173		1.25		
C000		380,923		22.6			
	CB00		31,861		1.89		
	CC00		32,946		1.95		
	C100		221,142		13.09		
	C300		18,539		1.10		
	C400		14,346		0.85		
	C700		50,997		3.02		
	C800		4,415		0.26		
	C900		6,677		0.40		
K000		18,600		1.1			
	KA00		18,600		1.1		
L000		13,095		0.8			
	LH00		8,947		0.53		
	LJ00		4,148		0.25		
M000		10,900		0.6			
	M300		5,029		0.30		
	M400		488		0.03		
	M500		4,365		0.26		
	M600		1,018		0.06		

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

EIC		Est. Cost ($)		Pct. Total		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
P000		15,045		0.9			
	P100		6,027		0.36		
	P600		6,887		0.41		
	P700		2,131		0.13		
Q000		45,885		2.7			
	QB00		1,450		0.09		
	QD00		17,677		1.05		
	QE00		4,283		0.25		
	QF00		4,378		0.26		
	Q100		16,987		1.01		
	Q300		1,110		0.07		
R000		1,214		0.1			
	R500		1,214		0.1		
T000		470,969		27.9			
	TA00		2,567		0.15		
	TB00		52,119		3.09		
	TC00		706		0.04		
	TF00		39,352		2.33		
	TH00		4,243		0.25		
	TK00		24,396		1.44		
	TL00		8,131		0.48		
	TM00		134,192		7.94		
	T100		5,455		0.32		
	T300		66,968		3.96		
	T500		6,978		0.41		
	T600		284		0.02		
	T700		44,723		2.65		
	T800		62,686		3.71		
	T900		18,169		1.08		

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

EIC		Est. Cost ($)		Pct. Total		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
U000		226,942		13.4			
	UF00		82,525		4.89		
	UG00		9,613		0.57		
	UH00		51,050		3.02		
	UJ00		17,106		1.01		
	U500		2,073		0.12		
	U600		14,988		0.89		
	U700		42,831		2.54		
	U800		6,756		0.40		
Y000		28,995		1.7			
	YC00		8,454		0.50		
	Y600		20,541		1.22		
1000		226,492		13.4			
	1A00		2,995		0.18		
	1B00		26,706		1.58		
	1C00		106,584		6.31		
	1100		1,136		0.07		
	1400		3,950		0.23		
	1600		2,019		0.12		
	1800		70,108		4.15		
	1900		12,994		0.77		
3000		30,580		1.8			
	3100		27,897		1.65		
	3300		2,683		0.16		
4000		39,842		2.4			
	4100		121		0.1		
	4300		5,156		0.31		
	4400		8,417		0.50		
	4700		26,148		1.55		

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

EIC		Est. Cost ($)		Pct. Total		Pct. Growth	
System	Subsys.	System	Subsys.	System	Subsys.	System	Subsys.
8000		35,434		2.1			
	8B00		32,275		1.91		
	8100		3,159		0.19		
TOTAL*		1,689,264	1,689,264	100.0	100.0		

*Total differs from estimated cost given in 2. a(2) since the latter includes estimates for new work and some growth items.

TABLE III.B-2. ALTERATION SUMMARY SHEET – USS DELIVER (ARS-23) (Sheet 1 of 2)

Alteration		FMP Est. *($)	NAVSHIP Est.† ($)	SUPSHIP Est. ($)	Actual Cost ($)	Remarks
ARS-208K	Salvage Pump Wiring and Stowage	25,179	25,200	5,857		
ARS-213K	LF/MF Radio	29,321	9,200	4,283		
ARS-217K	Antenna Arrangement	NA	46,000	16,812		
ARS-309K	HF Transmitter	57,770	20,750	7,559		
ARS-240K	AN/SPS-53L Radar	22,127	22,176	6,027		
ARS-250K	VHF/UHH Secure Voice	15,805	16,128	4,378		
ARS-251K	Gen/WT Moment Compensation	10,573	11,088	4,924		
ARS-254K	AFFF System	96,574	97,776	16,789		
ARS-265K	Partial Sewage Treatment (CHT)	149,984	105,840	38,059		
ARS-266K	Bilge Discharge Riser	10,573	11,088	2,567		
ARS-268K	Fuel Tank Level Indicator	78,698	79,632	12,385		
ARS-271K	Bilge Flooding Alarm	5,232	5,040	4,365		

*FMP estimate based on complete installation.

†This column will not total up to the same value as the K-alt budget since numerous changes were made to the alteration listing in the 180-Day Letter.

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

Alteration		FMP Est. *($)	NAVSHIP Est.† ($)	SUPSHIP Est. ($)	Actual Cost ($)	Remarks
ARS-276K	Improve Sanitary Spaces	106,057	84,672	40,391		
ARS-278K	Bridge Radar Repeater	5,014	5,040	2,131		
ARS-264D	Procure/Install F/O Purifier			18,920		
ARS-247D	Install 20mm and 50 cal Weapons			21,907		
ARS-248D	Wind Indicator			8,947		
ARS-260D	2 ea 30 KW M/G Sets			18,628		
ARS-288D	Sanitary Space Fixtures			26,363		
ARS-304D	Sprinkler Alarm System			4,304		
ARS-71 (AER)	Shore Pwr. Conn. 120 vdc			5,695		
ARS-111 (AER)	Fall Protection System			4,530		
ARS-117 (AER)	Padlocks for Magazines			NA		

*FMP estimate based on complete installation.

†This column will not total up to the same value as the K-alt budget since numerous changes were made to the alteration listing in the 180-Day Letter.

4. TYCOM Repair Package, USS DELIVER (ARS-23)

		No.	Pct.
1.	Total Automated Work Requests	0	
2.	Total Work Requests Screened	447	
	a. Number of Work Requests Deferred	11	3
	b. Number of Work Requests Disapproved	37	8
	c. Number of Work Requests Duplicated, etc.	0	0
	d. Number of Work Requests Approved	399	89
	TOTAL	447	100
3.	Total Work Requests Approved	399	
	a. Number Work Requests Screened: Priority One (1)	108	27
	b. Number Work Requests Screened: Priority Two (2)	158	40
	c. Number Work Requests Screened: Priority Three (3)	79	20
	d. Number Work Requests Screened: Priority Four (4)	46	11
	e. Number Work Requests Screened: Priority Five (5)	8	2
	f. Number Work Requests Screened: Priority Six (6)	0	0
	TOTAL	399	100
4.	Number of Approved Work Requests by Type Work	399	
	a. Repair (including Remove, Replace, Manufacture, Drydock, POT&I, and Calibrate)	339	85
	b. Ship Alteration	19	5
	c. TYCOM AER	13	3
	d. Habitability	18	5
	e. Routines	10	2
	TOTAL	399	100
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 DELIVER (ARS-23)

1. Screening Action	PERA	TYCOM
a. Number of Work Requests Screened One (1)	302	See Comments
b. Number of Work Requests Screened Two (2)	49	
c. Number of Work Requests Screened Three (3)	5	
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)	13	
h. Number of Work Requests Screened Eight (8)	11	
i. Number of Work Requests Screened Nine (9)	37	
j. Number of Work Requests Screened Zero (0)	0	

(*)

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 ARINC Research and TYCOM screening actions. It can be stated that the overhaul manager concurred with the recommended screening completely.

(*) 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 DELIVER overhaul.

a. Pollution Abatement Features. The following pollution abatement alterations were accomplished during the DELIVER overhaul:

1) Sewage collecting/holding tank installation (partial)

2) Bilge discharge riser

3) Fuel tank level indicators

4) Bilge flooding alarm

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 and Radar Systems. DELIVER's communication and radar systems were improved by the installation of:

1) Radar Repeater AN/SPA-25B in pilot house

2) Surface Search Radar AN/SPS-53L

3) VHF/UHF secure voice system

4) HF Transmitter AN/URT-23-AN/WRC-1

5) LF/MF Communication AN/WRT-1

6) Improvements in antenna system

d. Upgraded Ship's Armament. DELIVER's armament was improved by the installation of 20mm cannon and additional 50-caliber machine guns.

7. Narrative of Major Repair Items

Repair items causing the most serious problems in DELIVER are summarized below.

a. The four main motors were removed and overhauled in the shop. On DELIVER's first sea trial, the motors arced at 81 percent power. It was discovered that the brushes were not properly bevelled, leaving air gaps. The contractor had to return and refurbish the motors, causing a one-week delay in overhaul. On the second sea trial, in a full power run, the motors arced once more. The contractor was again called in to repair the damage. This problem was a major cause of overhaul extension.

b. The 30 KW motor/generator sets were removed and overhauled in the shop by the contractor. When they were returned and installed, it became apparent that the contractor had not fully adhered to the work specifications. The M/G sets were not arranged so that they could be operated in parallel. A design engineer was called in and plans were drawn to correct the problem. This also caused a delay in the overhaul.

c. The main generator couplings had the wrong-size bumpers and springs installed, and caused excessive noise on No. 2 main generator. All couplings were checked and replacements made.

d. For the steering gear, a new cable and chain were ordered. The cable arrived and was installed; ship's force will install the new chain when it is received.

e. Galley, Mess Decks, and Sanitary Spaces. Even though the galley modernization alts were deferred, several improvements in the crew's galley and mess deck were accomplished. All modifications were completed except for the late delivery of the galley food mixer, which will be installed by ship's force upon receipt.

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

Cost Range	Item	Estimated Cost ($)
>$100K	Repair four main engines	172,847
>$50K-$100K	None	
>$25K-$50K	Sandblast/preserve U.W. hull and freeboard	41,649
	Sandblast/preserve fresh water tanks	40,700
	Improve sanitary spaces	40,391
	Assist ship's force	39,050
	Install sewage treatment (CHT)	38,059
	Berthing and temporary services	34,868
	Overhaul four main motors	32,946
	Overhaul four main generators	31,861
	No. 1, 2, 3, 4 main engine components	30,146
	Install Gaylord hoods in galley	28,528
	Install false overhead and bulkhead sheathing in galley	28,203
	Repair No. 1 & No. 2 fire flushing and No. 1 & No. 2 salvage pump/motor	27,620
	Improve sanitary space fixtures	26,363
	Sandblast/preserve compartments C204-E, C-205-E	25,763
$10K-$25K	Install 20mm and 50 cal guns	21,907
	Repair tow machine	19,801
	Repair anchor windlass	19,716
	Sandblast/preserve topside structures	19,066
	Procure and install fuel oil purifier	18,920
	Install No. 2 30 KW MG Set	18,628
	Repair/clean/test HP/MP & LP air systems	17,793
	Improve antenna system	16,812
	AFFF system	16,789
	Port/starboard reduction gears	16,665
	Sandblast and preserve compartment A302A, A302-1/2A	16,264
	Docking and undocking	15,900
	Renew 2" tow wire	15,564
	Install vent system in ship's laundry and anchor windlass room	14,443

Cost Range	Item	Estimated Cost ($)
$10K-$25K (Cont)	Repair No. 2 ship service diesel engine	14,158
	Repair sea valves	14,085
	Sandblast and preserve freeboard areas of hull	13,263
	Install dresser/cabinets/sink in galley	12,775
	Fuel tank level indicator	12,385
	Sandblast/preserve and repair beach gear chain locker	11,859
	NDT Inspect mast/boom fittings	11,611
	Repair/calibrate 170 gages	11,135
	Renew carpeting and moldings	11,086
	MJ system sound powered circuit	10,840
	Renew one high-pressure air compressor	10,552
	Total	$1,021,011

8. Narrative of Material Condition Prior to ROH

USS DELIVER was inspected by the Board of Inspection and Survey in December. Excerpts from the INSURV report are given below.

a. Navigation Deficiencies

1) The ship steering system is obsolete and could place the ship in jeopardy under attack. After-steering and secondary control lack proper working, signaling, and control devices.

2) Engine-order telegraphs are obsolete and are operating at less than normal working capacity. Indicators and signal devices are inoperative.

3) Rudder-angle and engine-order telegraph indicators are not available for the ship's navigation wings.

4) Ship's navigation topside lights and pilot house light indicators are inadequate or not working.

b. Operations. Radar and communication equipments need various repairs and alterations to meet optimum standards for naval ships.

c. Weapons

1) Magazines are in an unsafe condition, being without sprinklers and an alarm system.

2) The armory is susceptible to break-in and pilferage.

3) The 40mm weapon does not have the capacity to protect the ship.

d. Deck

1) Various items of the life rafts are missing or inadequate for supporting life at sea.

2) Most deck and deck fittings are rusted. In addition, hoisting equipment needs overhaul or testing. Replenishment at-sea stations are not supportable with lighting for night operations.

e. Main Propulsion

1) Main reduction gears, port and starboard, have tooth damage.

2) All four main engines need complete overhaul.

3) Auxiliary engines, pumps, and most other engineering space equipment are in need of overhaul.

f. Electrical. The ship's electrical systems have numerous deficiencies, both major and minor items need to be overhauled or replaced. The electrical system controllers, switchboards, auxiliary motors, ship's service generators, and search lights all need repair.

g. Auxiliary Plant. The boilers and evaporators are operating at less than their standard operating proficiencies. Valves require overhaul, tubes need cleaning, and gauges need repair.

h. Damage Control/Hull Structure

1) In the damage control/hull structure are hull leaks; warped water-tight hatches; rusted knife edges, pump foundations, overheads, and bulkheads; and deteriorated spaces, with scaling and heavy rusting in corners and hard-to-reach areas.

2) AFFF system not installed on ship. Various items for repair lockers are missing, and others need preservation.

i. Supply

1) Galley equipment needs to be replaced or overhauled; steam kettles, gauges, and steam lines need rework for proper usage; galley deck drains are clogged; ovens have hot spots; mess deck equipment needs repairs.

2) Washing machine controls are inoperative. The presser lacks pressure gauge and needs to be hydrostatically tested.

3) Some registers in the ventilation equipment in various supply spaces in the galley and mess decks require cleaning.

j. Medical/Dental

1) Potable water tanks need to be disinfected. Drinking fountains in some spaces are not working.

2) Alarms are not installed on biological reefers.

3) Explosion-proof refrigerators are not provided for flammable medical items.

k. Habitability

1) Fans are not adequately provided with screen mesh, and some are too close to berth occupants.

2) Non-slip deck tread is missing in various areas, including weather decks.

3) Padding is not installed in various places where required.

4) A ventilation survey is needed. Ventilation ducting must be rerouted and repaired. Several spaces are not adequately provided with fresh air, including berthing spaces. Decks in showers and heads have rusted and deteriorated areas, clogged drains, and worn and pitted Terrazzo coverings.

5) The crew's, CPO's, and officers' sanitary spaces need a complete overhaul. Decks are rusted and pitted in spots; overheads and bulkheads are rusted; ventilation is inadequate; grab

rails are missing in showers; lighting is poor in certain areas; there are no urinals in some spaces. Terrazzo decks are worn and porous and need resealing. Flushometers are missing in various heads. Wash basin stoppers are not working.

6) The crew's, CPO's, and officers' living quarters need overhauling. Furniture needs replacing in some spaces. Reading lights are not available for some berths. Air conditioning ducting needs repairs. Piping needs lagging in some places. Privacy partitions are not installed. Bunks are too close to overheads.

9. Narrative of Material Condition After ROH (Subjective Overview)

Many of the problems noted in Section III. B. 8 were corrected during the overhaul. The four main diesel engines were completely overhauled, including such modifications as water jacketed manifolds, duplex oil filters, gauge boards, new fresh water pumps, fuel injectors, and turbocharges.

The four main generators were removed from the ship and overhauled in the shop.

The ship's four main motors were overhauled by the contractor. The sea trial had to be cut short when the No. 3 and 4 main motors arced at 81% power and 1000 amps. The sea trial was delayed until all four motors were inspected and repaired.

The ship's towing machine was overhauled and the 2-inch wire was removed, inspected, cleaned, slushed, and replaced.

A sewage treatment (CHT) system was installed.

Repairs were made to the No. 1 and No. 2 fire and flushing pumps, and the No. 1 and No. 2 salvage pumps and motors.

In the crew messing compartments, new Gaylord hoods, steam kettles, decks, bulkhead sheathing, serving line, dresser, and food mixer were installed. In addition, the scullery dishwasher was overhauled.

The 40mm weapon was removed and replaced with port and starboard 20mm cannon and 50-cal machine guns.

Installed new were an AFFF firefighting system; a fuel oil purifier; air compressors in engineering space B-2; and a radar repeater (AN/SPA-25) in the pilot house.

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). Using the completion date of the DELIVER overhaul as a starting point, and utilizing the records of that overhaul, ARINC Research prepared a plan identifying long range maintenance requirements for DELIVER. This plan addresses the period between overhauls, and specified major maintenance requirements that should be targeted for accomplishment during the next overhaul.

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 System (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 DELIVER 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 ROH 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 identified 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 work deferred had no impact on the overall quality of the DELIVER 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 DELIVER (ARS-23) (Sheet 1 of 2)

EIC	Description	Remarks	Est. Cost ($)
A. WORK DEFINED AND DEFERRED DURING 1973/74 ROH			
TL03	Steering Control System	Install electric rudder angle indicator in after steering	500
TM04	Anchor Windlass	Install strip heaters	2,000
TM05	Towing Machine Motor	Install strip heaters	2,000
CC01	Combination Pumps	Relocate power supply for pumps	4,000
T303	Ventilation System	Install mods in laundry and anchor windlass room	10,000
B. REPAIRS RECOMMENDED FOR NEXT ROH REQUIRING LLTM			
CC01	Main Motors	Install lube oil pressure alarms	2,000
4108	Switchboard 120V	Replace obsolete breakers	3,000
T300	B1 Engine	Ventilation survey	2,000
T300	Vent System	Vent exhaust system in CPO mess	4,000
IC00	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

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

EIC	Description	Remarks	Est. Cost ($)
	C. OTHER LONG-RANGE MAINTENANCE REQUIREMENTS		
TB00	Pump Fresh Water Distribution	Overhaul pumps	1,500
M500	Small Arms Ammo Stowage	Install security alarms in case of break-in	2,500
	D. PMS ITEMS (SHIP'S FORCE ACCOMPLISHMENT)		
1806	Salvage Equipment		
1807	Diving Equipment		
310U	Ship Service Diesel Generators		
4000	Electrical Safety Devices		
4400	Power Distribution Cabling		
C000	Main Propulsion Diesel Engine, Reduction Gears, Generators, Motors		
T100	Auxiliary Boiler		
T500	Refrigeration System		
TF00	Compressed Air Systems		
TK00	Evaporators		
TM00	Deck Machinery Tow Machine		

D. RECOMMENDATIONS

1. For the Ship

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

a. 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.

b. Follow-up on and ensure receipt of updated record plans and documents that reflect the condition of the ship at the end of overhaul.

c. 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-23 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 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.

c. Upgrade the divers' air system to improve capability.

d. Analyze as required INSURV reports and requests that shipalts or 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 a program to develop standardized work requests and overhaul specifications for ARS class ships be actively pursued. ARINC Research is currently developing a standard-work package under contract with COMSERVPAC. Experience gained on DELIVER was utilized on other ARS overhauls in fiscal year 1974.

4. For COMSERVPAC

It is recommended that COMSERVPAC take the following actions with respect to ship overhauls:

a. Consider more active participation of PERA(CSS) contractor during the overhaul planning and overhaul phases.

b. Increase emphasis on advance material definition and procurement for materials.

E. EVALUATION/USEFULNESS

1. ARINC Research Products to Ship/Industrial Activity

a. Ship Systems Definition and Index (SSDI). The SSDI was found very 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 DELIVER was not conducted fully in accordance with the plan prepared by ARINC Research. As a consequence, certain untested items were subjected to complete overhauls, where proper preoverhaul testing might have indicated the need for lesser repair. In the interests of overhaul economy it is recommended that such POT/I plans be used in the future when available. Additionally, for future overhauls the results to be expected from specific tests and inspections should be better defined.

One portion of the POT/I — electronics testing — did adhere rather closely to the subject plan and the results proved to be very beneficial, identifying not only industrial activity but ship's force work as well.

d. Tradeoff Analysis. Results of a tradeoff analysis were provided to the overhaul manager prior to the overhaul tradeoff conference to the extent possible, giving him the data necessary to authorize the most effective overhaul work package.

2. Resource Effectiveness

a. Ship's Force. Ship's force personnel were hindered in preparing their work package by the late scheduling of the INSURV inspection. However they did generate an adequate package.

b. SUPSHIP 14. SUPSHIP 14 was cooperative in providing estimates and making personnel available to discuss the unwritten specifications. Estimates were provided as they become available. A better rapport is required between SUPSHIP 14 and planning agents to optimize overhaul resources.

c. ARINC Research. ARINC Research personnel screened the work package and presented it to SUPSHIP 14 via COMSERVGRU FIVE maintenance office. 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.

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Engineering services provided by ARINC Research Corporation for the fiscal year 1974 overhaul of USS DELIVER (ARS-23) are discussed. The services included assistance in advanced planning, and preparation of the post-overhaul analysis report.

This document has been prepared to a Navy format for ship overhaul reports.

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