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U. S. GENERAL ACCOUNTING OFFICE

STAFF STUDY

[ GENERAL PURPOSE AMPHIBIOUS ASSAULT SHIP (LHA) -  
AND THE DD-963 ANTISUBMARINE WARFARE  
DESTROYER SHIPBUILDING PROGRAM ]

DEPARTMENT OF THE NAVY

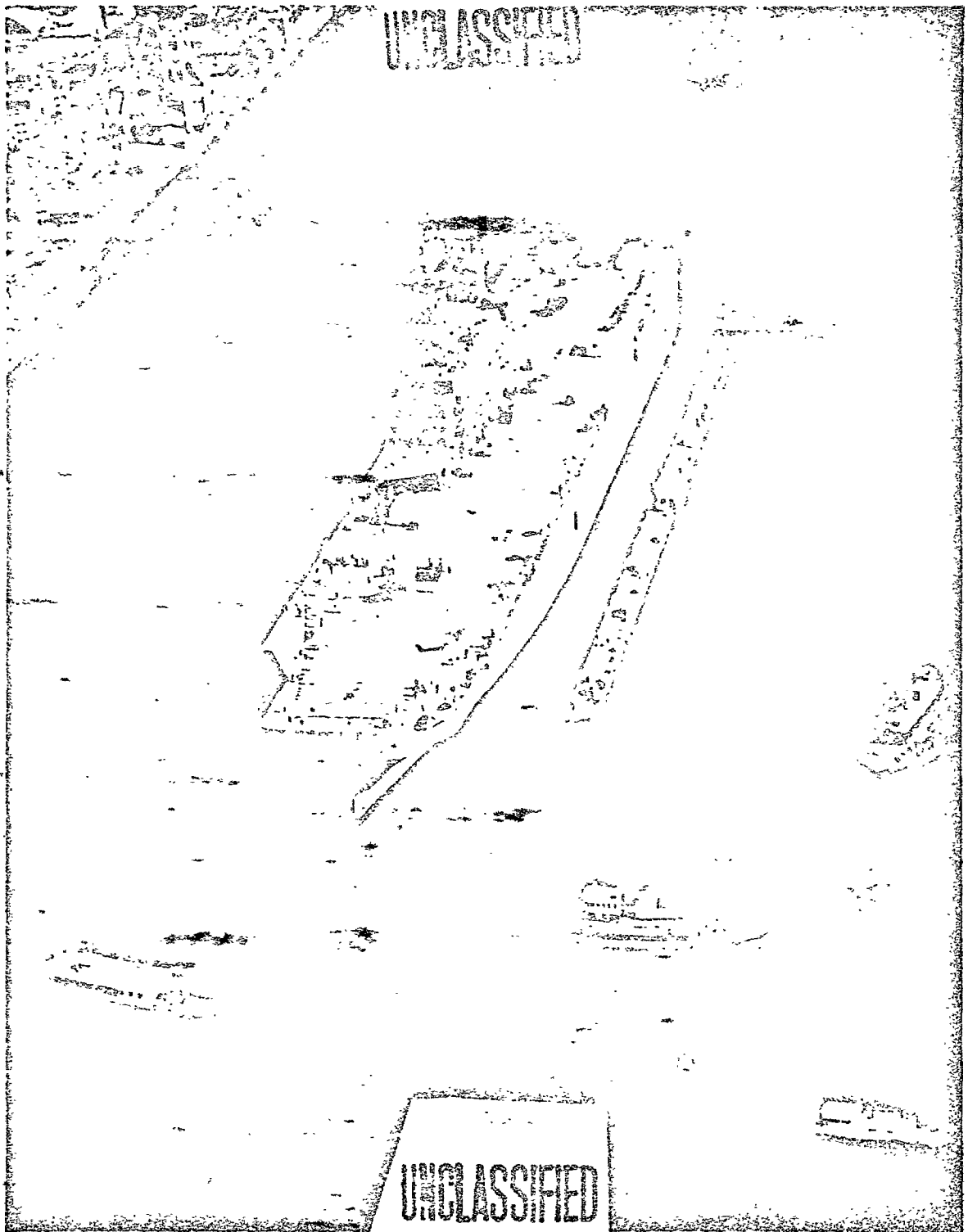
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ABBREVIATIONS

SCN Shipbuilding and Conversion, Navy Appropriation  
OPN Other Procurement, Navy Appropriation  
O&MN Operations and Maintenance, Navy Appropriation  
LAMPS Light Airborne Multipurpose System  
SAR Selected Acquisition Report  
GAO General Accounting Office  
DOD Department of Defense  
EW Electronic Warfare  
CNO Chief of Naval Operations  
TAR Technical Analysis Review  
DCP Development Concept Paper (recently redesignated as Decision  
Coordinating Paper)  
ISD Ingalls Shipbuilding Division  
AMBCO American Metal Bearing Company  
ASBCA Armed Services Board of Contract Appeals  
DECM Deceptive Electromagnetic Countermeasures  
VDS Variable Depth Sonar  
ETAS Escort Towed Array Sonar

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SUMMARY

SYSTEM DESCRIPTION AND STATUS

The LHA is a combatant general purpose amphibious assaultship designed to transport and land troops and their essential combat equipment and supplies in amphibious assault by means of helicopters, amphibious craft and vehicles. LHA-1 and LHA-2 were launched on December 1, 1973, and July 20, 1974, respectively.

The DD-963 class is a gas turbine-propelled destroyer designed with anti-submarine warfare and shore bombardment capabilities, with sufficient speed for escorting strike forces. The first five ships of the class have been launched.

COMING EVENTS

Significant events and milestones to take place within the next 15 months are: \*

--Deliver LHA-1	June 14, 1975
--Hearings before the Armed Services Board of Contract Appeals on the LHA appeal	To be determined
--Deliver DD-963	December 27, 1974**
DD-964	April 30, 1975
DD-965	June 30, 1975
DD-966	July 31, 1975
DD-967	October 31, 1975
DD-968	January 2, 1976
DD-969	March 5, 1976
--Complete negotiation of reset proposal for the DD-963 contract	Spring, 1975

\* Dates do not take into account the impact of the November-December, 1974, strike at Ingalls Shipbuilding Division of Litton.

\*\* Tentative revised delivery date as of February, 1975, is March 21, 1975. The strike is reflected in this date.

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## COST

The current estimated program cost for the LHA program as reported in the September 30, 1974, Selected Acquisition Report (SAR), totaled \$1,179.9 million for 5 ships (\$236 million per ship). This represents a cost decrease over the development estimate of \$1,380.3 million for 9 ships but a cost increase of \$82.6 million per ship over the development estimate of \$153.4 million per ship. Since September 1973, a program cost increase of \$38.9 million (\$7.8 million per ship) has occurred. (See p.14)

The current estimated program cost for the DD-963 program, as reported in the September 30, 1974, SAR, totaled \$3,599.8 million for 30 ships (\$120 million per ship). This represents a cost increase of \$1,081.6 million (\$33.95 million per ship) over the June 23, 1970, development estimate of \$2,581.2 million for 30 ships. Since September 1973 a program cost increase of \$794.7 (\$26.5 million per ship) million has occurred (See p. 20).

### Costs not included in the current Program estimates

The SAR cost estimate does not include any provision to cover the over \$373 million that Litton requested in its appeal of the Navy contracting officer's unilateral decision on the LHA program to the Armed Services Board of Contract Appeals. (See p. 19)

In March 1974, we reported that the Navy had reserved space and weight for the installation of subsystems after delivery of the DD-963s and that the estimated costs to procure and install these subsystems were not included in the total program estimate reported in the SAR.



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Included among these subsystems for which spare and weight is reserved are subsystems which provide capabilities originally required for the DD-903s and a subsystem which is now definitely planned for installation on the DD-903s. From information provided to GAO by various Navy subsystem project offices, we estimate that there will be at least \$116.4 million of additional costs above the program estimate reported in the SAR if these subsystems are installed. In addition, per ship costs for potential modernization and potential anti-air warfare conversion subsystems could amount to \$18.0 million and \$50.0 million, respectively. (See Chapter 4).

#### Economic Escalation

In the September 30, 1974, SAR, the Navy estimated escalation for the LHA program at \$199.4 million. This is an increase of \$48.6 million from the September 30, 1973, estimate. (See p. 15).

Estimated escalation for the DD-963 program was reported as \$760.4 million in the September 30, 1974, SAR. This is an increase of \$363.0 million over the September 30, 1973, SAR estimate. (See p. 22).

#### Funding Status

The Congress has appropriated \$1,128.7 million for the LHA program as of September 30, 1974, and the Navy has reprogrammed \$58.9 million making a total of \$1,187.6 million available for the program. Funds obligated through September 30, 1974, were \$1,127.0 million, and funds expended were \$764 million. As of September 30, 1974, the Navy estimated that an additional \$42.3 million will be required to complete the LHA program. \$100.9 million is being requested in the FY76 budget to cover part of the over \$373 million requested by Litton in its appeal to the Armed Services Board of Contract Appeals. (See p. 16).

As of September 30, 1974, the Congress had appropriated \$2,320.9 million for the DD-963 program and the Navy has reprogrammed a net increase of \$10.7 million making a total of \$2,331.6 million available for the program. Funds

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obligated through September 30, 1974, were \$2,140.7 million and funds expended were \$1,229.4 million. Navy estimated that an additional \$1,278.9 million would be required to complete the program. (See p. 22)

SCHEDULE

In March 1974, we reported that Litton probably would not meet construction schedules that had been established for the LHA and DD-963 class programs. At that time substantial schedule slippage had been acknowledged on the LHA program, but no slippage had been reported on the DD program.

Since then, Litton has acknowledged its inability to perform in accordance with established construction schedules for all its Navy programs simultaneously. Litton has assigned first priority to the work effort of submarine overhauls, second priority to the DD-963 class of destroyers, third priority to LHA's 1 and 2, and fourth priority to LHA's 3, 4, and 5.

The Naval Sea Systems Command, the Navy shipbuilding executive, feels that the latest Litton estimates are unrealistic for both the LHA and DD-963 programs. Their estimates of total slippage on the LHA ranges from 26 1/2 months for LHA-1 to 44 months for LHA-5 and total slippage on the DD-963 Class ships ranging from 6 months on the first ship to 20 1/2 months on the last ship. (See pp. 16 and 23).

Litton has not provided Navy with guaranteed delivery dates for the required number of DD-963s. In addition, the guaranteed delivery dates for LHA-1 and 2 have been withdrawn by Litton. (See pp. 18 and 25).

An inadequate shipyard labor force continues to be one of Litton's most serious problems in meeting LHA and DD-963 schedules. (See Chapter 7).

A strike closed ISD shipyard from November 18, 1974, to December 18, 1974. The impact of this strike on the LHA and DD-963 cost and schedules is unknown at this time. (See p. 45)

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PERFORMANCE

There has been no reported degradation from the planned operational characteristics of the two classes of ships or for the subsystems installed at the time of delivery. The DD-963 class ships, however, will be released to the Fleet for unrestricted service without several subsystems providing capabilities originally required in the DOD Development Concept Paper dated July 25, 1970. These include an active electronic warfare system integrated with the command and decision subsystem, and AN/SQS-35V Variable Depth Sonar, and a LAMPS III helicopter. In GAO's opinion, the absence of any of these subsystems will degrade the ships' mission capability. (See Chapter 4.)

RELATIONSHIP TO OTHER SYSTEMS

The LHA is a large multipurpose ship that can carry and operate helicopters as well as landing craft. It combines the features of the Amphibious Assault Ship (LPH), the Amphibious Transport Dock Ship (LPD), and the Amphibious Cargo Ship (LKA).

The DD-963 destroyer is intended primarily for operation with naval task groups and is required for ASW, naval gunfire support, offensive task group operations against other naval forces, and to contribute to the defense of task groups.

SELECTED ACQUISITION REPORTING

Cost estimates reported in the SARs for the two programs do not include costs for acquisition and installations of subsystems now planned to be installed after the construction period. The SARs do not include, nor do DOD Instructions require, summary statements regarding the ships' overall capability to accomplish their mission upon delivery.

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CONCLUSIONS/RECOMMENDATIONS

We believe that the estimated cost for acquisition and installation of all subsystems planned to be installed should be included in the SAR. We recommend that DOD identify these costs in the SAR.

We also recommend that DOD include summary statements in the SAR regarding the ships' overall capability to accomplish their mission upon delivery.

MATTERS FOR CONSIDERATION

Since it appears likely that certain subsystems that provide capabilities originally required for the DD-963s will be installed on the ships after delivery, the Congress may want the Navy to:

- Identify the amounts and types of funds to be used and the schedule for installation of the subsystems, and
- Identify the effect the absence of these subsystems will have on the mission capabilities of deployed ships.

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Cost incentives are tied to guaranteed delivery dates in both ship contracts. Litton has not provided guaranteed delivery dates for all the LHA's and DD-963's that should have been provided. The Congress may want the Navy to outline the actions it intends to take in regards to Litton's nonconformance with contract requirements for establishing guaranteed delivery dates.

The problems at Litton's Ingalls Shipbuilding Division (ISD) concerning an inadequate shipyard labor force has not changed significantly over the past year and has continued to impact the cost and schedule of the LHA and DD-963 programs. The Congress may wish to obtain DOD's outlook regarding the potential of reducing ISD's problems.

#### Questions

The following questions are provided for use by the congressional committees during their fiscal year 1976 hearings.

#### LHA

1. On July 5, 1973, Litton filed an appeal of the February 28, 1973, Navy contracting officer's decision to the Armed Services Board of Contract Appeals. The amount in issue is over \$373 million. Preparation on both sides for appeal hearings are being made.
  - a. Have hearings been scheduled yet?
  - b. Is the Navy or Litton attempting to settle out of court? If so, what progress is being made?
  - c. What is Navy's estimate of total dollar settlement on the appeal?

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2. It has been alleged by the former Litton design engineer that the LHA class ships are being constructed with inferior steel (CLASS "A" steel) that tends to become brittle under stress at cold temperatures and to develop cracks in structurally critical areas. A committee established by Litton which included the former employee considered 18 specific points concerning the steel issue and recommended on February 22, 1971, that Litton take action on 11 of the eighteen points.

- a. What action has Litton taken on the committee report?
- b. Has the grade of steel being used on the LHA external hull been upgraded to CLASS "D"?
- c. What type steel is generally recommended by shipyards and ship architects for applications such as required in the LHAs?
- d. What other Navy ships have been or are being constructed with steel similar to the CLASS "A" steel used in the LHAs?  
" "
- e. Does the Navy plan any further actions on the steel issue?

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3. The LHA program, which had experienced delivery slippages of up to 32 1/2 months in the past, has slipped an additional 11 1/2 months in the past 12 months. Work on the LHA-4 and 5 has virtually ceased.
  - a. What is the impact (cost and schedule) of the Litton labor strike of November and December, 1974, on the LHA program?
  - b. What is the Navy's most current estimate of delivery for the LHA vessels?
  - c. Guaranteed delivery dates, as required by the contract, have not been set. What actions does the Navy intend to take to enforce the requirement to establish guaranteed delivery dates?
  - d. What alternatives does the Navy have to receive delivery of the five LHA ships in the most timely and effective manner? Which of these alternatives does the Navy plan to implement?
4. The Navy estimates that the final cost escalation payment is due in December, 1974. What kind of financial position does the Navy estimate Litton will be in with regards to the LHA program after this last payment?
5. When does the Navy plan to collect the \$3 million in liquidated damages provided for by the contract for the contractor's failure to meet original delivery dates?
6. Because Litton has not complied with contract requirements for establishing guaranteed delivery dates, does the Navy intend to allow incentives for early delivery if and when the contractor does establish such dates?

## DD-963

1. The first DD-963 was originally scheduled for delivery on October 5, 1974. Its delivery is slipping and has not occurred as of January 1975. Estimates are being made of significant slippages for all the DD-963s.
  - a. What is Navy's most current delivery schedule estimate for the DD-963's?
  - b. What is the impact (cost and schedule) of the November-December, 1974 labor strike at Litton on the DD program?
  - c. Does the Navy foresee any schedule slippages as a result of material and/or equipment shortages? What has Litton done concerning cost increases/its contracts with subcontractors?  
in
  - d. What actions are being taken by the Navy to enforce contract provisions requiring establishment of guaranteed delivery dates.



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- a. The DD-963 was scheduled to be delivered December 27, 1974. What is the Navy's plan for ship operational testing after delivery?
2. The Ship Operational Program is the computer software that controls much of the ship and is considered to be the highest risk area of the program.
  - a. What is the status of the delivery of the Ship Operational Program (SOP)?
  - b. If the SOP has been delivered, was it acceptable and have any problems been identified in the testing or in the actual use of the program.
  - c. If the SCP is inoperable due to equipment failure or battle damage, the effectiveness of the DD-963's will be drastically reduced. How difficult is it to lose the use of the SOP? Should backup manual control be installed?
3. How much in liquidated damages is assessable against the contractor for failure to meet guaranteed delivery of DD-963?
4. Does the Navy contemplate revising the contract to include an incentive for early delivery as requested by the contractor in his reset proposal?
5. Is there any prospect of more efficient operation at the Litton shipyard?
6. Is the documentation, training, logistic support, etc., of the ship and its various subsystems adequate enough to allow efficient turnover of the ship to the fleet?
7. What is the demonstrated performance of the ships' engines?
8. What is the replacement procedure for the ship engines? Is reliability of the engines the critical factor in keeping the ship operational?
9. The Navy has reserved space and weight for subsystems with capabilities that were originally required, modernization subsystems, and anti-air warfare conversion subsystems. What are the installation plans for these subsystems?
10. An agreement on the Litton reset proposal was to have been made in the spring of 1974. It is now scheduled to be made in the spring of 1975. What is the status? If an agreement has been made, what does the agreement consist of? If the agreement has not been made, what is the expected agreement?

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AGENCY COMMENTS

A draft of this study was reviewed by DOD officials associated with the management of these shipbuilding programs and comments were coordinated at the Headquarters level. The DOD's comments are incorporated as appropriate. To the best of our knowledge there are no residual differences in fact.

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CHAPTER I

INTRODUCTION

The General Accounting Office (GAO) examined selected aspects of the Navy's General Purpose Amphibious Assault ship (LHA) and DD-963 destroyer shipbuilding programs. This report updates the weapon system data provided in our March 1974 staff study and includes information on major subsystems; contractor management; labor force requirements and trends; and other problems or potential problems.

The LHA class is designed to transport and land troops and their essential combat equipment and supplies in amphibious assault by means of helicopters, amphibious craft and vehicles. A multi-year fixed-price incentive development and production contract was awarded to Ingalls Shipbuilding Division (ISD), Litton Systems, Inc., Pascagoula, Mississippi, on May 1, 1969. The number of ships to be procured was reduced from 9 to 5 in December 1970.

The DD-963 class is a gas turbine-propelled destroyer designed with antisubmarine warfare and shore bombardment capabilities, with sufficient speed for escorting strike forces. ISD, Litton Systems, Inc. was awarded a multi-year fixed-price incentive development and production contract on June 23, 1970, for the construction of 30 ships.

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Separate staff studies on the LHA program were issued in 1970, 1971, and 1972. In 1971 and 1972 we issued separate staff studies on the DD-963 program. In 1973 and 1974 we issued single studies covering both of these programs. On July 26, 1973, we issued a report to the Congress entitled "Outlook for Production on the Navy's LHA and DD-963 Shipbuilding Programs," B-163053.

SCOPE

The information in this report was obtained at the contractor's location and from appropriate levels within the Department of the Navy, primarily the cognizant ship acquisition project offices and supervisor of shipbuilding, conversion and repair. We reviewed plans, reports, correspondence, and other records and interviewed Navy and contractor officials. We made no attempt to (1) assess the military threat or technology, (2) develop technological approaches, or (3) involve ourselves in decisions while they were being made.

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CHAPTER 2

WEAPON SYSTEM STATUS

LHA PROGRAM

This chapter highlights the cost, schedule, and performance experience of the LHA program through September 30, 1974, as shown in the Selected Acquisition Report (SAR) and related documents. The contractor's appeal of the Contracting Officer's decision to the Armed Services Board of Contract Appeals (ASBCA) is also discussed in this chapter because of its potential effect on program cost.

CONTRACT DATA

On May 1, 1969, Litton was awarded a contract for the design and construction of nine general purpose amphibious assault vessels on a multi-year basis. It is a fixed-price-incentive, successive targets type of contract with an 80/20 sharing ratio. The initial target cost was \$922.5 million (unescalated), the target profit was \$90 million (minimum of 5 percent of initial target cost and a maximum of 14.5 percent of initial target cost), and the ceiling price was \$1,199.25 million (unescalated). The ceiling price was established at 130 percent of initial target cost.

In December 1970, the Navy reduced the number of ships to be procured from nine to five. In accordance with the provisions of the LHA contract, the Navy and the contractor engaged in negotiations of price changes beginning in March 1972, to reset the LHA program prices, recognizing the cancellation of four ships, escalation estimate changes, and delays and changes in the contract. The inability of the parties to reach agreement on these issues ultimately led to the Navy contracting officer's decision of February 28, 1973. The contracting officer unilaterally

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determined: delivery schedule, excusable and Government-responsible delay, cancellation charge, firm incentive pricing, revised escalation provisions, measurement of physical progress, changes, and overpayment. A full discussion of the particulars of the contracting officer's decision is contained in our 1974 LHA/DD-963 staff study.

SYSTEM COST EXPERIENCE

The total current estimated program cost for the LHA program as reported in the September 30, 1974, Selected Acquisition Report (SAR), totaled \$1,179.9 million for 5 ships (\$236 million per ship). This represents a cost decrease of \$200.4 million from the development estimate of \$1,380.3 million for 9 ships, a cost increase of \$82.6 million per ship over the unit price development estimate of \$153.4 million, and a cost increase of \$38.9 million (\$7.8 million per ship) over the September 30, 1973, SAR estimate of \$1141 million for 5 ships. The increase from the September 30, 1973, SAR is attributed primarily to escalation. Cost increases since the development estimate are principally because of five-ship contract cost growth (\$103.8 million target price to ceiling price), four ship cancellation costs (\$109.7 million), and increase in five ship escalation costs (\$147.7 million)

A comparison of program costs is presented below:

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	Estimate		
	<u>4-15-69</u>	<u>9-30-73</u>	<u>9-30-74</u>
Quantity under procurement	9	5	5
Development cost	\$ 22.3	\$ 22.3	\$ 22.3
Procurement cost	1,269.0	967.9	958.2
Escalation	<u>89.0</u>	<u>150.8</u>	<u>199.4</u>
Total program cost	<u>\$1,380.3</u>	<u>\$1,141.0*</u>	<u>\$1,179.9*</u>
Program unit cost	\$ 153.4	\$ 228.2	\$ 236.0

\*Does not include over \$373 million that Litton is requesting in its appeal to the ASBCA.

#### Economic Escalation

The Navy periodically estimates escalation by applying to the contract's escalation provision actual labor and material indexes of the Bureau of Labor Statistics and the Navy's projection of the performance of these indexes through the end of the contract. In the September 30, 1974, SAR, the Navy estimated escalation at \$199.4 million. This is an increase of \$48.6 million from the September 30, 1973, estimate. Of this amount, \$29.4 million was due to separating escalation from GFE. The remaining \$19.2 million was an increase in escalation estimates. This estimated increase is based on actual labor indexes through May 1974, actual material indexes through June 1974, and DOD's projected indexes to completion of escalation payments.

The Navy estimates the final contractual escalation payment to be due in December 1974 with any adjustments for actual Bureau of Labor Statistics indexes being made at a later date.

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Status of Funding

Congress has appropriated \$1,128.7 million for the LHA program as of September 30, 1974, and the Navy has reprogrammed \$8.9 million making a total of \$1,137.6 million available for the program. Funds obligated through September 30, 1974, were \$1,127.0 million, and funds expended were \$764 million.

As of September 30, 1974, the Navy estimated that \$42.3 million for escalation, outfitting and post delivery will be required to complete the LHA program. However, no funding to cover any of the over \$373 million Litton requested in its appeal of the contracting officer's decision to the ASBCA had been requested or appropriated at the time of our review. In February 1975, project office officials informed us that \$100.9 million is being requested for the LHA appeal in the FY 76 budget.

SYSTEM SCHEDULE

Additional slippage has occurred in the LHA program since our March 1974 study. The following schedule summarizes slippage in the program.

	<u>Contractually established delivery dates (5/01/69)</u>	<u>Contracting Officer's decision (2/28/73)</u>	<u>Slippage</u>	<u>Litton's proposed delivery dates (5/22/74)</u>	<u>Addi- tional slippage</u>
LHA-1	3/30/73	3/14/75	23 1/2 mo.	3/14/75	-
LHA-2	6/29/73	9/12/75	26 1/2	9/12/75	-
LHA-3	10/01/73	2/27/76	29	5/28/76	3 mo.
LHA-4	12/31/73	7/30/76	31	6/03/77	10
LHA-5	4/01/74	12/17/76	32 1/2	12/02/77	11 1/2

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In a letter dated May 22, 1974, Litton acknowledged that it

"\* \* \* has become unable to perform in accordance with established construction schedules on its Navy contracts. The delays in the LHA-1 Class Program have created a requirement for acquisition of skilled manpower to a level which Ingalls cannot achieve in a time frame necessary to maintain all existing schedules"

and submitted three alternative schedules for Navy's consideration, based on its unilateral determination of priorities between the three Government contracts at ISD. First priority was assigned to submarine overhauls, second priority to the DD-963 class of destroyers, third priority to LHA's 1 and 2, and fourth priority to LHA's 3, 4, and 5.

In its response, the Navy declined to choose between these schedules in order not to void its contractual protection and reiterated that,

"\* \* \* the contractor has the sole responsibility for the performance of the requirements of each Navy contract including the scheduling of work required to meet its obligation for contractual deliveries under those contracts."

Litton, subsequent to the Navy reply, has implemented its proposed priority scheme in its work efforts.

The Navy feels that even the 5/22/74 Litton proposed delivery dates for LHA -1, -2 and -3 are unrealistic. Based on the Naval Sea Systems Command production analysis report of July 26, 1974, the expected delivery dates for the LHA program, before the November - December 1974 strike were:

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	<u>Navy estimate</u>	<u>Months delay from the delivery dates of the contracting officer's decision</u>
LHA-1	6/75	3
LHA-2	1/76	4
LHA-3	9/76	7
LHA-4	6/77	10
LHA-5	12/77	11.5

In addition, a review of progress indicators at Litton showed that all LHAs were behind the 2/28/73 schedule and probably would not be delivered in accordance with Litton's 5/22/74 proposed delivery dates. The Navy estimated that LHA-1 was about one month behind the 2/28/73 schedule in July 1974. Work package completions showed that work on LHA's 2 and 3 were considerably behind schedule, and little progress has been made on LHA's 4 and 5. Other indicators such as major events schedules and vessel labor confirm this estimate of the situation (See Chapter 6).

A strike closed ISD from November 18, 1974, to December 18, 1974. The impact of the strike is unknown at this time (See page 45).

#### Guaranteed delivery dates

Guaranteed delivery dates for all five ships were contractually due on June 14, 1974. Litton submitted guaranteed delivery dates for LHA-1 and LHA-2 as June 14, 1975 and March 12, 1976, respectively. Guaranteed dates for the other three ships were never submitted.

On November 11, 1974, Litton withdrew the guaranteed delivery dates for LHA-1 and LHA-2 because of its inability to meet the manpower goals on which the schedules were based. The Navy is maintaining a dialogue in an attempt to establish guaranteed delivery dates.

#### SYSTEM PERFORMANCE EXPERIENCE

There were no changes to the LHA operational/technical characteristics reported on the SARs between September 30, 1973, and September 30, 1974.

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In March 1974, we reported that the LHA is to be delivered with space and weight reservations for the CHAFFROC decoy system instead of an installed CHAFFROC system. As of September 1974, no final decision had been made by Navy on what type of system would be used on the LHA.

Status of ASBCA appeal

On July 5, 1973, Litton filed an appeal of the Contracting Officer's decision with the ASBCA. The amount in issue is over \$373 million. Litton, in its appeal to the ASBCA, listed seven counts in which it disagreed with the Contracting Officers' decision. In these counts Litton claimed that the Contracting Officer had made errors in fact and law in his interpretation of several contract provisions and had miscalculated the amount of cancellation costs, escalation, and liquidated damages.

A prehearing conference was held on September 9, 1974, before an ASBCA appeals judge. Counsel for both Navy and Litton agreed to meet later--at the judge's request--to resolve certain problem areas and to submit a joint memorandum of understanding to the judge by September 23, 1974. Some of the areas to be discussed were: Navy's inquiries regarding the relevance of the case of a number of documents requested by Litton, Navy's concern over Litton reluctance to further quantify the amount of damages which may be requested and the judge's desire that the two parties agree to "split" the complex appeal into a series of cases which could be tried individually. A joint memorandum of understanding has not been submitted and a hearing date has not been scheduled to date.

No funding to cover the over \$373 million has been included in the Navy's budget or in the SAR estimates.

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CHAPTER 3

WEAPON SYSTEM STATUS DD-963 PROGRAM

This chapter highlights cost, schedule, and performance experience of the DD-963 program through September 30, 1974, as shown in the SAR.

CONTRACT DATA

On June 23, 1970, Litton was awarded a fixed-price-incentive successive target contract at a target cost of \$1,646.1 (unescalated) million and negotiated target profit of \$143.1 million for a target price of \$1,789.2 (unescalated) million. The ceiling price for the contract was \$2,139.9 (unescalated) million, which is 130 percent of target cost. The contract has a sharing ratio of 85/15 for increases from target cost to ceiling. Unique features included in the contract are: (1) total contractor responsibility for design and production, and (2) incentive for exceeding silencing goals.

SYSTEM COST EXPERIENCE

The total current estimated program cost for the DD-963 program, as reported in the September 30, 1974, SAR, totaled \$3,599.8 million for 30 ships (\$120 million per ship). This represents a cost increase of \$1,018.6 million over the June 23, 1970, development estimate of \$2,581.2 million for 30 ships, a cost increase of \$33.95 million per ship over the unit price development estimate of \$86.04 million, and a cost increase of \$794.7 million, (\$26.5 million per ship) over the September 30, 1973, SAR estimate of \$2,805.1 million for 30 ships. Program cost changes during the period September 30, 1973, to September 30, 1974, are attributable to the following:

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—Economic escalation	\$350.1
—Target price to ceiling price	350.7
—Silencing incentives	23.3
—Outfitting material	36.0
—Test equipment	6.4
—Government-furnished equipment	24.5
—Outfitting and post delivery	<u>1.7</u>
	<u>\$794.7</u>

A comparison of program costs is presented below:

	Estimate		
	<u>6-23-70</u>	<u>9-30-73</u>	<u>9-30-75</u>
Original Development Estimate (millions)	_____		
Quantity under procurement	30	30	30
Development cost	\$ 36.0	\$ 37.6	\$ 37.6
Production cost	2,358.6	2,370.7	2,801.8
Escalation	<u>186.6</u>	<u>396.8</u>	<u>760.4</u>
Total program cost	<u>\$2,581.2</u>	<u>\$2,805.1</u>	<u>\$3,599.8</u>
Unit cost	\$ 86.04	\$ 93.50	\$ 120.00

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Economic Escalation

The Navy periodically estimates escalation by applying actual labor and material indexes provided by the Bureau of Labor Statistics and DOD's projection of the performance of these indexes through the end of the contract to the contract's escalation provision. In the September 30, 1974, SAR the Navy estimated escalation at \$760.4 million. This was an increase of \$363.6 million over the September 30, 1973, estimate. A portion of this increase, \$13.5 million, was due to transferring escalation from GFE to provision for economic change. The remaining \$350.1 million was an increase in escalation estimates. The September 1974 estimate was based on actual labor indexes through May 1974, actual material indexes through June 1974, and DOD's projection of 11.5 percent annually through FY 1978.

Status of Funding

As of September 30, 1974, Congress had appropriated \$2,310.2 million. This included \$30 million for development and \$2,280.2 million for procurement. Reprogramming actions from 1967 through June 30, 1974, accounted for a net increase in program funds of \$10.7 million. Therefore, the total funding as of September 30, 1974, was \$2,320.9 million. Funds obligated through September 30, 1974, were \$2,140.7 million and funds expended were \$1,229.4 million.

As of September 30, 1974, the Navy estimated that an additional \$1,278.9 million will be required to complete the DD-963 program.

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STATUS OF LITTON'S RESET PROPOSAL.

The DD-963 contract provides for a resetting of the target price on the basis of actual cost experience, but not to exceed the ceiling price. The Navy received Litton's reset proposal as scheduled on October 29, 1973. The proposal is for a firm-fixed-price contract at ceiling price.

Negotiations were expected to be concluded by the spring of 1974. Navy officials now estimate that negotiations will not be concluded until the spring of 1975. Delays in negotiations have occurred because the contractor resubmitted updated cost estimates which reflected later economic and shipyard experience data. Navy officials indicated additional time will be needed to analyze this data.

The Litton reset proposal is at the contractual ceiling price or \$350.7 million above initial contract target price. The Navy has reflected this estimate in its cost to complete in the September 1974 SAR.

SYSTEM SCHEDULE

On May 22, 1974, Litton submitted an alternative ship delivery schedule for the DD-963 program. This schedule indicated no slippage in the DD-963 program. On September 24, 1974, Litton formally acknowledged a 2-month slippage on delivery of the DD-963 to December 23, 1974, and stated that the slippage was the result of excusable and other contract compensable delays. Navy production analysis estimated the maximum delivery slippage on the 30 ships to be as much as 20 months.

At about July 31, 1974, progress indicators such as work package completions, vessel labor, and major event schedules all showed destroyers under construction to be delinquent to schedules established by Litton for

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the fiscal year ending July 31, 1974. The indicators also showed that in terms of percent delinquency vessels at the end of the current production sequence were further behind schedule than were lead vessels.

We found that Litton is encountering some problems with subcontractors that may delay delivery of destroyers scheduled toward the end of the production sequence. These problems are related to the escalating costs and scarcity of building materials. (See Chapter 7.)

A strike closed ISD from November 18, 1974, to December 18, 1974. The impact of this strike is unknown at this time. (See page 45.)

STATUS OF SHIP OPERATIONAL  
PROGRAM (SOP)

In June 1974 Litton delivered to the Navy a version of the Ship Operational Program (SOP). By this action Litton considered that they had satisfied a contract milestone. The Navy responded that additional testing was necessary to prove the capabilities of the SOP as a part of the requirements of the contract milestone. Litton performed a series of tests in December 1974 in order to assess progress on correcting the more serious deficiencies observed in early November. The Navy indicated that results of the December tests showed that Litton has made extensive progress in cleaning up the program and that it now appears that the software will be ready for builder's trials.

Navy officials have indicated that the computer software development appears to be the greatest technical risk in the program. The computer software is vital to the operation of the ship. The Navy has informed the contractor that it will not accept delivery of the DD-963 until the contractor provides an operationally suitable program.

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SYSTEMS PERFORMANCE EXPERIENCE

There were no reported changes in the operational characteristics from September 30, 1973, to September 30, 1974. However, the ship's capabilities will not include those of several subsystems originally planned for installation on the DD-903s prior to delivery.

(See Chapter 4.)

Guaranteed Delivery Dates

The contractor has submitted proposed guaranteed delivery dates on four ships as shown below:

	<u>Guaranteed delivery date</u>
DD-963	10/31/74
DL-964	4/30/75
DD-965	6/30/75
DD-966	7/30/75
DD-967	a/
DD-968	a/

It should be noted that these dates are the same as contract delivery dates.

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a/ Dates have not been submitted for these ships and are past due.

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CHAPTER 4

STATUS OF SUBSYSTEMS

In March 1974 we reported the status of space and weight subsystems designated for the DD963 and LHA class ships. This chapter presents the current status of space and weight subsystems designated for the DD963 class ships. LHA space and weight subsystems are not discussed because there have been no changes from those previously reported.

The Navy has established space and weight provisions to accommodate designated subsystems after construction and delivery of the DD963 class ships. These subsystems can be categorized as subsystems providing capabilities originally required for the DD963 class by the Navy, modernization subsystems, and AAW (anti-air warfare) conversion subsystems. According to the Navy, this approach was designed to provide for orderly growth over the expected life of the hull and will result in a reduction of life cycle costs.

The Navy has recognized the possible need to eventually upgrade the ships' capability during the life cycle of the ship. This planning is in recognition of the fact that over a long period both technology and threats change and new mission requirements develop.

The cost of subsystems procured and installed during the ship construction period are funded with Shipbuilding and Conversion, Navy (SCN) funds, and are included in program cost estimates shown in the Selected Acquisition Report (SAR). If subsystems are procured and installed after the construction period, i.e., later than 11 months after delivery, their costs will be absorbed by Other Procurement, Navy (OPN) or Operations and Maintenance, Navy (O&MN) appropriation

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and are not included in program cost estimates shown in the SAR. Navy officials stated OPN and O&MN are not considered to be part of the program cost estimates.

SUBSYSTEMS PROVIDING CAPABILITIES  
ORIGINALLY REQUIRED

In order to accomplish or enhance the DD-963 mission capability, the DD-963 Development Concept Paper (DCP), dated 25 July 1970, specified certain baseline subsystems which were in a developmental status and for which space and weight reservations were made. These subsystems included (1) an active/passive electronic warfare (EW) system integrated with a command and decision subsystem to deter incoming missiles (2) a shipboard chaff decoy system to provide additional self-defense against missiles, (3) a variable depth sonar (VDS) to improve underwater detection performance, and (4) a light Airborne Multi-purpose System (LAMPS) to assist in classifying, localizing, or attacking long-range sonar contacts. The Basic Point Defense Surface Missile System was specified during initial construction, as was a helicopter facility to support and operate helicopters through sea state 4. The above subsystems will not be installed in DD-963 during the initial construction phase, with the exception of the helicopter facility, due to problems in development, increases in acquisition costs and other urgent fleet requirements.

In our opinion, the absence of any of these subsystems will degrade the ships' mission capability.

The Navy stated that passive EW, a point defense surface-to-air missile system NATA Sea Sparrow, and the Rapid Bloom Overhead Chaff are funded as acquisition costs, are included in the total program cost shown in the DD-963s SAR, and will be installed before the ships are released to

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the Fleet for unrestricted service. In addition, funds have been requested in the FY76 budget to provide all 30 DD-963s with LAMPS I capability.

Although not listed as a definite requirement in the Development Concept Paper dated July 25, 1970, the HARPOON anti-ship missile is currently planned to be backfitted on the DD-963 class ships. The Navy has indicated there is sufficient weight and space available to accommodate the HARPOON as the principal surface-to-surface missile for this class ship.

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If installation of all of the subsystems discussed above on all 30 DD-963s occurred, additional acquisition costs for shipboard equipments of at least \$116.4 million beyond those identified as program cost estimates in the SAR would be required. This amount was arrived at by obtaining present estimated unit cost of the subsystems from the various project offices responsible for the subsystems and does not necessarily reflect current Navy plans. A breakdown of the \$116.4 million is shown below.

POTENTIAL ADDITIONAL ACQUISITION  
COST OF THE DD963s

	<u>Estimated Cost (millions)</u>
Electronic Warfare Suite (active)	\$27.0
VDS (AN/SQS-35V)	\$59.4
LAMPS III	\$ 9.0
HARPOON	<u>\$21.0</u>
Total Estimated Cost	\$116.4

In addition, the cost of acquisition and installation of the passive "Design-to-Price" EW (\$18.3 million) and the NATO Sea Sparrow (\$75.0 million) could be greater than the funding presently included in the SAR total program cost and reserved by the Navy for their use. GAO identified up to \$110.8 million that was originally reserved but \$66.2 million of this has already been spent on AN/JYK-7 computers for EW (\$40 million), early EW efforts on the WLR-8 (\$5.6 million) and later EW efforts on the now defaulted contract for the AN/SLQ-17 (\$20.6 million).

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Electronic Warfare System

The Navy originally planned to install an active/passive EW system to provide the ship with an anti-ship missile detection, early warning, and guidance disruption system. To ensure rapid response to threats identified, the system was required to be interfaced with the ship's command and decision system.

In February 1972, the Chief of Naval Operations (CNO) deleted the active/passive EW hardware from the program. This decision was made because of concern over program costs and effectiveness of the EW system. This action was taken though it was recognized that elimination of the EW subsystems would result in degrading combat capability.

On September 13, 1973, the CNO selected a passive EW system for the first ten ships of the DD-963. This passive system would be used until a passive "Design-to-Price" EW Suite that is under development would be available for installation on the DD-963s. On December 19, 1973, a firm-fixed-price contract was awarded for the passive EW systems for the first 10 ships. In May 1974, the contractor informed the Navy that the delivery schedules could not be met. On August 8, 1974, the Navy terminated this contract for default.

Current Navy plans call for installing a deployed manual passive EW suite (WLR-1 and WLR-11) on the first 10 ships as an interim system until the passive "Design-to-Price" EW is available.

The passive "Design-to-Price" system currently planned for DD-963 installation will be capable of meeting only the anti-ship missile detection and early warning threat requirements. The Navy stated that analysis of overall Fleet EW requirements, which included consideration of cost versus projected capability of equipment, has determined that DD-963 will be initially

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fitted with passive EW only. the Navy stated that if effective Deceptive Electro-magnetic Countermeasures (DECM) and decoys are forthcoming from the Navy's developmental programs, it may be desirable to backfit these equipments on DD963's at a later date.

Shipboard CHAFF Decoy System

The Navy planned for a shipboard CHAFF decoy system capable of providing the DD-963s with additional defense against missiles and to operate in conjunction with the active EW system.

In October 1974, CNO decided to install the MK 33 Rapid Bloom Overhead Chaff for the first 10 ships. The follow-on 20 ships will receive a Chaff system as part of the "Design-to-Price" EW Suite. These systems are funded as acquisition costs and will be installed before the ships are turned over to the Fleet for unrestricted service.

Variable Depth Sonar System

The AN/SQS-35V Variable Depth Sonar (VDS) system was part of the DD963 underwater surveillance and communication subsystem. The sonar was not included in the basic contract because of increased price, and delays during testing. According to Navy officials no decision has been made to install either a VDS or the Escort Towed Array Sonar System (ETAS) as an alternative. VDS will be added on a selected basis only, if Fleet experience shows a sufficient gain in performance to justify the higher cost of procurement and installation.

If the ETAS were installed on all 30 DD963s, the estimated cost would be \$150 million and an additional \$90.6 million would have to be added to our estimate of \$116.4 million of additional required acquisition costs to install subsystems providing capabilities originally required.

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Antisubmarine Warfare  
Helicopter Capability

The DD-963 is required to have a helicopter facility to support and operate helicopters. In its ASW role, the helicopters would be used to assist in classifying, localizing, or attacking long-range sonar contacts, particularly those over the horizon or beyond ASROC range. Facilities were to include both operations and organizational maintenance support for two LAMPS (Light Airborne Multi-Purpose System).

In April 1970, the CNO issued a formal operational requirement for developing a combined air/ship system to perform both ASW and anti-ship missile defense (ASMD) missions. The CNO specified at least two helicopters for each destroyer to satisfy urgent needs.

Fleet introduction of the Mark III LAMPS has slipped from fiscal year 1975 to 1982, after all ships are scheduled to be delivered to the Navy.

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The Navy plans to initially stage the SH-3H (staged from CVs) helicopter or the SH-2F (LAMPS I) helicopter on the DD-963 as interim systems until the MARK III LAMPS is available. Certain mission sensors of these interim helicopters have been found to be limited for their ASMD and ASW roles.

Basic Point Defense  
Surface Missile System

The Basic Point Defense Surface Missile System was originally planned for installation during construction. The NATO SEA SPARROW Surface-to-Air Missile System, however, has now been selected for installation on the DD-963 class and is being procured for installation following delivery.

HARPOON

Current Navy plans call for installation of the HARPOON missile system, a surface-to-surface missile system on all 30 DD-963 ships as post delivery action. The HARPOON Missile System was not included in the original program budgeting because the systems had not been fully defined and developed. The Navy has indicated that a request for funds has been included in the FY 76 budget to procure and install HARPOON systems for those ships for which system procurement could meet acquisition funding cut-off dates.

SAR REPORTING

We believe that costs of the subsystems discussed above that are planned to be incurred outside of the SCN funding period should be disclosed in the SAR.

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SUBSYSTEMS PROVIDING MODERNIZATION AND ANTI-AIR  
WARFARE (AAW) CAPABILITIES

Space and weight provisions have been made on all 30 DD-963s for various additional subsystems still in development and for AAW conversion subsystems. No commitment has been made by the Navy to purchase or install any of these subsystems.

Modernization subsystems

The Navy considers the DD-963 class as a candidate for installation of the Phalanx Close-in-Weapon System, an 8-inch lightweight gun, SPS-58 radar, and an Acoustic Warfare System. If these are installed, modernization costs of at least \$18.6M per ship could result.

AAW Conversion subsystems

Systems necessary for AAW conversion include the following:

- AN/SPS-48 radar
- MK 26-0 launcher forward, MK-26-1 launcher aft
- MK 13-0 Weapons Direction System
- TARTAR D missile system

The estimated cost for a DD-963 AAW conversion is at least \$50.0 million per ship. Navy officials informed us that no consideration is being given to installing any of these systems.

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CHAPTER 5

CONTRACT INCENTIVES AND PENALTIES

DELIVERY INCENTIVES AND PENALTIES

Both the LRA and the DD-963 contracts provide penalties for late delivery. In addition, the LRA contract provides an incentive for early delivery of the Ships.

LRA Delivery Incentives and Penalties

Under terms of the LRA contract, the contractor could receive an incentive for early delivery, although the completion of the program has been delayed almost four years. The contract provides the following incentives and penalties:

- a penalty of \$10,000 per day per ship for failure to meet contract dates, provided the total penalty does not exceed \$600,000 per ship, and
- an additional penalty of \$20,000 per day per ship for failure to meet guaranteed delivery dates, provided the total penalty does not exceed \$1,200,000 per ship; or
- an incentive of \$10,000 per day per ship for delivery in advance of guaranteed delivery dates, provided that such amount does not exceed the penalty which would be assessable for failure to meet original contract dates.

Penalties totaling \$3,000,000 have been assessed against the contractor for failure to meet contract delivery dates but have not been collected. Collection will not be made until final contract pricing upon delivery of all ships. The amount of incentive which could be paid for delivery in advance of guaranteed delivery dates cannot exceed this amount.

DD-963 Delivery Penalties

The DD-963 contract provides penalties for late delivery as follows:

- a penalty of \$5,000 per day per ship for failure to meet original contract dates, provided the total penalty does not exceed \$500,000 per ship, and

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--an additional penalty of \$10,000 per day per ship for failure to meet guaranteed delivery dates, provided the total penalty does not exceed \$600,000 per ship.

Delivery of DD 963 has slipped to 12-77 and the Navy estimates additional slippage in the program. The amount of penalty assessed against the contractor for this slippage will not be known until the excusable delay, if any, is determined.

The contractor, as part of the reset proposal, has requested that the contract be revised to include an incentive of \$10,000 per day per ship for delivery in advance of guaranteed delivery dates. Pending completion of the reset negotiations it would be prejudicial to the Navy's negotiating position to disclose the Navy's position on the contractor's proposed changes in terms and conditions of the contract.

#### SILENCING INCENTIVES

The DD 963 class ships are being constructed to meet specified noise levels for radiated noise and sonar self-noise. Radiated noises are those ship noises which could be detected by the enemy. Sonar self-noises are those ship noises which will be heard through the ship's own sonar.

As an incentive for the contractor to improve upon the specified levels for self-noise and radiated noise the contract provides a maximum award of \$23,250,000. The contract also provides a maximum penalty of the same amount for failure to meet specified self-noise and radiated noise levels. Project Office officials told us that they expect the contractor to earn the maximum award of \$23,250,000 for ship silencing. The anticipated program cost increase for ship silencing is reflected in the September 1974 SAR.

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CHAPTER 6

STATUS OF CONSTRUCTION AT THE SHIPYARD

In March 1974 we reported that ISD probably would not meet construction schedules that had been established for the LHA-1 Class Program and the DD-963 Class Program. At that time schedule slippage in the LHA program had been acknowledged, but no slippage had been reported on the DD program. Since the date of that report, ISD has:

- acknowledged its inability to perform in accordance with established construction schedules for all programs simultaneously;
- adjusted priorities among the Navy shipbuilding and overhaul programs it holds, to provide schedule assurance for some of them; and
- experienced a strike of one month duration.

The reasons why ISD has been unable to perform in accordance with established schedules are complex and varied and include such matters as:

- overoptimism about starting up a new shipbuilding yard,
- strikes
- changes in designs,
- delays in merchant ship construction,
- instability of past contractor management, and
- continuing labor force problems.

These matters, to a great extent, are interrelated and interdependent. The effect of one of the shipbuilding programs cannot be separated from the effect of others. Both ISD and the Navy have made charges claiming action

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and inaction. Resolution of these charges will be made when the Litton appeal to the ASRCA is settled.

INDICATORS OF PROGRESS  
IN CONSTRUCTION

Various indicators used by ISD to gauge progress in construction show that ISD is behind the established schedule on both the LHA and DD-963 programs. These progress indicators further reveal that, in percent delinquency, ships toward the end of the current production sequence in each program were generally further behind schedule than lead ships.

According to ISD officials, progress indicators compare the number of work units completed at a certain date with the number of work units scheduled to be completed at that date, but the type of work unit varies with the indicator. They are management tools that give visibility to construction progress and trends; problem areas and their impact on construction; and prospects for delivery of individual vessels on or before the date scheduled by the shipyard. If the indicators consistently show a vessel to be delinquent to schedule, we can reasonably assume that the shipyard will not meet the delivery date scheduled for the vessel.

The following table highlights delinquencies to schedule as of July 1974. We used information available in the Navy Status Reports and ISD planning documents to arrive at percentages in the schedule. Backup data for the table is contained in Appendix 1.

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STATUS OF CONSTRUCTION  
ABOUT JULY 31, 1974

Progress Indicators  
(All figures in percentages indicating delinquency to schedule)

<u>Ship</u>	<u>Work package completion</u>	<u>Vessel labor</u>	<u>Major event schedule</u>	<u>Compartment completions</u>	<u>Structural releases</u>
<u>LHA program</u>					
LHA-1	54	6*	16	84	(a)
LHA-2	67	17*	24	(b)	45
LHA-3	62	28*	54	(b)	95
LHA-4	95	58*	(b)	(b)	(b)
LHA-5	93	(b)	(b)	(b)	(b)
<u>DD-963 program</u>					
DD-963	45	27	9	64	(c)
DD-964	47	29	15	100	(c)
DD-965	63	32	17	100	(c)
DD-966	59	27	12	(b)	(c)
DD-967	72	37	26	(b)	(c)
DD-968	74	53	52	(b)	(c)
DD-969	85	66	46	(b)	(c)
DD-970	68	59	20	(b)	(c)
DD-971	82	(b)	(b)	(b)	(c)
DD-972	68	(b)	(b)	(b)	(c)
DD-973 and subsequent	(b)	(b)	(b)	(b)	(c)

General: This table is a summary of other tables presented in an appendix to this study.

<sup>a</sup>Construction has progressed beyond the point where this indicator is a meaningful measure of progress.

<sup>b</sup>Construction has not progressed to the point where this indicator is a meaningful measure of progress.

<sup>c</sup>Data needed to compute this indicator is not being reported for the DD program.

<sup>d</sup>Data based on Navy estimates as of June 1974 and projected through July 1974.

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PROPOSED ACTION TO  
IMPROVE PRODUCTIVITY

ISD officials began to introduce early in the fiscal year 1975 (ISD's fiscal year begins August 1 and ends July 31) a production process they call "stationizing". They said the west bank yard, where the LHA's and destroyers are being built, was designed for stationized production. Stationizing, as ISD uses the term, means assigning certain craftsmen to a station, and then bringing an assembly, module, or hull and materials to them. When men assigned to the station have completed all the work planned for that particular station, the piece of construction moves to the next station in the production line.

ISD, we were told, has experienced difficulty in getting yard supervisors, who are accustomed to conventional shipbuilding methods, to accept in its entirety stationizing and all it implies. An ISD official believes, however, that proper use of stationizing will improve supervision and productivity to the extent that the yard will recover from delinquencies to schedule and enable the yard to deliver most of the destroyers on or before contract dates.

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CHAPTER 7

SHIPYARD LABOR FORCE

ISD continues to experience manpower problems which are essentially the same as those identified in previous GAO staff studies and that contribute to missed schedules and increased costs. These problems stem from a number of conditions including:

- a limited labor market to draw from;
- a relatively low wage to compete with in that market; and,
- a less than desired level of productivity.

Pascagoula Area  
Labor Market

ISD, located in Pascagoula, Mississippi, on the Mississippi Gulf Coast approximately 45 miles west of Mobile, Alabama, draws primarily from a labor pool of about 54,560 workers in the Pascagoula area. According to the local State Employment Service representatives, this figure represents about 85 percent of the total labor force in the three county area. The unemployment rate for the area averaged 3.1 percent between January and August 1974. State Employment Service figures show that of the 52,753 workers employed in the area, about 26,471 or 50 percent are employed in manufacturing industries such as paper and allied mills, chemical and allied plants, petroleum refineries, and shipbuilding. ISD, based on July 74 employment data, employs about 74 percent of all workers in local manufacturing industries.

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According to a report prepared by the Mississippi State Employment Service dated September 1974, manpower shortages in the Pascagoula area continue in job classifications such as welders, pipefitters, shipfitters, and sheet metal workers. Another Employment Service report indicated that local shipbuilders are especially hard hit by the current demand supply situation for crafts critical to shipbuilding. Continuing recruiting problems, the report said, includes reluctance of skilled workers to relocate; low pay offered recruits; high cost of relocation coupled with cost of living in the relocated area (rent, taxes, utilities, etc.); and transportation to and from the shipyard for workers living in the area.

ISD has had some success in increasing the number of skilled workers from October 1973 through July 1974. Manufacturing employees were added at an average monthly rate of about 9.9 percent while manufacturing employees were lost at an average monthly rate of about 6.6 percent.

#### Relatively Low Wage

A major non-manufacturing industry ISD must compete with is the construction industry, which employs about 7 percent of the area workers. Many kinds of skilled craftsmen rated by ISD as critical are also recruited by construction firms. However, pay scales in the construction industry are higher than in shipbuilding for the same skills. For example, the hourly rate for journeymen welders at ISD was \$4.50 in July 1974. According to ISD's Manager of Industrial Relations, other companies in the area were paying an hourly rate of \$9.00 for a journeyman welder.

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PRODUCTIVITY

ISD, in meeting cost and schedule goals, not only faces the problem of recruiting the number of employees needed, but also must assure that employees, once on board, are as productive as desired.

However, ISD officials told us that inexperience, absenteeism, attrition, and excessive idle time all combine to depress productivity. They did not know in what measure each of these factors contribute to lagging productivity.

Inexperience In  
The Labor Force

The ratio of journeymen to apprentices during the fiscal year ended July 1974 ranged from 1 to 1 to 1.3 to 1. Responsible ISD officials said that, although it is generally assumed that the higher the journeymen to apprentice ratio the greater the workforce productivity, they could not relate the ratio directly to productivity.

ISD had no analyses to show the length of service for all skilled workmen, but personnel statistics for June 1974 showed that about 35 percent of the total workforce had one year or less experience with ISD.

Absenteeism  
and Attrition

From early in the LHA and DD-963 Programs ISD has had high rates of attrition and absenteeism, and over the years ISD attempts to improve the labor situation and stabilize the workforce have been unsuccessful.

ISD officials said that continuing high rates of attrition and absenteeism among direct labor employees are among the most critical

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problems ISD now faces. An ISD official told us that if the situation does not improve significantly in the last quarter of calendar year 1974, construction schedules could slip further.

For the ten month period ending in July 1974, the monthly rate of absenteeism for manufacturing workers ranged from 8.4 to 13 percent with the average being about 10.9 percent. During July 1974 absenteeism by shifts peaked at about 13 percent for the first shift, 16 percent for the second shift, and 18 percent for the third shift. An ISD official said that the immediate goal is to reduce overall worker absenteeism to a maximum of 12 percent and then concentrate on further reductions.

Attrition averaged 6.6 percent monthly and ranged from 4.7 to 8.4 percent. The immediate goal relative to attrition is a reduction to 5 percent.

#### Idletime

Navy officials said they had observed instances of idle time and had informally advised ISD management that there seemed to be a rather high rate of idle time in the production work force. The Navy assessment, we were told, was based on systematic and continuing observation in various work areas of the shipyard. While the Navy method may not be statistically defensible, Navy officials told us it provided a useable assessment of idle time.

ISD officials told us that they too have studied the problem of idle time. Through spot checks they have found that often supervisors could

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not account for the whereabouts of subordinates. Also, ISD industrial engineers noted a significant amount of idle time due in part to supervisors leaving work sites to obtain detail drawings, or to follow up on materials. ISD officials said they have detailed industrial engineers to make continuing spot checks, and report instances of idle time. Proper yard officials will then require the responsible supervisors to explain why the workers were idle and to take remedial action to prevent idle time.

MANAGEMENT EFFORTS  
TO IMPROVE SITUATION

ISD officials said more effective use of available manpower by reducing absenteeism, attrition, and idle time has the greatest potential for increasing production. Specific actions taken or planned were to:

- Establish a Sound-Off Program that allows employees to air grievances in writing to top management. ISD officials hope the program will identify reasons why employees are absent or leave the company, and give a sound basis for eliminating source of complaints.
- Encourage first line supervisors to be responsive to and assist in solving personnel problems of employees when these problems affect the man's performance on the job.
- Institute unannounced spot checks to determine whether workers assigned to a supervisor are effectively employed.
- "Stationize" production by assigning employees to fixed locations and stations where the work will come to them.

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--Pay bonuses for referral of journeyman workers and as incentives for attendance.

According to an ISD official the recruiting situation will not improve as long as competition between local employers for skilled workers continues at the present level. ISD plan to continue current recruiting efforts such as advertising job openings in local communications media, and rewarding ISD employees with a \$100 bond for every journeyman they refer that the shipyard employs continuously for more than 90 days.

ISD officials found that transportation was a major problem contributing to employee absenteeism and attrition. Some employees commuted long distances and complained of transportation costs and traffic tie-ups, while others had no reliable transportation. To improve this situation ISD officials said the company started a bus service to outlying areas, promoted car pooling by coordinating and centralizing this activity, and worked with town officials to improve traffic flow in and out of the shipyard.

#### LABOR STRIKE

A strike called by the Metal Trades Council closed down the ISD shipyard on November 18, 1974. Labor contracts between ISD and various unions representing company workers expired on November 17, 1974. When ISD and representatives of the Metal Trades Council could not agree on terms for a new contract, union members voted to strike. The Metal Trades Council barganings for about 80 percent of yard workers. The strike was settled on December 18, 1974. The new contract calls for increased pay, cost of living increases, increased health and life insurance, one additional paid holiday, and a pay

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bonus for each 13 weeks of continuous work. Impact of the strike on the cost and schedule of the LHA and DD-963 programs were unknown at this time.

Navy officials have advised us that since the strike was settled, Ingalls has experienced an improved hiring rate for both "qualified" and "new" employees. This is attributable to the attractiveness of the pay and other benefits of the new labor contract as well as a reduced amount of industrial type jobs available in the area. However, it is too early to determine whether this improved situation will be sufficient to reduce the continuing problems of missed schedules and increased ISD costs.

Litton has tentatively advised us that delivery of the DD-963 is now scheduled for 3/21/75, a slippage of approximately four months from the date that Litton had scheduled for the delivery of the DD-963 prior to the strike.

#### CONCLUSION

ISD's capability to meet current LHA and DD-963 delivery schedules hinges on how effective management officials are in reducing the rate of absenteeism, attrition, and idle time to tolerable levels, and hiring additional skilled workmen in critical crafts. To date ISD management has had little success in reducing absenteeism and attrition, and it appears unlikely that ISD will be able to recruit the needed skilled workmen in the critical crafts due to the limited labor market and relatively low wage situations. For these reasons we believe that manpower problems will continue to contribute to missed schedules and increased ISD costs.

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CHAPTER 8

ESCALATING COSTS AND IMPACT OF SCARCITY  
OF SHIPBUILDING MATERIALS

ISD is encountering problems such as longer procurement lead times and higher prices for materials. The immediate impact of these problems is currently being reduced through intensive management attention. In the future, however, materials costs could increase and deliveries of materials could be delayed, thereby increasing ISD's construction costs and delaying delivery of ships ISD is building for the Navy. These problems would be more likely to affect the later ships in the LHA and DD-963 production series.

ISD has a material escalation clause with the Navy but Litton subcontractors, in general, do not have material escalation clauses with Litton.

EXAMPLES OF ESCALATING PRICE AND  
INCREASED LEAD TIMES

An example of the potential impact of escalating cost is procurement of the sets of waterborne propulsion shaft bearings for DD-963 class destroyers. We estimate that the escalating price for bronze used in these bearings has increased the unit cost for a shipset from \$89,876 to approximately \$137,794. American Metal Bearing Company (AMBCo) of Garden Grove, California supplied five shipsets at the original price, but announced that they would not manufacture the 25 remaining shipsets ISD contracted for unless ISD agrees to pay the increased price. ISD officials told AMBCo that the shipyard would not pay the increased price unless it receives reimbursement from the Navy. Without Navy reimbursement, ISD expects

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AMBCo to deliver according to terms of the contract between ISD and AMBCo. If AMBCo does not perform in accordance with the contract and reprourement becomes necessary, ISD officials estimate that deliveries of the last 25 destroyers could be delayed about six months.

Another example of the impact of escalating prices is procurement of the main propulsion shafting for DD-963 class destroyers. ISD contracted with a foreign company for the first nine shipsets at \$735,369 a shipset. A contract for the remaining 21 shipsets was awarded, by Navy direction, to a domestic firm at \$777,985 per shipset. The domestic supplier, National Forge Company of Irvine, Pennsylvania, is claiming that the inflation rate the company is experiencing was unforeseeable at the time they contracted for the shafting and is now claiming \$959,672 a shipset under Section 2-615 of the Uniform Commercial Code. There was no mention of delay in deliveries. The matter had not been settled as of August 29, 1974, and it could have a decided impact on the cost of the last 21 destroyers of the DD-963 class.

Other procurements that could be affected by escalating prices and scarcity of material are steel plate, aluminum plate, and electric cable. ISD has not as yet experienced significant shortages of steel and aluminum plate for the LHA and DD-963 programs, but costs and lead times for these items have increased in recent months. For example:

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- The base price of a typical steel plate (5/8 inch x 10 feet feet x 24 feet) increased from \$8.50 a hundred pounds in January 1973 to \$12.35 a hundred pounds on August 1, 1974, and at the same time, procurement lead time increased from about three months to about six months.
- Aluminum plate prices for the same period have increased from \$.42 a pound to \$.905 a pound and procurement lead time increased from two to five months.
- According to ISD officials, copper electrical cable has been in short supply, and ISD has had trouble satisfying yard requirements. Copper prices rose from \$.505 a pound in January 1973 to \$.77 a pound in October 1974, and cable procurement lead times in recent months have increased about three to six months.

EXAMPLES OF ISD  
MANAGEMENT ACTIONS

ISD material officials pointed out several techniques they have used to alleviate lead time and material shortage problems and minimize the impact of these problems on ship construction. These techniques are:

- Yard material requirements are forecast more accurately and for longer periods so that orders can be placed in consideration of longer lead time requirements and

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manufacturers production allocations. For example, in the case of steel plate for the shipyard, total program requirements have been projected and compared with anticipated quarterly allocations through 1980 to determine when adequate supplies of steel plate will be available.

- Items are purchased more aggressively which entails the extensive use of expediter and field representatives to contact manufacturers and vendors to persuade them to meet contract delivery schedules;
- Material delivery schedules are examined more closely at the time of contracting to determine if they are realistic;
- Searches are conducted nationwide for new manufacturers and suppliers of scarce materials;
- Substitutes for materials in short supply are investigated, and workaround plans are devised to continue construction until needed materials are received;
- Requests for Special Priorities Assistance are submitted through Navy to the U.S. Department of Commerce, for help in locating suppliers for critically needed materials.

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APPENDIX I

INDICATORS OF PROGRESS  
IN CONSTRUCTION

Major Event Schedule

The Major Event Schedule sets target dates to accomplish significant events that must be completed before the contractor can deliver the ship. The following schedules taken from Navy progress reports show actual to planned performance. In this case the completion of major events was scheduled to support delivery of the LHA's and DD 963 class ships according to terms of the contract.

LHA PROGRAM  
MAJOR EVENTS SCHEDULED FOR COMPLETION  
THROUGH JULY 20, 1974

Ship	Number scheduled	Scheduled and completed	Scheduled and not completed (delinquent)	Percent delinquent	
				Navy	ISD
LHA-1	466	392	74	16	12
LHA-2	376	285	91	24	22
LHA-3	302	140	162	54	56

<sup>a</sup>Construction of LHA-4 and LHA-5 has not progressed to the point where this indicator would be a meaningful measure of progress.

<sup>b</sup>ISD provided the percent delinquent data presented in this column. Comparable data for other columns in this table were not offered.

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DD-963 PROGRAM  
MAJOR EVENTS SCHEDULED FOR COMPLETION  
THROUGH JULY 1974

Ship <sup>a</sup>	Number scheduled		Scheduled and completed		Scheduled and not completed (delinquent)		Percent delinquent	
	Navy	ISD	Navy	ISD	Navy	ISD	Navy	ISD
DD-963	115	108	105	110	10	42	9	0
DD-964	96	82	82	81	14	1	15	1
DD-965	88	77	73	76	15	1	17	1
DD-966	73	70	64	63	9	7	12	10
DD-967	57	50	42	36	15	14	26	28
DD-968	40	30	19	15	21	15	52	50
DD-969	24	25	13	14	11	11	46	44
DD-970	15	15	12	14	3	1	20	7

<sup>a</sup>The construction of DD-971 and subsequent ships has not progressed to the point where this indicator would provide a meaningful measure of construction status.

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Vessel Labor

Vessel labor, defined by ISD as total direct labor less engineering labor, is an indicator that weighs heavily in formulas used by ISD and the Navy to compute progress payments on the two programs. We analyzed vessel labor figures taken from Navy progress reports, and compared them to planned vessel labor taken from the ISD financial plans.

ANALYSIS OF VESSEL LABOR  
LHA PROGRAM  
AS OF JULY 1974  
(All figures in percentages)

<u>Ship</u>	<u>Scheduled to be earned</u>	<u>Earned*</u>	<u>Delinquent to schedule</u>	<u>Percent delinquent</u>
LHA-1	84.5	79.7	4.8	5.7
LHA-2	63.3	52.6	10.7	16.9
LHA-3	33.3	24.0	9.3	27.9
LHA-4	8.1	3.4	4.7	58.0
LHA-5	1.6	1.8	-0-	-0-

\*Navy estimate as of June 1974, projected through July 1974.

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ANALYSIS OF VESSEL LABOR  
DD-963 PROGRAM  
AS OF JULY 1974  
(All figures in percentages)

<u>Ship*</u>	<u>Scheduled to be earned</u>	<u>Earned</u>	<u>Delinquent to schedule</u>	<u>Percent delinquent</u>
DD-963	91.8	67.4	24.4	26.6
DD-964	77.2	54.8	22.4	29.0
DD-965	66.9	45.7	21.2	31.7
DE-966	51.9	38.0	13.9	26.5
DD-967	40.7	25.5	15.2	37.3
DD-968	31.7	14.9	16.8	53.0
DD-969	16.1	5.5	10.6	65.8
DD-970	11.0	4.5	6.5	59.1

\*Construction of DD-971 and subsequent ships has not progressed to the point where this indicator is a meaningful measure of progress.

Compartment Completions  
And Structural Releases

A compartment, according to ISD officials, is complete when all work called for by detailed engineering drawings has been completed. Work incidental to completion includes installation and testing of fixtures and equipment, as well as painting required by contract specifications. Some compartments must be structurally released by the welders before the other trade groups such as electricians and pipefitters can install equipment and fixtures. Since structural

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releases precede compartment completions, they are a progress indicator in the earlier stages of construction, before a significant number of compartments are completed.

Navy status reports as of the end of July 1974 showed progress on compartment completions and structural releases to be as follows.

LHA PROGRAM  
COMPARTMENT COMPLETIONS AND STRUCTURAL RELEASES

<u>Ships<sup>a</sup></u>	<u>Number scheduled</u>	<u>Scheduled and completed</u>	<u>Scheduled and not completed (delinquent)</u>	<u>Percent delinquent</u>	<u>Through date</u>
<u>Compartment completions</u>					
LHA-1	497	81	416	84	7-26-74
<u>Structural releases</u>					
LHA-2	880	480	400	45	7-20-74
LHA-3	448	23	425	95	7-20-74

<sup>a</sup>LHA's 4 and 5 have not progressed to the point where this indicator is a meaningful measure of construction status.

DD-963 PROGRAM  
COMPARTMENT COMPLETIONS  
THROUGH JULY 31, 1974

<u>Ship<sup>a</sup></u>	<u>Number scheduled</u>	<u>Scheduled and Completed</u>	<u>Scheduled and not completed (delinquent)</u>	<u>Percent delinquent</u>
DD-963	174	63	111	64
DD-964	86	-0-	86	100
DD-965	16	-0-	16	100

<sup>a</sup>DD-966 and subsequent ships have not progressed to the point where this indicator is a meaningful measure of construction progress.

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Work Package Completions

Work packages are work authorizations. Among other things they authorize yard supervisors to install equipment on board; install piping, wiring and other pre-outfitting work in structural hull assemblies before the assemblies become part of the ship; conduct required tests; and draw materials needed to install equipment and do pre-outfitting.

The following schedules based on ISD's Group Statistical Reports summarize the completion status of major groups of work packages. Both schedules exclude support work packages, because the completed packages do not become part of the ship and therefore are not a measure of physical completion of the ship.

LHA PROGRAM  
WORK PACKAGE COMPLETIONS  
THROUGH AUGUST 10, 1974

<u>Ship</u>	<u>Scheduled for Completion</u>	<u>Scheduled and completed</u>	<u>Scheduled and not completed (delinquent)</u>	<u>Percent delinquent</u>
LHA-1	9110	4155	4955	54
LHA-2	6128	2027	4101	67
LHA-3	2387	915	1472	62
LHA-4	1688	107	1581	94
LHA-5	1019	71	948	93

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DD-963 PROGRAM  
WORK PACKAGE COMPLETIONS  
THROUGH AUGUST 10, 1974

Ship	Scheduled for Completion		Scheduled and Completed		Delinquent to schedule		Percent delinquent	
	Navy	ISD	Navy	ISD	Navy	ISD	Navy	ISD
DD-963	4697	4821	2601	3242	2096	1579	45	33
DD-964	2964	3060	1557	1946	1407	1114	47	36
DD-965	2981	3242	1104	1488	1877	1754	63	54
DD-966	2366	2455	981	1280	1385	1175	59	48
DD-967	1747	1749	491	597	1256	1152	72	66
DD-968	1326	1326	349	431	977	895	74	67
DD-969	711	711	108	133	603	578	85	81
DD-970	289	289	92	110	197	179	68	62
DD-971	68	69	12	14	56	55	82	80
DD-972	34	35	11	12	23	20	68	57

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