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REPORT BY THE U.S.

# General Accounting Office

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## Better Planning And Management Of Army Watercraft Could Improve Mission Capability While Reducing Excess Numbers And Costs

The Army is spending \$23 million a year to operate, maintain, and store its watercraft. Additionally, it has established an \$80 million program to improve some ships no longer required.

The Army should:

- Dispose of unneeded watercraft.
- Make sure that funds are not spent on unneeded watercraft.
- Develop more realistic plans for off-shore resupply operations.
- Delay procurement of a new air cushion vehicle until its true performance and costs are determined.



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LCD-79-419  
AUGUST 2, 1979



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

LOGISTICS AND COMMUNICATIONS  
DIVISION

B-133170

The Honorable Harold Brown  
The Secretary of Defense

Dear Mr. Secretary:

This report suggests ways in which the Army can more efficiently and effectively manage its watercraft program. The Army needs to dispose of unneeded watercraft, develop more realistic plans for offshore resupply operations, and delay the procurement of a new air cushion vehicle until the vessel's true performance and costs are determined.

As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Director, Office of Management and Budget, and the Chairmen, House and Senate Committees on Appropriations and Armed Services and House Committee on Merchant Marine and Fisheries. Additionally, because of his special interest in the 30-ton lighter air cushion vehicle, we are sending a copy to Congressman G. William Whitehurst.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Donald J. Horan".

R. W. Gutmann  
Director

D I G E S T

The Army could more efficiently and effectively manage its watercraft if it

- disposed of unneeded watercraft,
- developed more realistic plans for offshore resupply operations, and
- delayed procurement of a new watercraft until the vessel's true performance and costs are determined.

The Army spends about \$23 million annually to maintain, operate, and store those watercraft. (See p. 6.)

QUESTIONABLE NEED FOR SOME  
WATERCRAFT ASSETS

The Army's watercraft requirements are questionable because adequate supporting documentation is not available, some assets are seldom used, and other assets have been recognized by the Army as excess.

The need for 93 watercraft assigned to an operational project in Europe has also been questioned. The European Command advised the Army that these watercraft were not needed in view of available fixed ports and host nation agreements and asked that they be transferred to another command. The Army did not agree because firm host nation support agreements did not exist. However, an Army official said that, when the support agreements are signed, the assets in Europe would be used to satisfy other needs or would be declared excess. (See p. 8.)

(LCD-79-419)

Although the Army has a current inventory of about 840 watercraft, it has determined that its requirements total 500. Although there are shortages for specific watercraft types, in gross terms, the Army has many more assets than required. The excess watercraft are likely causing the Army to spend millions of dollars a year for unnecessary operations, maintenance, and storage costs.

Additionally, the Army has established an \$80 million program to improve watercraft, some of which are excess to requirements. (See p. 9.)

#### ACCOMPLISHING THE RESUPPLY MISSION

The Secretary of Defense has directed the Army to plan to support a corps force capable of deploying anywhere in the world. In GAO's opinion, <sup>however</sup> it is doubtful that the Army could conduct such an over-the-shore operation within the expected time frame because:

- Watercraft units are reporting low operational readiness, and the actual readiness may be even lower. (See p. 12.)
- Commercial 1/ ships, on which the Army is depending to transport its watercraft to the area of operations, may not be available when needed, and no priorities have been set on using the ships. (See pp. 13 and 14.) Also, the alternative of towing may be too time consuming. (See p. 16.)
- An over-the-shore logistics capability using containers has not yet been satisfactorily developed. (See p. 18.)

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1/Commercial, as used in this report, refers to Military Sealift Command owned or controlled ships.

## PURCHASING NEW WATERCRAFT

Recognizing a need for container-handling capability and believing that the current inventory could not adequately fill this need, the Army has established a requirement for 29 amphibians known as the 30-ton lighter air cushion vehicle. In fiscal year 1979, the Congress appropriated \$21 million for four vessels. The Office of Management and Budget, in fiscal year 1980, approved \$20.8 million for four more vessels. (See p. 20.) This procurement decision appears to be premature because:

- The requirement has not been firmly established in that some Army officials believe vessels already in the inventory can satisfy the need for container capability.
- Testing has not been adequate to determine the vessel's true performance or fuel costs.

Throughout the program, several Army agencies questioned the adequacy of the vessel's developmental and operational testing. Their concerns included inadequate logistics support planning, the many modifications proposed during testing, and the unrealistic test environment. Some officials believed additional tests, as well as a cost analysis, should be conducted. (See pp. 23 and 24.)

The testing that was conducted showed that the vessel was a logistics burden and that it rated poorly in reliability, availability, maintainability, and load-carrying capability. Whether proposed modifications will correct these problems was not confirmed before the Army made its procurement decision. (See pp. 27 and 28.)

## RECOMMENDATIONS

- X The Secretary of Defense should direct the Army to:

- Review watercraft requirements to ensure that they can be adequately justified. (See p. 10.)
- Dispose of unneeded watercraft. (See p. 10.)
- Expedite the signing of host nation support agreements so that watercraft stored in Europe could be used to satisfy other needs or declared excess. (See p. 10.)
- Establish criteria for authorizing watercraft to table of distribution and allowances units. (See p. 10.)
- Make sure that Product Improvement Program funds will not be spent on unneeded watercraft. (See p. 10.)
- Establish, with the Joint Chiefs of Staff and the Military Sealift Command, priorities to take maximum advantage of available transportation and to ensure that Army watercraft are transported to the area of operations when needed. (See p. 19.)
- Not commit any procurement funds for a new air cushion vehicle until it makes a cost and economic evaluation analysis to determine that its requirements cannot be satisfied by onhand assets and until further testing determines its cost effectiveness and utility in a realistic military environment. (See p. 32.)

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#### AGENCY COMMENTS

The Army agreed with most of GAO's recommendations. It did not agree that a criteria should be established for authorizing watercraft to table of distribution and allowances units. However, it agrees it needs a criteria for the retention of watercraft by these units. Army Regulation 310-34 will be changed to include watercraft utilization criteria.

Army officials said that their decision to acquire the 30-ton lighter air cushion vehicle was made after all dissenting views were considered. These views were thoroughly aired before the procurement decision was made. Army officials said that no information which GAO had not previously considered was available during the decisionmaking process. GAO continues to believe the procurement decision was premature and that further analysis is needed.

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#### ABBREVIATIONS

GAO	General Accounting Office
LACV	lighter air cushion vehicle
LARC	lighter amphibious resupply cargo
LEA	Logistics Evaluation Agency
OTEA	Operational Test and Evaluation Agency
TDA	table of distribution and allowances

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## CHAPTER 1

### INTRODUCTION

During a contingency, Army troops will need to be resupplied with ammunition, fuel, spare parts, food, etc., to sustain their operations. The Army has acquired watercraft to resupply its combat troops and to carry out terminal services at U.S. and foreign seaports.

As of September 30, 1978, the Army had about 840 watercraft (see app. I) valued at about \$340 million. Of the 840 watercraft, 518 are maintained in the Active and Reserve Army Forces. Army records do not identify operating and maintenance costs specifically associated with watercraft; however, based on information developed at Fort Eustis, Virginia, 1/ we estimate that it costs at least \$19 million a year to operate and maintain the active watercraft.

Some watercraft are kept in storage. The Charleston, South Carolina, storage activity, which is operated by a commercial contractor, has 64 watercraft, and the Sharpe Army Depot in Stockton, California, has 95. The annual storage cost of these two activities is \$2 million, or about \$15,000 a unit. In addition, 93 watercraft are stored at Hythe, England, at an Army-projected cost of about \$2.1 million for fiscal year 1979. Therefore, the Army spends about \$4.1 million annually, or about \$18,000 per unit, to store watercraft. 2/

Because a large number of watercraft were acquired in the 1940s and 1950s and are now approaching obsolescence, the Army has experienced considerable difficulty in maintaining them. The Army has estimated that it would cost about \$2 billion to replace its watercraft. To bridge the gap until the introduction of new replacement watercraft, the Army has initiated a program to extend the vessels' lives by 10 to 12 years. The program, expected to be completed by 1981, is estimated to cost about \$80 million.

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1/In fiscal years 1977 and 1978, Fort Eustis' operation and maintenance costs for 108 watercraft averaged \$3.9 million, or \$37,000 per craft.

2/The cost for the remaining 70 watercraft, stored at the locations shown in app. I, was not readily available.

The photographs on pages 4 and 5 illustrate some of the Army's watercraft.

### RESUPPLY OPERATIONS

In the initial phase of a confrontation, combat troops will be resupplied by air since air is the fastest means. Subsequently, a significant portion of the troops' material needs will be moved by cargo ships. When the ships reach the area of operation, they will use fixed ports as much as possible to offload their cargo. Some of the factors which affect the availability of fixed ports are:

- The area of the world in which the contingency occurs. Lesser developed countries will probably have fewer fixed ports than better developed countries.
- The ability of U.S. or allied troops to secure and protect fixed port facilities.

If fixed ports are not available or if they are destroyed, denied, or tactically desirable to bypass, cargo ships will have to be unloaded offshore and the material brought to shore by other means. This operation, commonly referred to as an over-the-shore logistics operation, involves

- unloading cargo from ships at sea (ship unloading subsystem),
- transporting cargo from ship to shore (lighterage subsystem), and
- moving cargo to a designated beach area to await further distribution (shoreside subsystem).

In addition to maintaining watercraft for over-the-shore operations, the Army is required to operate water terminals and to conduct logistics operations in coastal, harbor, and inland waterway areas. The same types of watercraft are used for both over-the-shore and coastal, harbor, and inland operations, with the possible exception that amphibians are not needed for the latter.

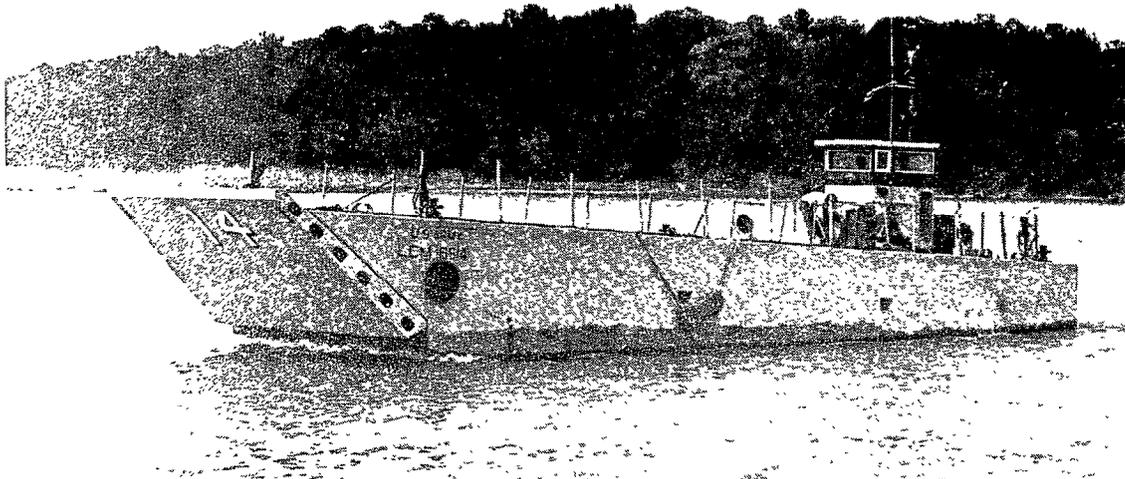
## SCOPE OF REVIEW

We made our review primarily to evaluate the Army's requirements for operating and maintaining watercraft and amphibians. We examined the policies, criteria, and procedures used and discussed with Army officials the methods for determining the number of watercraft needed. We also evaluated the readiness of the watercraft to perform assigned missions.

We worked at the following locations.

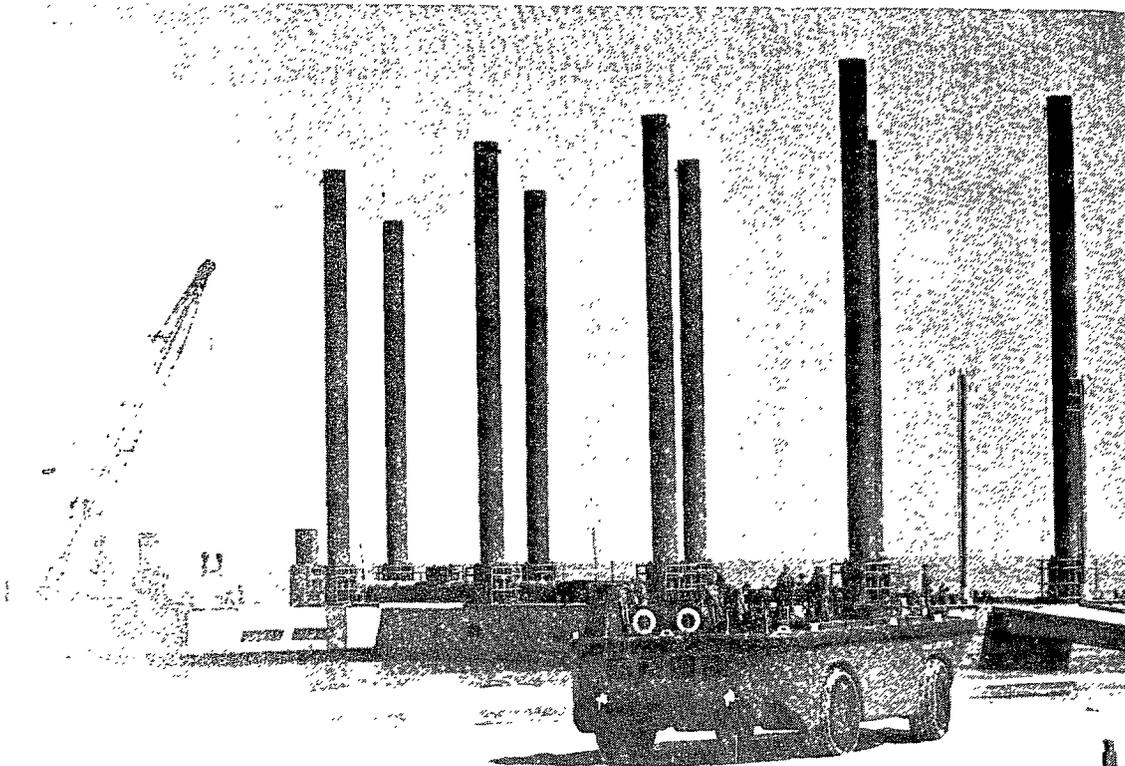
- Headquarters, United States Army, Washington, D.C.
- United States Army Training and Doctrine Command, Fort Monroe, Hampton, Virginia.
- United States Army Troop Support and Aviation Materiel Readiness Command, St. Louis, Missouri.
- United States Army Transportation Center and Fort Eustis, Fort Eustis, Virginia.
- Charleston Storage Activity, Charleston, South Carolina.
- Aberdeen Proving Ground, Aberdeen, Maryland.

Although the Navy uses many of the same types of craft as those used by the Army, the Navy was not included in this review.



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**FIGURE 1. LANDING CRAFT MECHANIZED**



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**FIGURE 2. SELF-ELEVATING (DELONG) PIER WITH A LARC-LX IN FOREGROUND**

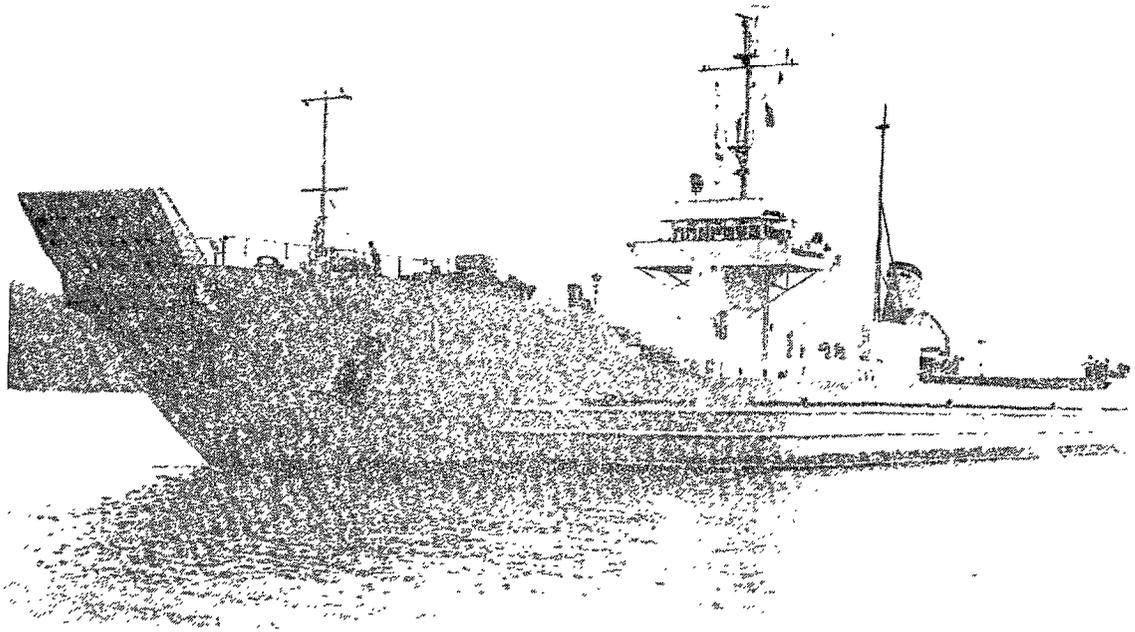


FIGURE 3. BEACH DISCHARGE LIGHTER COURTESY OF U.S. ARMY

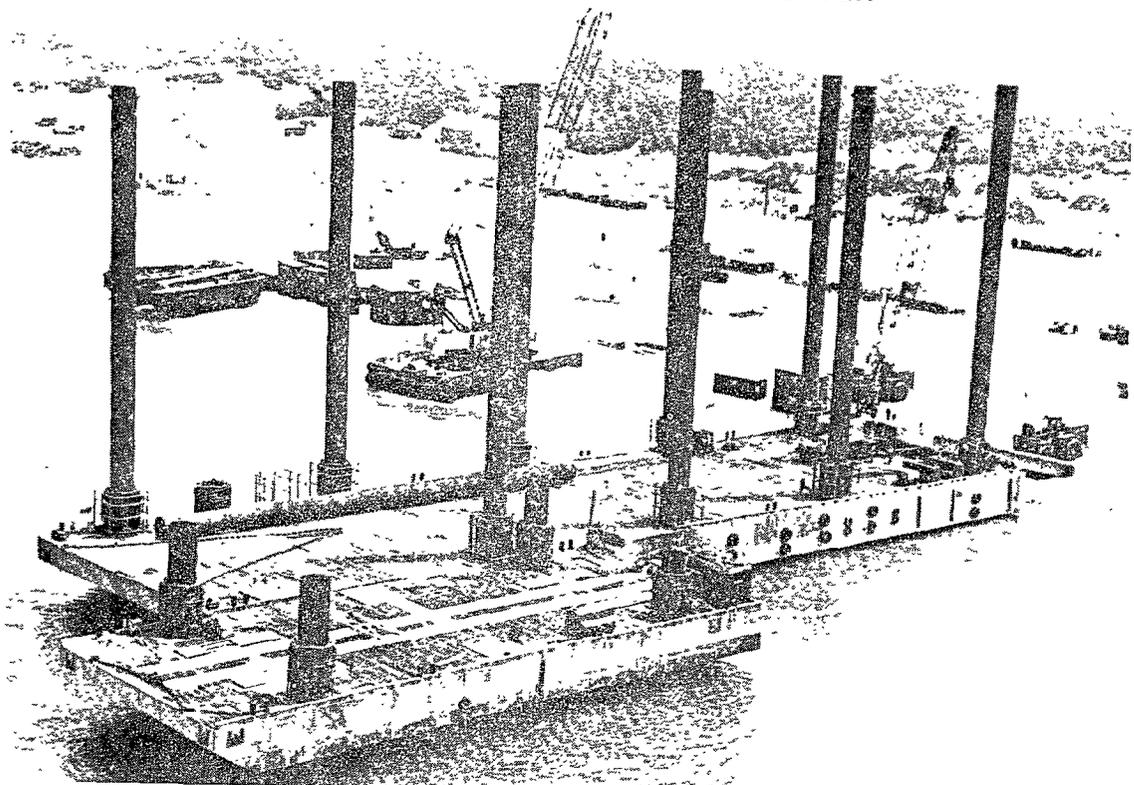


FIGURE 4. DELONG PIERS BOTH "A" AND "B" COURTESY OF U. S. ARMY

## CHAPTER 2

### DO WATERCRAFT ASSETS MATCH ARMY REQUIREMENTS?

To efficiently and effectively manage its watercraft program, the Army must first determine how many and what types of watercraft will be needed. Determining such requirements is difficult, partly because watercraft planned for use in over-the-shore logistics operations will actually be used only as a last resort. That is, if fixed ports are available for offloading Army supplies in a contingency, over-the-shore operations will not be necessary. Planning must therefore consider the expected availability of fixed ports, as well as the amount of host nation support that can be expected to contribute to the resupply operation. Also, the amounts of supplies expected to be needed by combat troops must be considered in determining the types of watercraft, in terms of their load-carrying capability, that will be required.

After considering these and other factors, requirements should be matched with assets. That is, if requirements exceed current watercraft assets, more watercraft should be obtained to enable effective accomplishment of the Army's watercraft missions. If assets exceed requirements, the excess watercraft should be disposed of. Otherwise, funds will be spent unnecessarily on operating, maintaining, and storing the excess watercraft.

Currently, the Army spends about \$23 million annually to operate, maintain, and store its watercraft. Some of these assets exceed Army requirements and are seldom used. The excess may increase if certain host nation agreements being negotiated are signed. In addition to spending millions of dollars on maintaining and storing excess watercraft, the Army has established an \$80 million program to improve certain watercraft, some of which exceed requirements.

### WATERCRAFT REQUIREMENTS

The Army categorizes its watercraft requirements as (1) table of organization and equipment, (2) table of distribution and allowances (TDA), (3) operational projects, and (4) war reserve and maintenance float requirements, as discussed below. These requirements are questionable because adequate supporting documentation is not available, some assets are seldom used, and other assets have already been recognized by the Army as excess.

### Table of organization and equipment requirement

In a March 1978 consolidated guidance document, the Secretary of Defense directed the Army to plan to support a corps force capable of deploying anywhere in the world. The requirement to support this force was based on the daily tonnage of supplies and ammunition to support 100,000 troops.

Most of the Army's table of organization and equipment requirement of 172 watercraft (see app. II) are intended to support the corps force. These watercraft can be used for both over-the-shore and coastal, harbor, and inland operations.

### Table of distribution and allowances requirement

The Army told us that 157 watercraft were required to support its operations--119 in the United States and 38 in 6 foreign countries. (See app. III.) These watercraft are used in positioning supply ships and moving cargo and personnel and for patrol and training.

In attempting to compare the onhand TDA watercraft with their current justifications, we found that the individual units did not have justification documents on file. This was attributed to the fact that most of the units had been in existence several years and such documents were either in storage or had been destroyed. However, an Army official stated that about every 3 years TDA watercraft are subjected to a justification review, including a review of usage records and preparation of reports on watercraft found to be unjustified.

### Operational project requirement

The Army has only one watercraft operational project which is referred to as minimum required logistics augmentation, Europe. The Army has stated a need for 101 watercraft to support this project. (See app. IV.)

### War reserve and maintenance float requirement

Although the Army's watercraft product manager said that 70 watercraft are required for war reserve and maintenance

float (see app. V), he was unable to furnish us the basis for the requirement. Another Army official said, however, that generally this requirement is 20 percent of the table of organization and equipment and TDA requirement.

#### QUESTIONABLE NEED FOR SOME WATERCRAFT ASSETS

Although the Army has a current inventory of about 840 watercraft, it has determined that its requirements total 500. Although there are shortages for specific watercraft types, in gross terms, the Army has many more assets than required. Our work at TDA units at Fort Eustis and Aberdeen Proving Grounds, which operate about 26 percent of the Army's TDA watercraft, also showed that watercraft may be excess to needs. Some were used infrequently, and others had already been recognized by the Army as excess. Two examples follow.

--The unit at Aberdeen had 15 watercraft, the majority of which were used for patrol purposes. We did not attempt to determine if a valid need existed for these watercraft. However, records for the 11 patrol boats showed that usage ranged from 9 to 90 percent and averaged 52 percent in fiscal year 1978. Army officials told us that they were unaware of any criteria for determining how many patrol boats were needed.

--The TDA watercraft at Fort Eustis are used for training. Of the 26 assigned, 9 are lighter amphibious resupply cargo (LARCs) used by the transportation school. Six of the nine have been declared excess and are awaiting disposition instructions.

The 93 watercraft assigned to the European operational project (see p. 7) are also of questionable need. The European Command has advised the Army that these watercraft are not needed in view of the availability of fixed ports and host nation support agreements and had requested that they be transferred to another Army command and physically relocated to the United States. This request was predicated on intelligence data which indicated that, even if the majority of the fixed ports were destroyed by enemy action, sufficient capability would remain to more than satisfy daily tonnage requirements for supplies and ammunition.

The Department of the Army did not concur with this request because firm host nation support agreements did not exist. An Army official told us that when the support agreements are signed, the assets in Europe would be used to satisfy other needs or would be declared excess. The official also said that if and when this operational project is no longer needed, one of the table of organization and equipment floating craft companies will be deactivated.

#### PRODUCT IMPROVEMENT PROGRAM

To extend the lives of its aging watercraft until replacements are procured and to comply with Environmental Protection Agency requirements, the Army had initiated a product improvement program. The improvements consist of updating machinery to extend the useful lives of watercraft by 10 to 12 years; replacing obsolete and unsupportable electronics, communications, and navigational equipment with state-of-the-art equipment; and providing means to clean waste and oil-contaminated water. Total improvements have been estimated to cost about \$80 million.

As of September 1978, the Army had spent slightly more than \$31 million. Some of the additional \$49 million is planned for unneeded assets. For example, the Army plans to update machinery and communications systems on 119 LCM-8 watercraft in fiscal years 1979 and 1980 at an estimated cost of \$4.7 million. Yet total requirements for the LCM-8 are about 70. The Army also plans to make ramp improvements to 72 LARC-XVs at an estimated cost of \$1.3 million in the same year. But the Army has a requirement for only 10 LARC-XV. (See p. 11 for picture.)

#### CONCLUSIONS

Although there are shortages for specific watercraft types, the Army has many more assets than required. As a result, some assets are underused and millions of dollars are likely being spent on maintaining, operating, storing, and improving unneeded watercraft.

In view of these unnecessary expenditures, we believe a reassessment of requirements and assets is needed. Only those assets which have a valid justification, considering all pertinent factors, should remain in the inventory, and those that do not should be disposed of to reduce watercraft

management costs. Further, only those watercraft needed to meet current and future requirements should be included in the product improvement program.

#### RECOMMENDATIONS

We recommend that the Secretary of Defense direct the Secretary of the Army to

- review watercraft requirements to ensure that they can be adequately justified,
- relate requirements to available watercraft and dispose of unneeded watercraft,
- expedite the signing of host nation support agreements so that assets stored in Europe could be used to satisfy other needs or declared excess,
- establish criteria for authorizing watercraft to TDA units, and
- make sure that product improvement program funds are not spent on unneeded watercraft.

#### AGENCY COMMENTS

The Army agreed that (1) watercraft requirements should be reviewed to ensure that they can be adequately justified, (2) requirements should be related to available watercraft and that they should dispose of unneeded watercraft, (3) agreements for host nation support should be expedited, and (4) product improvement funds should not be spent on unneeded watercraft.

The Army did not agree that a criteria should be established for authorizing watercraft to TDA units. They agreed, however, that the Army needs a criteria for the retention of watercraft by these units. Army Regulation 310-34 will be changed to include watercraft utilization criteria. The revised regulation will provide documented records to support retention or turn-in of watercraft assigned to TDA units.

Although the retention criteria is good, we believe that it should also be used to establish initial watercraft requirements. Otherwise, the equipment need may be established on one basis and justified for retention on another basis. We believe they both should be the same.

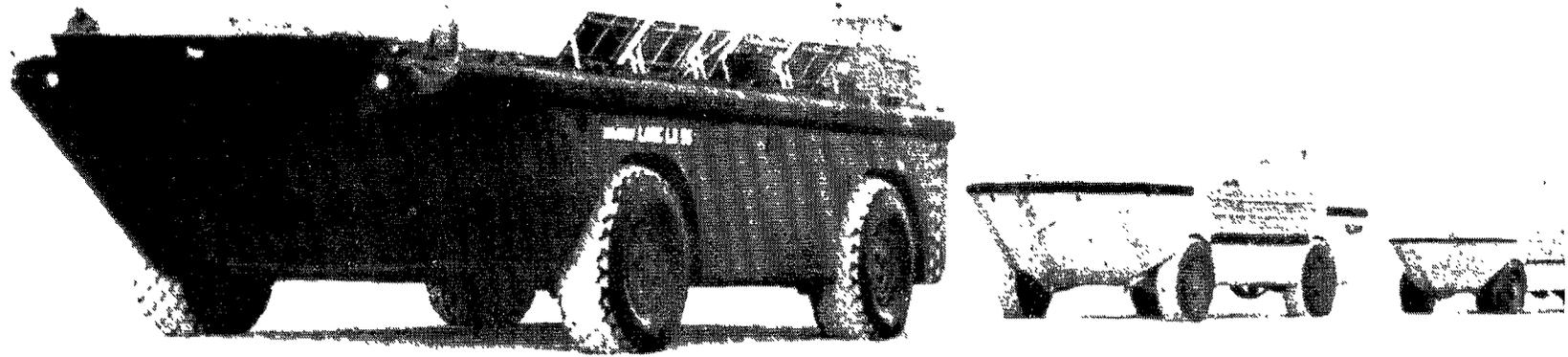


FIGURE 5. LARC-LX, LARC-XV, AND LARC-V

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### CHAPTER 3

#### CAN THE ARMY ACCOMPLISH ITS RESUPPLY MISSION?

Although the Secretary of Defense has directed the Army to plan for resupplying a corps force anywhere in the world, the Army might not be able to do so due to

- the low operational readiness of its watercraft,
- the unavailability of required vessels and the lengthy time needed to deploy essential equipment, and
- its inadequate capability to conduct over-the-shore operations using containers.

#### LOW OPERATIONAL READINESS

The reported readiness conditions of watercraft units indicate that they may not be capable of carrying out their over-the-shore mission. The material readiness reports of the five watercraft companies we reviewed showed that two companies met the readiness standard in only one quarter each in fiscal year 1978, as shown below.

Type of company	Percent of readiness				
	Standard	Reported in quarter			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Heavy boat (LCU)	83	75	56	49	54
	83	64	78	73	70
Medium boat (LCM)	83	87	71	77	62
	83	71	69	27	87
Floating craft (tugs and cranes)	75	59	31	25	23

The operational readiness of the two heavy boat companies and the two medium boat companies ranged from a low of 33 to a high of 70 percent as of November 15, 1978.

Further, the actual readiness of Army watercraft units may be even lower than that reported. The U.S. Army Audit Agency reported, 1/ for example, that the Army had not

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1/Report EC.78.25 (Sept. 7, 1978).

published equipment serviceability criteria to determine the condition of watercraft. In the absence of such criteria, watercraft are reported either operationally ready or not operationally ready, as subjectively determined by unit commanders. The audit report also pointed out that, because many units reported watercraft as operationally ready when they were not, higher level commanders could not use the reports to identify readiness problems. The Audit Agency recommended the establishment of objective and comprehensive criteria for determining the operational status of watercraft. The Army agreed and stated that a new readiness reporting system would be implemented.

Although the Army stores assets that would be required to support the corps force, some of these assets are not in usable condition. For example, the 18 LARC-LX wheeled amphibians that the Army stores at the Charleston Storage Activity and the Sharpe Army Depot are not in usable condition, according to inventory records.

#### PROBLEMS IN TRANSPORTING WATERCRAFT TO AREA OF OPERATIONS

Most of the Army's watercraft are not considered seagoing vessels because of their size. Basically, only the cargo vessels, the beach discharge lighters, and some of the tugs are seagoing. Therefore, most of the watercraft needed in an over-the-shore operation must be either transported by commercial 1/ vessels or towed by tugs. Certain Navy vessels are capable of transporting Army watercraft, however, there is no plan for doing so.

Depending on commercial vessels to transport Army watercraft and equipment to the area of operations could cause problems because the vessels might not be available when needed. Also, if tugs are used to tow the watercraft, the watercraft would likely not reach the area of operation on time.

#### Questionable availability of commercial vessels

Several types of watercraft, such as mechanized landing craft, utility landing craft, tugs, and 100- to 250-ton crane barges, are necessary for a successful over-the-shore

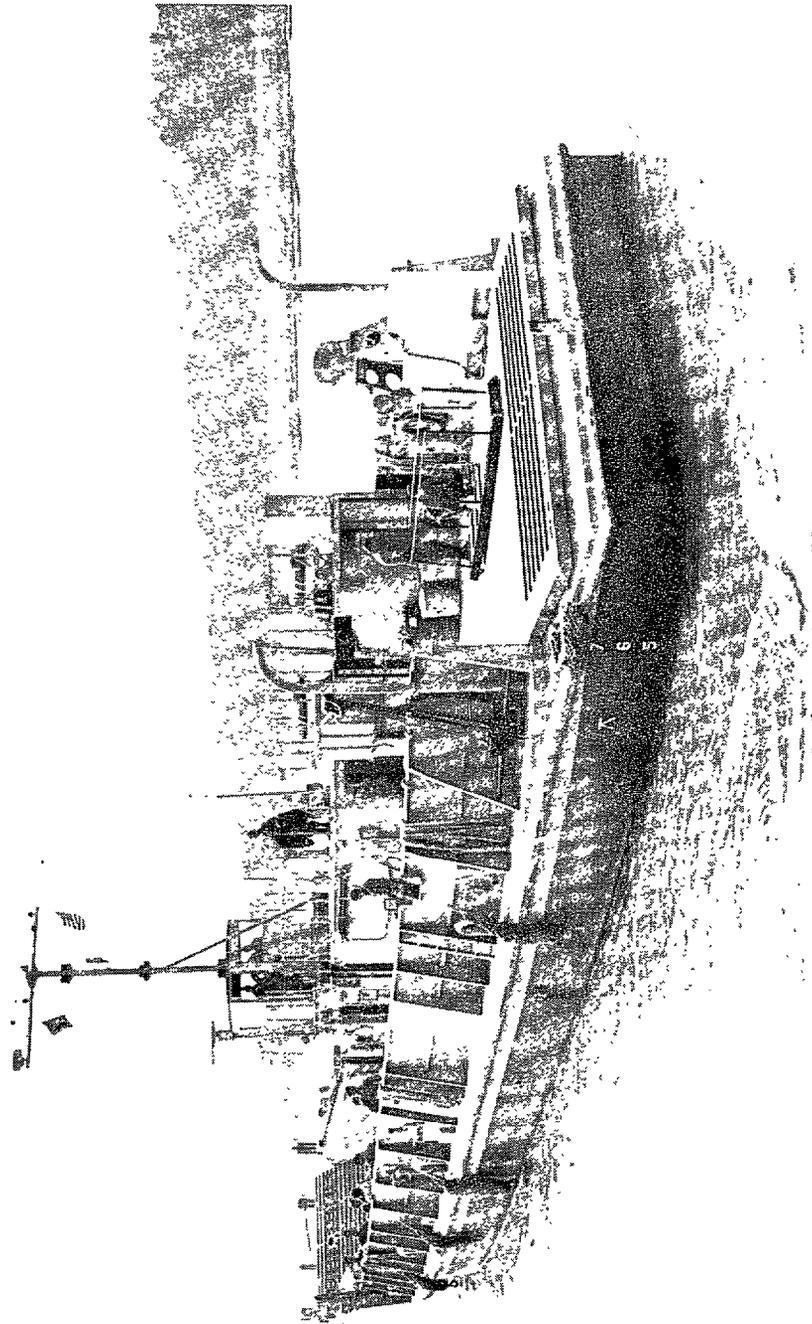
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1/Commercial, as used in this report, refers to Military Sealift Command owned or controlled ships.

operation and/or terminal and port operation. Because of the size and weight of some of these watercraft, they can be transported only on certain types of vessels. For example, the 100- to 250-ton crane barges can be transported only on SEABEE ships. But there are only three SEABEEs in the U.S. maritime inventory. As with all barge ships, the SEABEE requires no dock or pier to load or unload cargo. In addition to nearly eliminating port delays, the barge's ability to maneuver in shallow water allows service to be offered to areas which otherwise would be inaccessible to large oceangoing vessels.

The Department of Defense obtains commercial ships for a less-than-full mobilization contingency through the Sealift Readiness Program, administered by Defense through the Military Sealift Command. Under this program, the participating carriers make a certain percentage of their fleet available at the call of the command. However, the carriers were not required to provide certain types of ships, such as the SEABEE. However section 2 of the Maritime Appropriation Authorization Act for Fiscal Year 1979 (Public Law 95-298, 92 Stat. 339) provided that any vessel receiving a construction or operating subsidy for fiscal year 1979 must be offered for enrollment in this program. Unless this provision is included in Maritime Appropriation Authorization Acts for future years or unless permanent legislation is enacted requiring ships needed by the Army to transport watercraft be enrolled in the Sealift Readiness Program, there will be no assurance the SEABEEs will be part of the Sealift Readiness Program.

Even in a full mobilization situation, there may be several days' delay before the three SEABEE ships can be made available to the Army, depending on their location at the time they are mobilized and the priority assigned to the Army. Army and Joint Chiefs of Staff officials told us, however, that under full mobilization, priorities for the number and types of vessels needed would be set if and when the time arose.



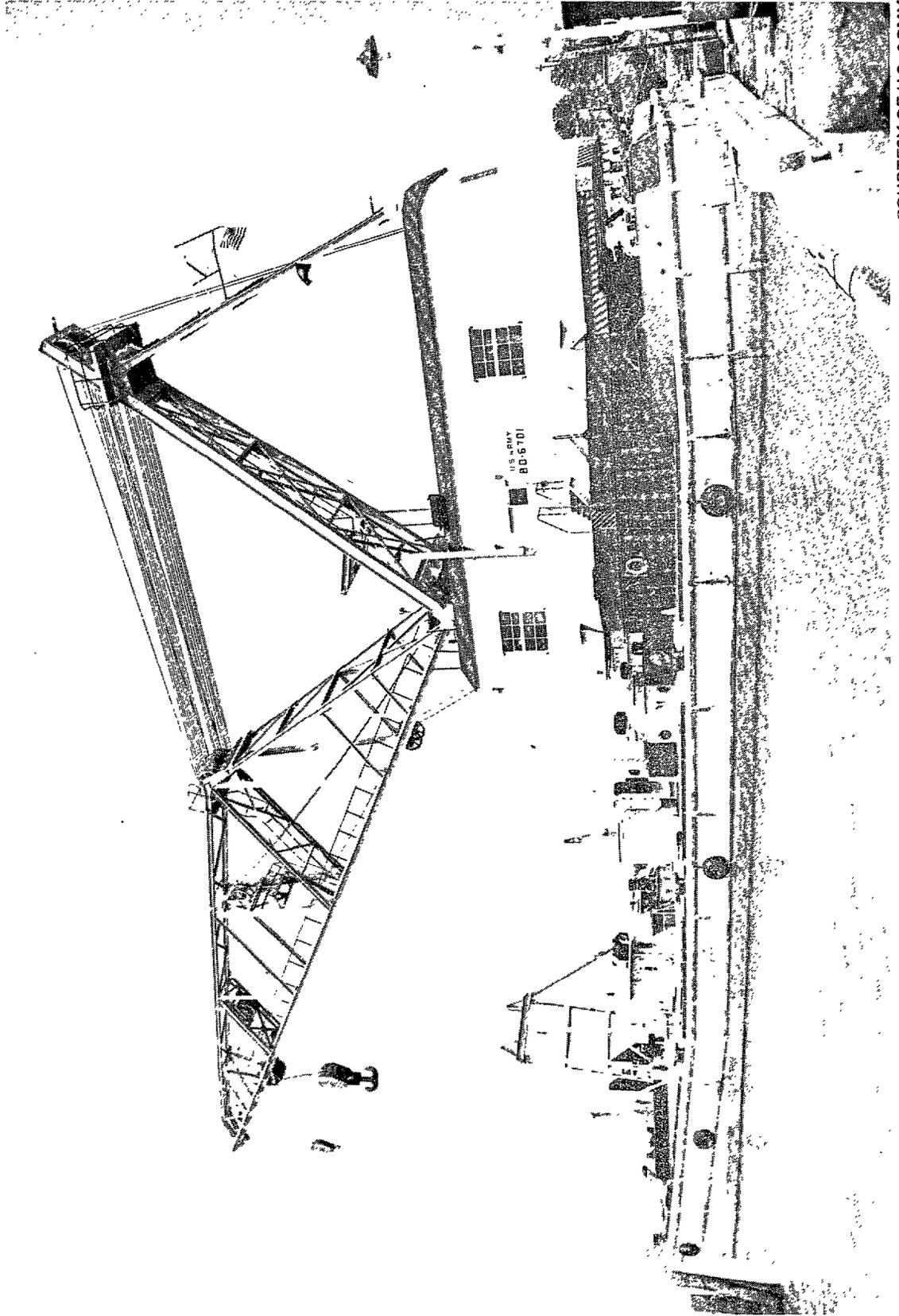
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FIGURE 6. LANDING CRAFT UTILITY

### Towing problems

If the necessary ships are not available or if they are not capable of transporting Army watercraft, consideration would have to be given to towing by oceangoing tugs. However, towing would take a long time, even in low to moderate seas. Therefore, if the resupply operation must begin within about 30 days as is expected, towing may be completely impractical.

For example, Army tests and demonstrations have shown that in an over-the-shore operation using containers, it is essential to have a temporary container discharge facility, which is a 250-ton crane on a "B" Delong pier/ barge. (See photograph on p. 17.) Because of the facility's excessive weight and size, it can be transported only on a SEABEE or towed. According to Army officials, it is highly improbable that the facility could be towed to the area of operations in 30 days or less. In fact, they stated that a more realistic time would be approximately 45 days, depending on sea conditions.



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FIGURE 7. 100-TON FLOATING CRANE

## INADEQUATE SUPPORT FOR OVER- THE-SHORE CONTAINER OPERATIONS

In 1970 the Joint Logistics Review Board recognized that containers would be required in over-the-shore logistics operations because of the commercial fleet's transition from break-bulk (loose cargo) ships to container ships. The board recommended that the services jointly develop and test the capabilities and procedures necessary for over-the-shore container operations and procure the equipment needed to support contingency operations in underdeveloped areas.

A joint Army-Navy operational test of currently developed equipment and techniques was completed in the summer of 1977. Defense officials expect that a realistic assessment of capabilities and limitations should be possible based on this test data and the military departments now plan to complete their over-the-shore system development by 1980. However, funding and developmental uncertainties may cause further delays.

No adequate capability for sustained over-the-shore container operations currently exists, according to Defense officials. Also, in its April 1978 report, the Army Materiel Systems Analysis Activity stated that the Army could not adequately support an over-the-shore operation using containers primarily because it did not have an acceptable capability to unload non-self-unloading container ships. In our opinion, much must be done to complete development enabling the services to conduct satisfactory over-the-shore container operations.

## CONCLUSIONS

It is doubtful that the Army, at this time, could adequately support an over-the-shore operation of the magnitude necessary to resupply a corps force of combat troops. Although such an operation would most likely be needed about 30 days after D-day, Army planning and management of its watercraft have not been adequate to ensure that the watercraft will be there when needed. Some watercraft are not stored in usable condition. They, therefore, may not be readily available in a contingency. In addition, ships on which the Army is depending to transport its watercraft to the area of operations, may not be available when needed, and no priorities have been set on using the ships. If the

ships are not available, the Army plans to tow its watercraft by tugboats. This alternative also presents problems, because towing is expected to be too time consuming.

If, in spite of these potential problems, watercraft reach the area of operations within the necessary time frame, they may not be able to accomplish their resupply mission due to readiness problems. Our review, as well as work done by the Army Audit Agency, showed that watercraft units were reporting low readiness and that their actual readiness may be even lower. Because the Army has not established firm criteria for determining the condition of watercraft, readiness reports have been based primarily on unit commanders' subjective judgments. The Army has said it would take corrective action in this area.

Another factor inhibiting the Army's watercraft capability is that it cannot adequately support an over-the-shore operation using containers, even though the commercial fleet is converting to container ships. The system being developed to unload container ships offshore should therefore be given emphasis.

To adequately meet its resupply mission, the Army should revise its planning and management of watercraft to more accurately reflect the operating environment expected to prevail during a contingency. More realistic plans, as well as established priorities for using and transporting watercraft, are needed.

#### RECOMMENDATION

We recommend that the Secretary of Defense direct that the Army, the Joint Chiefs of Staff, and the Military Sealift Command, establish priorities to take maximum advantage of available transportation and to ensure that Army watercraft can be transported to the area of operation when needed.

#### AGENCY COMMENTS

The Army concurred with our recommendation.

## CHAPTER 4

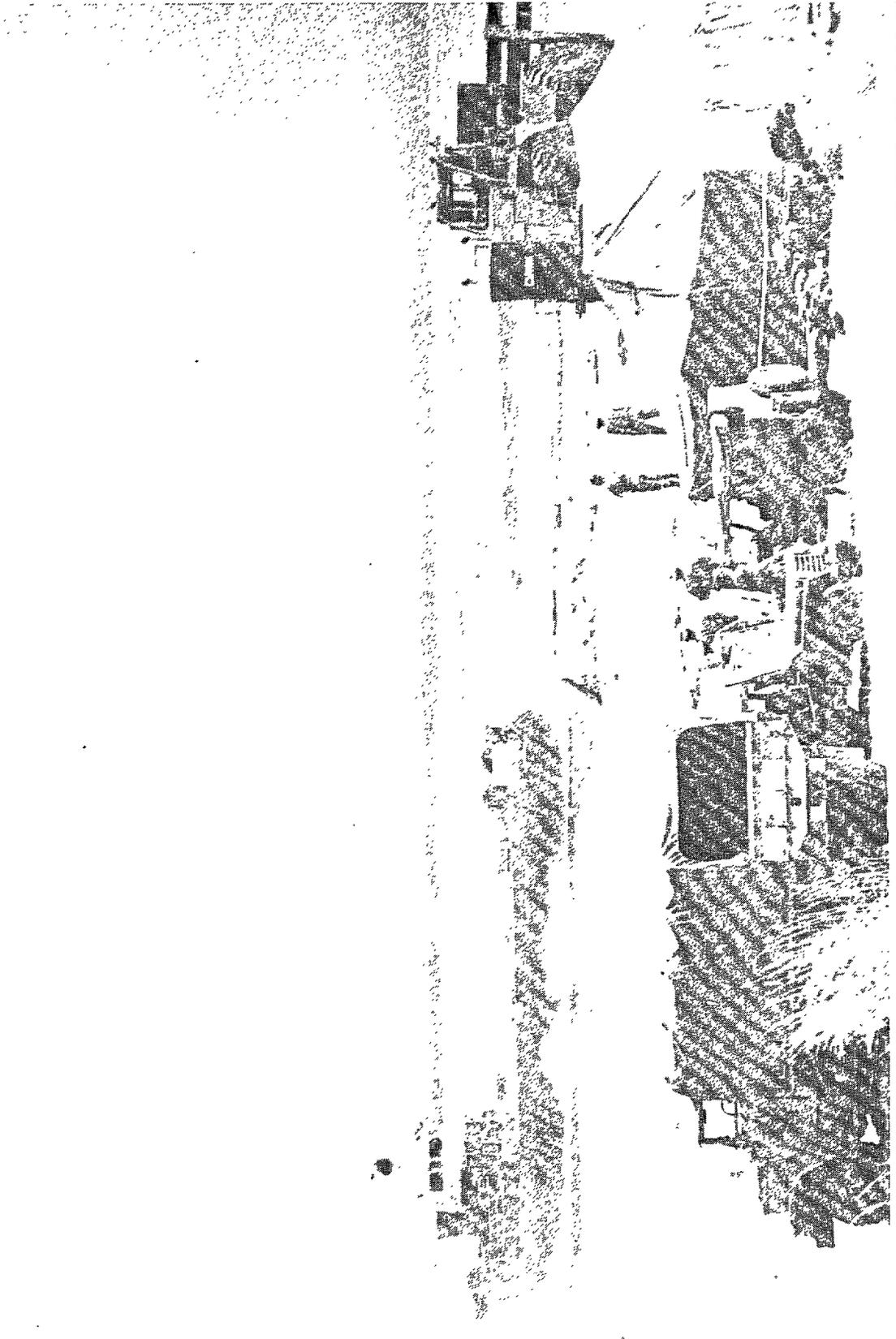
### IS PROCUREMENT OF THE LACV-30 WARRANTED?

With commercial shippers converting to containerized cargo, the Army realized that some of its current watercraft would inhibit fast turnaround of container ships and thereby reduce productivity. The Army concluded that the air cushion vehicle concept should be developed for use in an over-the-shore logistics operation. A study conducted by the Army to identify its watercraft needs in 1975-85 stated that the air cushion vehicle should be capable of transporting both break-bulk and containerized cargo weighing as much as 30 tons. The study stated further that the current inventory of LARC-Vs and LARC-XVs could not transport containerized cargo and would have to be replaced.

By the time the study was completed, Bell Aerospace had built an air cushion vehicle under the name of Bell Voyageur. Selecting the Voyageur as the replacement for the LARC-Vs and LARC-XVs, the Army modified and purchased two Voyageurs from Bell Aerospace under the Military Adapted Commercial Item program. The modified Voyageur resulted in the military design which has been designated as the 30-ton lighter air cushion vehicle (LACV-30). (See photograph on p. 21.)

The Army has established a requirement for 29 LACV-30s. The Congress appropriated \$21 million for four LACV-30s in fiscal year 1979. The Office of Management and Budget has approved an additional \$20.8 million for four more LACV-30s in fiscal year 1980.

Some Army officials who questioned the requirements for the LACV-30 believe that the LARC-LX can meet the current requirements; however, the LARC-LX was not considered in the Army's study. There are 36 LARC-LXs in the current inventory, and according to Army officials, they will remain even after receiving the LACV-30s. Furthermore, several Army agencies believe that LACV-30 operational testing has not been adequate for making a procurement decision. Modifications proposed during testing have not been tested, and the LACV-30's operational performance and costs have not been adequately determined.



COURTESY OF U.S. ARMY

FIGURE 8. LAVC-30 ARRIVING AT BEACH

LIMITED USEFULNESS OF  
COMMERCIAL DATA

Under the Military Adapted Commercial Item program, the services can reduce their research and development and testing costs by purchasing from commercial sources rather than going through the developmental process. In this way, the information needed to make a procurement decision can be based on historical data about the commercial product, but essential data not available commercially must be gathered from Army tests.

Several issues limit the usefulness of commercial data on the Voyageur as a basis for decisionmaking on the LACV-30. For example, Bell Aerospace has built only four Voyageurs, although we have not seen them, an Army official said that they are all prototypes and that no two of them are alike. In addition, the commercial Voyageurs have operated in snow, ice, and fresh water environments--far different from the salt water and sand environment that a fielded LACV-30 can be expected to operate in.

Another reason for not using the Voyageur as a measure of what to expect of the LACV-30 is the extensive modifications made to the Voyageur to arrive at a fielded LACV-30. These modifications include

- adding an 11-1/2-foot deck section,
- upgrading the horsepower rating of the gas turbine engines,
- improving the variable pitch propellers,
- adding a swing crane and ramp section,
- adding load-spreader pallets for load distribution,
- soundproofing and air-conditioning the cabin,
- adding a craft fender for protection during operations along container ships, and
- adding an auxiliary power unit.

In view of recognized risks in these modifications, the Army decided to put the LACV-30 prototypes through operational and developmental test II. Test I, which

determines whether the hardware configuration of a system or its components will be useful to the military, was bypassed because the LACV-30 is an adapted commercial item. Test I normally occurs at the end of the planning phase of the acquisition process and before full-scale development.

In a November 11, 1977, report to the Secretary of the Army, we stated that the scope of operational testing would not ensure that the LACV-30 demonstrates certain required capabilities before a major procurement decision is made. At that time, Army officials stated that operational testing of the LACV-30 was not as extensive as it normally is because the vessel is a military adaptation of a commercial item and that civilian experience could thus be used in the operational evaluation. However, we stated that civilian experience should not be substituted for operational testing because experience in the civilian sector may have been acquired under conditions far different from those expected during military operations.

#### CONCERNS OVER ADEQUACY OF TESTING

Operational and developmental test II, which looks at equipment reliability, availability, and maintainability, is designed to test prototype equipment in the field after full-scale development and before the procurement decision. Testing of the LACV-30 was done by the Army Operational Test and Evaluation Agency (OTEA) and the Army Armor Engineer Board. Although test II is normally the most rigorous test, a number of Army officials expressed concerns about the adequacy of the LACV-30 testing throughout most of the program.

The Army's Logistics Evaluation Agency (LEA) was troubled about the adequacy of tests on the LACV-30 early in the program. During a June 25, 1976, review of the draft development plan and coordinates test program for the LACV-30, LEA's position was that certain portions of the development plan were inadequate, as follows:

"The plans for Personnel and Training (section V) and Logistics Support (section VI) are vital to the development effort. They are of particular importance to the LACV-30 program since the item represents a totally new, very expensive, highly complex piece of equipment for the Army. Adequate planning for the identification, acquisition, and testing of support resources

is essential to successful fielding of the LACV-30. Documentation of planning in the Developmental Plan does not reflect that adequacy."

LEA was also concerned that a logistics support analysis would not be made as required by Army regulation and that an operational test III was not planned. LEA felt that the analysis was needed to establish repair level policy, to evaluate alternative support concepts and manuals, and to identify required logistics resources. And test III was considered essential because of the equipment's complexity and the tremendous amounts of support resources required to operate and maintain the LACV-30. The test would also address unresolved critical issues, especially supportability, reliability, availability, and maintainability, and would confirm the adequacy of actions taken to correct problems disclosed during operational test II.

In addition to LEA, representatives of the Army Logistics Center expressed concerns about the LACV-30 testing. At a June 27, 1977, conference, a Logistics Center official questioned the validity of the logistics portion of test II because

- the logistics support provided would be more intensive than that anticipated in the field,
- the maintenance supply package had excesses and shortages,
- the commercial manuals were not adequate for some repair actions, and
- test personnel were trained by the contractor and not typical of user unit operators and support personnel.

The official concluded that logistics support of test II would be extremely artificial and that the resulting logistics data would not be sufficient to evaluate logistics supportability.

Immediately after the conference, LEA sent a memo to the Deputy Chief of Staff for Logistics which stated that test II would not be a good indicator of what to expect of a fielded LACV-30 in an over-the-shore environment. LEA felt that the following factors made further testing necessary before a full-scale production decision could be made.

- Due to funding constraints, not all identified support equipment is being tested with the craft.
- Many modifications will be required as a result of test II findings.
- The crew's military training needs to be assessed.
- Support skills have been identified but not tested.
- A hanger is available for maintenance test personnel but will likely not be available in an over-the-shore environment.
- Sand and salt accumulations will be rinsed off each day of the test, but fresh water may not be available in an over-the-shore environment.

Prior to actual operational testing, the Army Armor and Engineer Board's inspection revealed that the LACV-30 prototype had significant discrepancies and that further modifications and changes would probably be necessary during the test. Although the Board felt that the prototype was ready more for an operational test I than an operational test II, it was directed to initiate test II.

On August 29, 1978, after test II had been completed, an in-process review was held to evaluate the test results and make a procurement decision on the LACV-30. LEA's position was that a cost and economic evaluation analysis and test II should be conducted before making a procurement decision. The reasons given for this position were:

- Test II of the LACV-30, while quite extensive, was in many ways untypical of test II testing in general.
- The prototypes were modified frequently during tests, thus changing the system baseline.
- The LACV-30 was not tested in a typical table of organization and equipment unit environment.
- The adequacy of required personnel in terms of quantity, skill level, and training could be addressed only superficially.

--The adequacy of technical manuals to be fielded could not be addressed because commercial manuals were used.

--Required maintenance facilities were not tested.

--Some support equipment was not tested.

LEA also contended that testing to date had confirmed its opinion that in an over-the-shore environment, the LACV-30 would be unreliable and a considerable logistics burden. That burden included:

--Extensive training requirements.

--A large maintenance contingent.

--Intensive management of major components due to high cost and low density.

--Continual technical assistance to using units.

--Costly facility requirements.

--Little configuration management control.

OTEA, which monitored the testing, agreed with LEA.

As a result of LEA's nonconcurrency, the procurement decision was elevated to the Department of the Army for staffing. During the staffing, a paper prepared by the Deputy Chief of Staff for Research, Development, and Acquisition, which addressed the issues raised by LEA, was distributed throughout the Department. After reviewing the paper, three offices still nonconcurred. The Office of the Deputy Chief of Staff for Logistics, OTEA, and the Office of the Assistant Secretary, Assistant Deputy for Logistics, believed that classifying the LACV-30 as standard would be premature in view of the many issues still unresolved due to inadequate testing. According to these offices, the LACV-30's supportability, cost, and operational effectiveness had not yet been determined, and measures to reduce the maintenance burden and otherwise improve the vessel's effectiveness had not been confirmed. However, the February 1979 final decisions of the executive session were to:

--Type classify the LACV-30 as standard.

- Enter full-scale production (four each year in fiscal years 1979-81).
- Conduct a structured initial production test and follow-on evaluation to confirm concepts not fully tested during test II (such as unit logistic supportability and training); verify fixes identified in previous testing; obtain additional reliability, availability and maintainability data; and confirm a 25-30 ton load-carrying capability.
- Conduct special in-process reviews after the follow-on evaluation and prior to execution of 3-year procurement.
- Have costs validated by the Comptroller of the Army in lieu of a cost and operational effectiveness analysis.
- Examine force structure for the LACV-30 (i.e., number of units) in greater depth.

These decisions were based on the opinion that:

"In view of the impacts to the program schedule, added costs, and credibility to Congress, it was the consensus that risk of immediate acceptance \* \* \* more than offsets the disadvantages of major program turbulence and cost increase if a limited procurement and DT/OT [test] III alternative approach were taken."

#### UNRESOLVED ISSUES

Although the Army agrees that procurement of the LACV-30 has associated risks, it has decided to go ahead with full-scale production in anticipation of correcting the problems later. Information shows that to date the Army does not know what the eventual performance of the LACV-30 will be nor what it will cost to maintain and operate the vessel.

#### Reliability, availability, and maintainability

During the in-process review, LEA reported that the LACV-30's

- reliability was poor (2.91 hours mean time between system failure),
- availability was low (49 percent during operational test II), and
- maintainability was a great burden (5.47 maintenance staff-hours per operating hour).

A report prepared by the U.S. Army Materiel Systems Analysis Activity showed similar data. In comparing the LACV-30's maintainability of 5.47 maintenance staff-hours per operating hour with the Bell Voyageur's 4.4 hours, the report stated that:

"The major contributor to the overall difference in reliability between the LACV-30 and Voyageur, i.e., the frequency of unscheduled corrective maintenance actions, is the operating environment. The civilian version was operated in fresh water in summer and as an ice breaker in the winter, whereas the LACV-30 was operated in both brackish and salt water, and over unimproved beaches (loose sand)."

The report went on to say that during testing, the environment affected the following areas.

- Salt water corrosion of both mechanical and electrical subsystems.
- Sand contamination of the transmission and electrical subsystems.
- Sand erosion of the propeller blades.

Further, the test report prepared by the Army Armor and Engineer Board concluded that the LACV-30's reliability, availability, and maintainability characteristics were inadequate when considered in conjunction with its proposed operational use, in that the LACV-30 could not be expected to complete two 10-hour shifts without a system or mission failure.

#### Extensive modifications

At the in-process review, LEA reported that during testing 101 modifications were proposed for the LACV-30 prototype to arrive at the configuration that would eventually

be delivered to the Army. We have since been told that the number of modifications has risen to 186. Although some of the modifications are considered minor, a number of them are significant design changes expected to have a direct impact on the LACV-30's reliability, availability, and maintainability. The modifications which are expected to increase reliability from 2.91 to 15.3 hours mean time between system failures, include:

- 12 design changes to the auxiliary power unit,
- 8 design changes to the engine and transmission,
- 5 design changes to the rudder assembly,
- 3 design changes to the swing crane, and
- 2 design changes to the fuel line.

The Army Materiel Systems Analysis Activity recommended installation and testing of the proposed reliability improvement engineering changes before production.

#### Load limitations

The LACV-30 was designed to carry 25 to 30 tons of containerized cargo in an over-the-shore logistics operation. Because an average container loaded with military materiel weighs approximately 18 to 20 tons, LEA reported that the LACV-30, whether self-loading or not, could safely carry only one randomly chosen container. The agency questioned whether such hauling capability was worth the severe penalties incurred, such as:

- Five to seven times as much fuel required (per container loaded) as for conventional lighters.
- Extensive training requirements for operators (100 hours), navigators (35 hours), and maintenance personnel.
- High unit production costs.
- High operation and support costs (the extent of which is not fully known).

The operational test report stated that the LACV-30 had never successfully completed a mission or sortie carrying 23 tons or more of cargo. Its greatest endurance operation at maximum gross vehicle weight was 2.5 hours, half of its required operational capability, and its fuel consumption rate varied widely depending on weather, sea, payload, and mission conditions. The operational testers believed that because of the payload and endurance limitations and the vessel's problem of obtaining adequate engine power, the LACV-30 was underpowered for its intended operational performance role.

LARC-LX--an alternative  
to LACV-30

Officials of at least two Army activities have stated that the LARC-LX has several advantages over the LACV-30 and that it should be considered as an alternative to procuring a new vessel. The LARC-LX is an amphibious craft, and the Army currently has 36 of them.

In its technical report number 229, the Army Materiel Systems Analysis Activity stated that despite its shortcomings in speed, the LARC-LX has no major deficiencies and is probably the most versatile lighterage vessel in the current inventory. Fuel consumption for its 60-ton cargo capacity is much lower than for the 30-ton LACV-30. For nominal weights, the comparative fuel consumption varies from 38 gallons per hour for the LARC-LX to 260 gallons per hour for the LACV-30.

In a June 1978 memorandum, the Army Deputy Chief of Staff for Logistics asked the Army Deputy Chief of Staff for Research and Development if the LARC-LX has been seriously considered as an alternative to the LACV-30. The Deputy Chief of Staff for Logistics stated that the extremely high cost of the LACV-30 and the acceptable performance of the LARC-LX seemed to dictate an objective comparison of cost and capability factors. The memorandum also noted the following advantages of the LARC-LX over the LACV-30.

- Increased load capability. Will carry two military vans or one 40-foot commercial container. Also will carry a tank or any general cargo up to 100 tons in a limited overload mode. LACV-30 will not carry 40-foot containers and can carry two military vans only when lightly loaded.

--The LARC-LX is not affected by minor slopes and surface gradations which cause major steering and maneuverability problems for the LACV-30.

--The LARC-LX is a proven product. Maintainability and costs to support it are known. The degree of technical expertise of the crew and the amount of time to train operators and mechanics for the LARC-LX can be satisfied with the "normal" pipeline soldier. Crew members and mechanics for the LACV-30 were hand picked and do not represent "average" soldiers normally received by the basic unit through current induction and training cycles. The sophistication and high cost of the LACV-30 suggest that some system must be used to hand pick and extensively train crew members.

--Shop and maintenance support areas are far less than required for the LACV-30. No special hardstand is required as is mandatory for the LACV-30 which literally creates a "sandstorm" when moving across unimproved areas.

--The four engines in the LARC-LX provide greater reliability than the two engines in the LACV-30.

Officials of these two Army activities agreed that the only advantage the LACV-30 has over the LARC-LX is speed.

#### CONCLUSIONS

The Army's procurement of the LACV-30 to provide a container-handling capability appears to be premature. Although the Army agrees that there are risks involved with the procurement, it has decided that the risks are worth taking. We question whether the risks are warranted because the Army

--does not know its firm requirements,

--does not know the true performance of the LACV-30,  
and

--has not prepared a cost effectiveness analysis.

A number of Army officials have raised questions about the adequacy of testing on the LACV-30 prototypes and the performance of the vessel during operational and developmental test II. Their questions concerned inadequate logistics support planning, the many modifica-

modifications proposed during testing, the unrealistic test environment, and other critical issues. Although some officials believed that additional testing, as well as a cost and economic analysis, should be conducted, the procurement decision was made without the benefit of such information. Furthermore, test II showed that the LACV-30 was a logistics burden and rated poorly in reliability, availability, maintainability, and load-carrying capability. Whether proposed modifications will correct these problems has not been confirmed.

The LACV-30 will be used primarily for over-the-shore operations, which are only a last resort. The questions that should be considered, then, are how much can the Army afford to spend on operations that might not be needed? And can equipment already in the inventory do the job less expensively and as effectively?

#### RECOMMENDATION

We recommend that the Secretary of Defense direct that the Army not commit any procurement funds for the LACV-30 until it makes a cost and benefit analysis between the LARC-LX and LACV-30 to determine if onhand assets can meet amphibian watercraft requirements. If it is determined that the LARC-LX will not meet requirements, the Army should conduct further testing of the LACV-30 to determine that it will be cost effective and useful in a realistic military environment.

#### AGENCY COMMENTS

Army officials did not concur with this recommendation. They said that all views were thoroughly aired before the procurement decision was made. However, Army officials told us that no information which we had not previously considered was available during the decisionmaking process.

ARMY WATERCRAFT INVENTORY AT SEPTEMBER 30, 1978

<u>Type watercraft</u>	<u>Total assets</u>	<u>Storage</u>						<u>On loan</u>
		<u>A&amp;R</u>	<u>CSA</u>	<u>R&amp;R</u>	<u>Hythe</u>	<u>Pacific</u>	<u>Other</u>	
Barge, deck cargo-7005	65	37	8	14	-	-	-	6
Barge, deck cargo-231A	65	17	3	-	43	2	-	-
Barge, deck cargo-7001	25	24	-	-	-	-	-	1
Barge, deck or liquid cargo-231B	16	8	-	1	4	2	-	1
Barge, deck or liquid cargo-218E	4	4	-	-	-	-	-	-
Barge, refrigerated-700	3	-	2	1	-	-	-	-
Boat, passenger and cargo-2001	14	5	3	2	3	-	-	1
Boat, picket-4003	5	4	1	-	-	-	-	-
Boat, picket-4002	4	3	1	-	-	-	-	-
Boat, utility-6009	1	1	-	-	-	-	-	-
Barge, conversion kit	2	1	1	-	-	-	-	-
Crane barge - 60 ton	11	2	3	-	4	-	-	2
Crane barge - 100 ton	14	5	1	-	4	1	-	3
Ferry boat	1	1	-	-	-	-	-	-
LCM-6	3	3	-	-	-	-	-	-
LCM-8	147	109	1	25	2	7	1	2
LCU	51	46	-	-	-	-	-	5
LARC-V	127	91	9	27	-	-	-	-
LARC-XV	73	67	2	2	-	-	-	2
LARC-LX	36	14	6	12	4	-	-	-
Beach discharge lighter	1	1	-	-	-	-	-	-
Floating machine shop	4	2	-	1	1	-	-	-
Tug - 100'	30	15	5	4	4	1	-	1
Tug - 65'	36	11	7	-	16	1	1	-
Tug - 45'	13	6	1	1	5	-	-	-

Type watercraft	Total assets	Storage						On loan
		A&R	CSA	R&R	Hythe	Pacific	Other	
Pier barge - 150'	11	-	-	-	-	-	-	11
Pier barge - 300'	12	-	2	-	2	6	-	2
Freight supply ship	5	3	1	-	-	-	-	1
Liquid cargo ship	3	-	1	1	-	1	-	-
Patrol boat	3	3	-	-	-	-	-	-
Barge, deck cargo - 140'	4	3	-	1	-	-	-	-
Barge, deck cargo - 250'	2	2	-	-	-	-	-	-
Barge, deck cargo - 200'	1	1	-	-	-	-	-	-
Barge, deck cargo - 210'	2	2	-	-	-	-	-	-
Barge, deck cargo - 160'	1	1	-	-	-	-	-	-
Barge, deck cargo - 130'	1	-	-	1	-	-	-	-
Utility boat - 46'	18	10	4	1	1	-	-	2
Utility boat - 45'	1	1	-	-	-	-	-	-
Utility boat - 44'	1	1	-	-	-	-	-	-
Utility boat - 42'	3	3	-	-	-	-	-	-
Utility boat - 41'	1	1	-	-	-	-	-	-
Utility boat - 37'	1	1	-	-	-	-	-	-
Utility boat - 34'	1	1	-	-	-	-	-	-
Crane barge - 250 ton	1	-	-	-	-	-	-	1
Tug - 143'	5	3	-	-	-	2	-	-
Tug - 86'	6	3	2	1	-	-	-	-
Tug - 50'	1	1	-	-	-	-	-	-
Picket boat - 37'	<u>1</u>	<u>1</u>	-	-	-	-	-	-
<b>Total</b>	<u><u>836</u></u>	<u><u>518</u></u>	<u><u>64</u></u>	<u><u>95</u></u>	<u><u>93</u></u>	<u><u>23</u></u>	<u><u>2</u></u>	<u><u>41</u></u>

A&R = Active and Reserve, CSA = Charleston Storage Activity  
R&R = Sharpe Army Depot, Hythe = Hythe, England

TABLE OF ORGANIZATION AND EQUIPMENTWATERCRAFT REQUIREMENTS (note a)

	<u>Number of</u>	
	<u>Units</u>	<u>Watercraft</u>
Medium boat company	2	30
Heavy boat company	4	48
Medium amphibian company	2	24
Amphibian barge company	1	4
Floating craft company	2	28
Floating craft maintenance company	2	10
Engineer port construction company	<u>4</u>	<u>28</u>
Total	<u><u>17</u></u>	<u>b/172</u>

a/Based on current tables of organization and equipment of active units.

b/Includes the requirements for a Corps Force made up of two medium boat companies, two heavy boat companies, and two medium amphibian companies.

TABLE OF DISTRIBUTION AND ALLOWANCESWATERCRAFT REQUIREMENTS

<u>Type of watercraft</u>	<u>Number</u>
Barge, deck cargo	69
Barge, deck or liquid cargo	8
Boat, passenger and cargo	2
Picket boat	26
Utility boat	1
Crane barge - 60 ton	1
Crane barge - 89 to 250 ton	5
Ferry boat	1
LCM-6	2
LCM-8	14
LCU	6
LARC-V	7
LARC-XV	3
LARC-LX	4
Tug	8
	<hr/>
Total	<u>157</u>

MINIMUM REQUIRED LOGISTICS AUGMENTATION, EUROPE,  
WATERCRAFT REQUIREMENTS AT  
SEPTEMBER 30, 1978

<u>Type of watercraft</u>	<u>Number</u>
Barge, deck cargo	44
Barge, liquid cargo	4
Passenger boat	1
Barge conversion kit	1
Crane barge - 60 ton	4
Crane barge - 100 ton	4
LCM-8	2
Floating machine shop	1
Small tug - 45'	7
Barge assembly - 5' x 12'	4
Pier barge - 300'	10
Small tug - 65'	15
Tug - 100'	<u>4</u>
Total	<u><u>101</u></u>

WAR RESERVE AND MAINTENANCE FLOATWATERCRAFT REQUIREMENTS

<u>Type of watercraft</u>	<u>Number</u>
Barge, deck cargo-7005	3
Barge, deck cargo-231A	1
Barge, deck cargo-7001	2
Barge, liquid cargo-231B	1
Barge, deck or liquid cargo-231E	1
Picket boat (J)	2
Crane barge - 100 ton	2
LCM-8	19
LCU	6
LARC-V	1
LARC-XV	7
LARC-LX	1
Barge assembly - 6' x 18'	1
Pier barge - 150'	6
Pier barge - 300'	12
Tug - 65'	3
Tug - 100'	<u>2</u>
Total	<u>70</u>

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