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REPORT BY THE  
**Comptroller General**  
OF THE UNITED STATES



# Navy Should Reconsider Plans To Acquire New Fleet Oilers And Ocean Tugs

Congressman Paul N. McCloskey, Jr., asked GAO to determine whether, and to what extent, merchant vessels could perform the functions of ocean tugs and fleet oilers, and if this would be cost effective. GAO expanded its review to evaluate the criteria used by the Navy to develop peacetime and wartime requirements for the new fleet oilers and ocean tugs.

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Millions of dollars could possibly be saved if the Navy reconsiders its program to replace its fleet oilers and ocean tugs with modern military vessels, reexamines mission requirements of the proposed ships, and looks more to the merchant marine and other alternatives for logistic support.



LCD-78-234A  
AUGUST 30, 1978



COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON D.C. 20543

8-133170

The Honorable Paul N. McCloskey, Jr.  
House of Representatives

Dear Mr. McCloskey:

This report discusses the need for the Navy to re-consider plans to acquire new fleet oilers and ocean tugs. We made this review pursuant to your April 19, 1977, request.

According to instructions from your office, we did not request official comments from the Department of Defense. We did, however, discuss the report with Navy Department officials and they concurred in the accuracy of our findings.

As directed by your office, we plan no further distribution of this report until 5 days after it is sent to you. Copies will then be sent to the Secretary of Defense, the Secretary of Commerce, and the Director of the Office of Management and Budget. Copies will also be sent to the House Committees on Merchant Marine and Fisheries, Government Operations, and Appropriations; and to the Senate Committees on Governmental Affairs and Appropriations.

Sincerely yours,

A handwritten signature in black ink, appearing to read "James B. Starks".

Comptroller General  
of the United States

COMPTROLLER GENERAL'S  
REPORT TO THE HONORABLE  
PAUL N. McCLOSKEY  
HOUSE OF REPRESENTATIVES

NAVY SHOULD RECONSIDER PLANS  
TO ACQUIRE NEW FLEET OILERS  
AND OCEAN TUGS

D I G E S T

NAVY'S FLEET OCEAN TUGS

As part of the Navy's replacement program for aging fleet ocean tugs, four new tugs are currently being constructed at a cost of \$54.8 million.

Three additional tugs approved in fiscal year 1978 will cost about \$53 million. The need for the three tugs is questionable.

The Navy

--did not give sufficient consideration to the substantial U.S. merchant marine, other Navy, and friendly nation towing capability that could increase overall readiness of the Navy's towing and salvage mission (see p. 7);

--did not adequately determine wartime requirements (see p. 12); and

--overstated peacetime requirements (see p. 14).

An estimated \$53 million or more in program costs and post delivery expenses could be saved by not obtaining the three fleet ocean tugs requested and by increasing peacetime and wartime reliance on commercial tugs. An additional recurring annual savings of about \$3 million or more in operating expenses could be realized. (See p. 14.)

A 1974 Navy study proposed, on a trial basis, a limited shift toward more use of commercial tugs to determine their responsiveness and effectiveness. The Navy has not tested this proposal. (See p. 15.)

GAO agrees with the Navy's doctrine that it is necessary to maintain a nucleus of fleet ocean tugs in the event of war but the size of this nucleus is questionable. Without adequate evaluation of peacetime and wartime requirements, and maximum use of commercial assets, the Navy cannot justify additional construction of new fleet ocean tugs. (See p. 8.)

GAO recommends that the Secretary of Defense direct the Secretary of the Navy to

- defer construction of additional fleet ocean tugs,
- develop criteria from which more adequate peacetime and wartime requirements can be determined,
- maximize peacetime use of commercial assets, and
- in light of wartime reliance anticipated, develop a definite plan for the use of commercial assets and coordinate this plan with commercial operators. (See p. 26.)

#### NAVY'S FLEET OILERS

The Navy's replacement program for the aging fleet oilers involves three oilers currently being constructed and two additional approved in fiscal year 1978. These 1978 oilers are estimated to cost about \$323 million.

Current concepts regarding the wartime role of replenishment ships are generally described as either station ships or shuttle ships. Station ships operate within combatant task forces and provide for transfer at sea of fuel, ammunition, stores, and spare parts. Multiproduct replenishment ships capable of delivering all of these products are preferred as station ships because they reduce the time that combatants are involved in replenishment operations. Shuttle ships operate between ports and

station ships, permitting the station ships to provide continuous service to the task force. The oiler's primary mission is to function as a shuttle ship; its secondary mission is a backup station ship.

GAO found that:

- Current concepts regarding the wartime mission of oilers indicate that those being constructed are less than adequate as backup station ships and productively inefficient as shuttle ships. (See p. 17.)
- There are other alternatives that could save the Navy millions of dollars. (See p. 19.)
- Commercial tankers are currently capable of providing peacetime support and limited support to the Navy in wartime, but much more could be done to increase the merchant tankers' capabilities. (See p. 21.)
- To fully modify and operate commercial tankers, as opposed to new construction, is too costly. However, less modification with minimum cost could add flexibility to the Navy's fleet support operations. (See p. 24.)

The Navy's main objection to using merchant tankers is that the tankers are not able to transfer fuel as quickly as oilers to other ships. (See p. 22.) It has taken action to proceed with construction of fleet oilers even though other alternatives have been presented which could enhance merchant tankers' capability (see p. 21), offer lower cost ship designs (see p. 19), or offer different and lower cost concepts in underway replenishment. (See p. 20.)

GAO recommends that the Secretary of Defense direct the Secretary of the Navy to

- reevaluate the need for fully capable oilers to accomplish the primary wartime mission,

- reevaluate the suitability of the oiler to function as a backup station ship,
- work toward making the merchant tanker fleet more responsive as a fleet support auxiliary, and
- determine if the National Defense Reserve Fleet could play a greater role in providing auxiliary shuttle capability. (See p. 27.)

AGENCY COMMENTS

GAO did not request official comments from the Department of Defense. GAO did, however, discuss the report with Navy Department officials and they concurred in the accuracy of the findings.

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ABBREVIATIONS

DOD Department of Defense  
GAO General Accounting Office  
MarAd Maritime Administration  
NATO North Atlantic Treaty Organization  
POL petroleum, oil, and lubricants



## CHAPTER 1

### INTRODUCTION

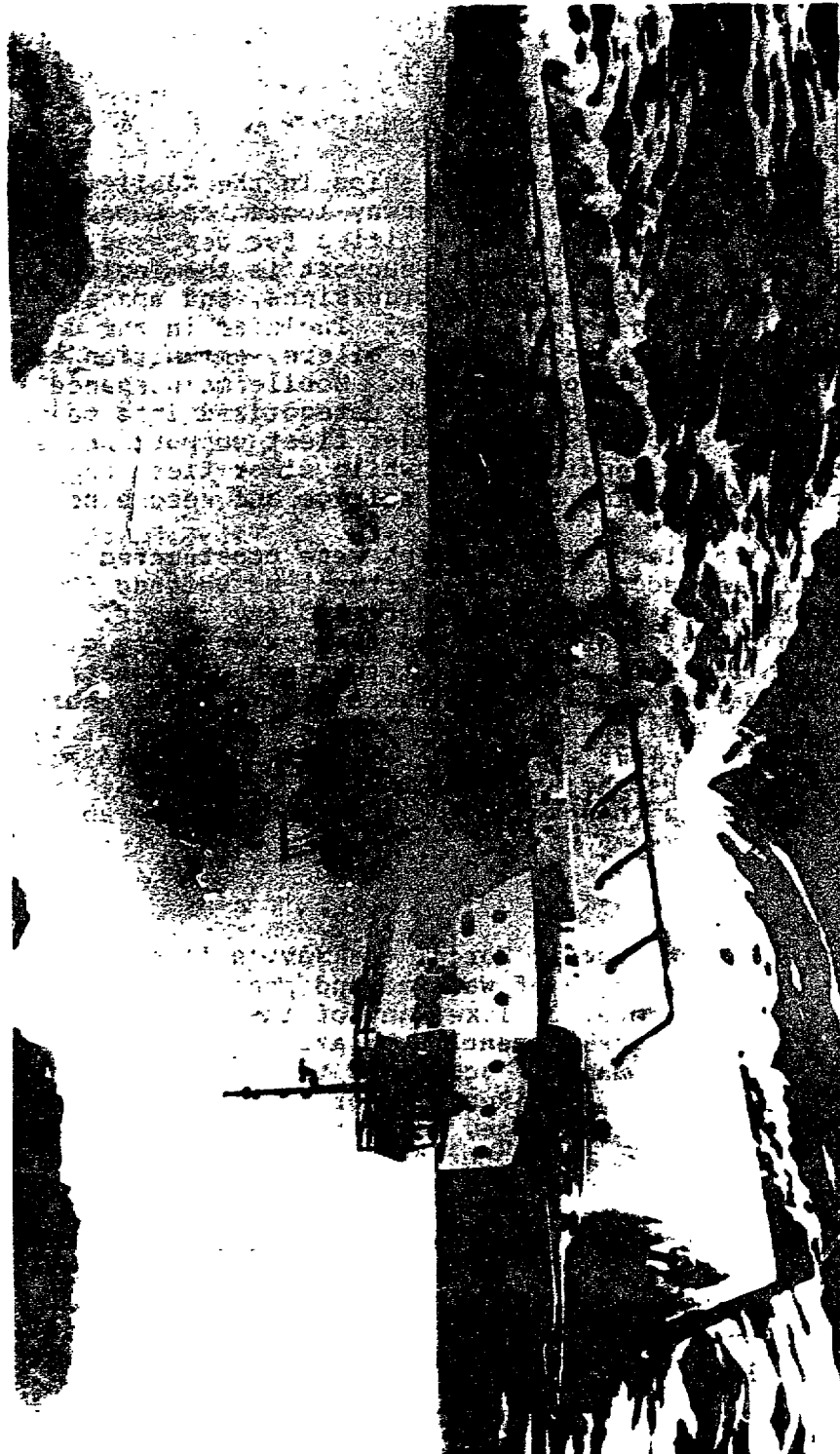
The Navy operates nearly 100 ships in the Mobile Logistics Support Force to provide underway logistics support and mobile maintenance and repair facilities for deployed units of the fleet. Underway logistics support is the replenishment at sea of fuel, ammunition, provisions, and spare parts to combatant ships in forward areas. Included in the underway replenishment ship category are oilers, ammunition ships, store ships, and multiproduct ships. Mobile maintenance and repair facilities are generally categorized into major and minor fleet support ships. Major fleet support ships include tenders and repair ships; while minor fleet support ships include oceangoing tugs and salvage and rescue ships.

Many of the fleet support ships were constructed during World War II, and according to Department of Defense (DOD) officials, replacement cannot be deferred any longer. However, due to fiscal constraints and the low priority given to support ships, only a few ships programmed for construction have actually been funded. There are currently three oilers and four tugs under construction. In addition, the Navy's fiscal year 1978 authorization included \$375.4 million for two fleet oilers and three oceangoing fleet tugs. This report evaluates the need for the additional oilers and tugs funded in 1978.

### FLEET OCEAN TUGS

As part of the Support Force, the Navy's fleet ocean tugs provide a wide range of wartime and peacetime fleet support services. However, like many of the Navy's fleet support ships, the tugs currently operating were built for World War II service and are scheduled to soon be retired or transferred to the Naval Reserve Force. The Navy has determined that it needs 10 new ocean tugs as replacements. Seven are either under construction or are programmed for construction.

The seven authorized replacement tugs will cost an estimated \$108 million. If acquired, all 10 tugs will cost about \$160 million and will be assigned to the Military Sealift Command. As fleet support vessels, the new tugs will be crewed and operated by civil service personnel, with the exception of a four-man Navy communication detachment. The three tugs approved in fiscal year 1978 will cost



COURTESY OF DEPARTMENT OF THE NAVY

ARTIST'S CONCEPT OF NAVY'S NEW OCEAN GOING FLEET TUG

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about \$17 million each. The first tug is scheduled for delivery in July 1978, with follow-on deliveries through fiscal year 1981.

The basic design of the new tug is an adaptation of the commercial offshore supply vessel used in the petroleum industry. In contrast to its World War II predecessor, the new tug will have a larger main deck aft, twin screw controllable-reversible pitch propellers, 50-percent greater horsepower, and a towing system capable of handling both wire rope and synthetic lines. A detailed comparison of the general characteristics of the old and new tugs is shown in appendix I.

A unique feature of the new tug will be the portable salvage and diving system, which will require the ship to have space and weight reservations and support capabilities for the equipment. The equipment will be located at various Emergency Ship Salvage Material System pools until needed, at which time equipment and Navy personnel will be placed on the first available tug. The primary reason for the omission of salvage and diving equipment and personnel as a permanent feature on the tug is the relatively small amount of salvage operations made annually by fleet ocean tugs. Additionally, it will provide a cost savings to the Navy. It was also determined that only one complete set of salvage and diving equipment for every two tugs would be required, which also reflects the small amount of salvage operations done by this ship type.

The new tug's primary wartime mission, like its predecessor, is to salvage and tow battle-damaged and nonoperational units of the fleet. Additional wartime tasks may include harbor clearance operations and retrieving beached amphibious assault vessels. Peacetime services include target towing, drone and torpedo recovery, towing inactivated or nonoperational units of the fleet, search and rescue operations, limited salvage operations, and other support functions.

#### FLEET OILERS

Fleet oilers are designed to carry and transfer petroleum products to other ships at sea, primarily to multiproduct ships. These multiproduct ships, in turn, refuel combatants and other ships.

However, many of the oilers are victims of the same malady suffered by the Navy's fleet ocean tugs--age, and consequently they will soon be retired from the active fleet. The Navy, to fill the void that will result from the retirement of the aging fleet oilers, plans to procure five new fleet oilers at an estimated cost of \$664.4 million. Three of the oilers are presently under construction and two more were authorized in fiscal year 1978. The oilers approved in fiscal year 1978 will cost an estimated \$322.7 million. The first oiler obtained under the current program is scheduled for delivery in fiscal year 1980, with follow-on deliveries through fiscal year 1981. As the new oilers enter the fleet, older ones will be retired and others will be assigned to the Military Sealift Command. All new oilers will be crewed with Navy personnel.

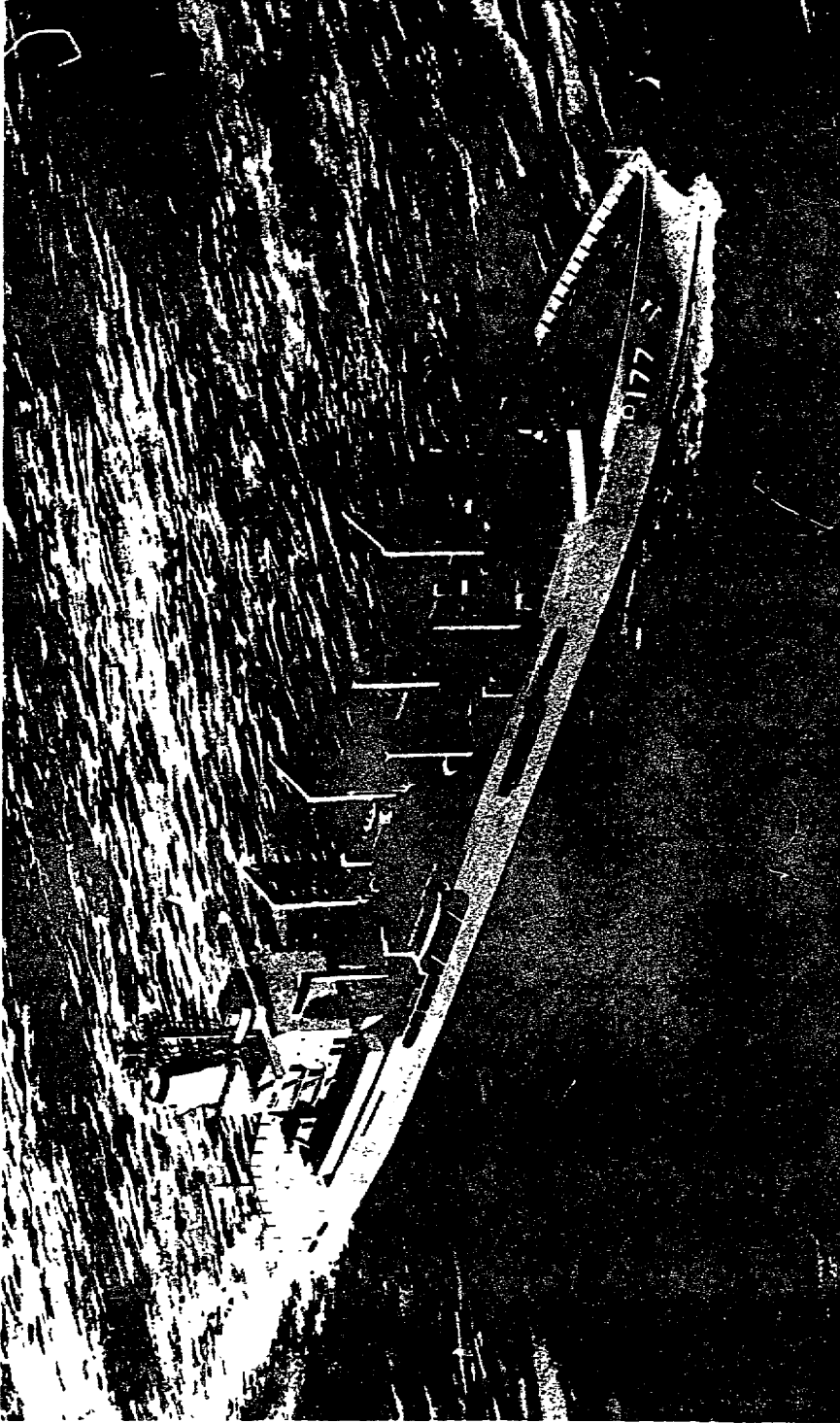
According to Navy sources, the design of the new oiler is aimed at optimizing manning and reducing costs while providing a ship that will be able to meet requirements. To accomplish this objective (1) commercial specifications were used where feasible and economical, (2) manning was reduced, (3) more automated systems and equipment were employed, and (4) existing subsystems, components, and equipment were used wherever practicable. The principal characteristics of the new oilers are shown in appendix II.

Fueling at sea capability is provided through three double hose stations on the port side and two single hose stations on the starboard side. The new oilers have the capability to transfer 900,000 gallons of marine diesel fuel and 540,000 gallons of aviation fuel per hour from both sides at the same time. Receiving capability includes three double-probe receivers on the starboard side and three single probe receivers on the port side. Delivery and receiving stations will use 7-inch hose outlets for both marine and aviation fuel.

Other features of the oiler include a pickup and drop area for replenishment by helicopter and limited capability to transfer and receive other cargo, mail, and personnel. A standard Navy communication system and limited self-defense in the form of two close-in weapons systems will be included on the oilers.

Current wartime underway replenishment concepts provide that oilers (single product ships) operate in a shuttle mode to directly supply the station ships (multiproduct ships). The multiproduct ships--ships which supply ammunition, stores,

and provisions, as well as fuel--will serve as station ships for the carrier task groups. The oiler in its secondary mission operates as a backup station ship should a multiproduct or station ship be rendered nonoperational.



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ARTIST'S CONCEPT OF NAVY'S NEW FLEET OILER

## CHAPTER 2

### NEED FOR ADDITIONAL TUGS QUESTIONABLE

The need for the three fleet ocean tugs approved in the fiscal year 1978 budget is questionable. In justifying the new tugs, the Navy

- underestimated U.S. merchant marine capability,
- did not give appropriate consideration to other Navy and friendly nation capability,
- did not adequately determine wartime requirements, and
- overstated peacetime requirements.

By deferring procurement of the three tugs, the Navy could avoid initial costs of over \$53 million and could save an estimated \$3 million a year in operating costs.

### MERCHANT MARINE CAPABILITY UNDERESTIMATED

The preamble of the 1936 Merchant Marine Act states that:

"It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine \* \* \* capable of serving as a naval and military auxiliary in time of war or national emergency \* \* \*. It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine."

While this declaration of policy does not place the burden of achievement on the Navy, it is obvious that the Navy can do a great deal to enhance the merchant marine's ability to serve as a naval auxiliary. One such area would be to let the merchant marine provide more fleet support services.

Navy officials, however, have been reluctant to expand peacetime use of commercial tug services because of the Navy's substantial in-house capability. They believe it is necessary to maintain a nucleus of fleet ocean tugs to have ready in the event of war.

Within the current Navy/merchant marine environment, we agree with the Navy's position on the necessity to maintain a nucleus of towing and salvage assets in the event of war. The size of this nucleus, however, is questionable. Currently, the Navy has 20 fleet ocean tugs including those in the Naval Reserve Force,

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We identified over 3,000 U.S.-flag support vessels which could be used to satisfy some of the Navy's tug requirements. In addition to pure ocean tugs, we included oil exploitation vessels (such as offshore supply vessels) because of their versatility and because the Navy's new tug is an adaptation of the offshore supply vessel.

The following table shows the number and age of commercial tugs and oil exploitation vessels 1,500 horsepower <sup>1/</sup> and over as of May 1977.

Year built	Horsepower						Total
	1,500 to 1,999		2,000 to 3,999		4,000 and above		
	Oil exploitation vessels	Tugs	Oil exploitation vessels	Tugs	Oil exploitation vessels	Tugs	
Before 1955	5	227	2	141	1	14	390
1955 to 1966	65	125	11	175	0	61	437
Since 1967	<u>126</u>	<u>179</u>	<u>190</u>	<u>270</u>	<u>66</u>	<u>275</u>	<u>1,106</u>
Total	<u>196</u>	<u>531</u>	<u>203</u>	<u>586</u>	<u>67</u>	<u>350</u>	<u>1,933</u>

<sup>1/</sup>Although the present Navy fleet ocean tug is rated at 3,000 horsepower and the new fleet ocean tug will have 4,500 horsepower, we used 1,500 horsepower based on comments by Navy officials that this is sufficient to accomplish many of the tasks now done by fleet ocean tugs.



In addition to those vessels rated at 1,500 horsepower and above, there are more than 1,100 tugs and oil exploitation vessels that are rated at 1,000 to 1,499 horsepower. Although these vessels would be more limited in their application by the Navy, it is possible that they would be suitable for less demanding tasks.

Some of the above vessels may not be suitable to perform tasks done by the Navy's fleet ocean tug, but such vessels were not identifiable because vessel characteristics were too general. However, based on our review and our discussions with tug operators, it is likely that a substantial portion of this commercial capability would be suitable for doing Navy tasks.

The Navy claims that its new tugs have capabilities which are not found in commercial ocean tugs. Specifically, the Navy maintains that its tugs have

- better towing capability and more room for personnel and equipment,
- better response and reaction for search and rescue operations,
- naval communication systems,
- appropriate equipment and beaching gear for salvage operations,
- facilities for transient personnel,
- greater readiness for oil spill clean up operations on the high seas,
- the ability to maneuver and adjust to a four point deep sea moor laid by another ship,
- the ability to dewater other ships and greater fire fighting capability,
- the ability to refuel at sea, and
- space and weight provisions for armament.

The Navy's assessment of commercial capability was limited to tugs only. However, merchant marine vessels of other types--such as the offshore supply vessel--cannot only do point-to-point towing, but can also

- tow target sleds,
- retrieve drones and exercise torpedoes,
- tow ships that are to be used for targets,
- provide cable laying support, and
- provide limited salvage capability.

Commercial operators told us that numerous commercial ocean tugs and offshore supply vessels have the capability to spend 25 days or more at sea, attain speeds of over 15 knots, and have an endurance of over 8,000 miles. Additionally, many commercial vessels are equipped with radar and other navigational equipment similar to that of the Navy. Other capabilities exist in the merchant marine, although not routinely found on board commercial vessels due to a lack of demand or because another sector of merchant marine provides that particular service. For example, fire fighting, dewatering, and salvage capability exists in the merchant marine, but not every tug and offshore supply vessel has it on board. Such capability could be placed on board if required.

Although the merchant marine has the capability to satisfy considerably more of the Navy's peacetime demands, it is not necessary to find a commercial replacement for the Navy tug. Since the Navy would still have substantial towing and salvage capability inhouse without acquiring the tugs requested in fiscal year 1978, it becomes a matter of determining which tasks are to be done commercially and which by Navy assets. Employment scheduling for Navy fleet ocean tugs is done every quarter, with the exception of such tasks as emergency tows, salvage, and other unplanned tasks. Even though this employment schedule is subject to change, and sometimes on short notice, merchant marine officials believe they could accommodate the Navy in most requests.

The overall effect on the merchant marine by having additional demand placed on it by the Navy is expected by industry spokesmen to be negligible. There are hundreds of commercial vessels and the Navy would only require the

equivalent of a few. Many of the U.S.-flag ocean tugs and offshore supply vessels are dispersed worldwide and many are located at ports in close proximity to major naval installations. A number of industry officials expressed to us the view that the multitude of vessels and their geographical locations could add flexibility to the Navy's ability to meet both peacetime and wartime requirements.

#### Commercial service less costly

Based on discussions with numerous commercial operators, we determined that most of the various tasks done by fleet ocean tugs could be done commercially for about \$3,600 to \$5,000 daily. At these rates, it would cost between \$700,000 and \$900,000 for the same level of service (182 shipdays) that is planned for the first new Navy tug. In contrast, we estimate the new tug will cost about \$2.0 million annually to operate and maintain. Our computation of the operating cost of the new tug is based on a Navy estimate of \$1.8 million plus the cost of (1) a four-man Navy communication detachment and (2) personnel and maintenance of the portable diving/salvage systems. The cost of these two items increases the annual operating expense to about \$2.0 million.

There are two major factors that account for the lesser cost in commercial use. First, the merchant marine has a wide-range of vessel types with different capabilities and can better match a vessel to specific tasks. Many of the capabilities inherent in the Navy tugs are not needed on each mission. Secondly, the Navy would only pay for the days the commercial ship is actually used; whereas, the cost of the Navy vessel would continue whether or not it is productively employed.

In addition to savings in procurement and operating costs, the phase-up cost of the new tugs would be avoided if commercial tugs were employed. This one-time expense of about \$665,000 for each tug covers the period several months after delivery where the ship and crew are prepared for service.

#### OTHER NAVY AND NORTH ATLANTIC TREATY ORGANIZATION (NATO) CAPABILITIES NOT CONSIDERED

In assessing its towing capabilities, the Navy did not consider several sources. In addition to the fleet ocean tugs, there are other types of Navy ships that have peacetime and wartime towing capability. For example, ships

designed for salvage and rescue operations can perform many operations generally assigned to ocean tugs. At the end of fiscal year 1977, the Navy had 15 such ships in service and another 2 chartered to a commercial salvage company.

Another possible source of towing capability would be to use a combatant ship to tow another combatant ship. Although this detracts from the combatant's primary mission, it does provide a source for emergency use.

Still another source would be the commercial and military fleets of NATO countries. The Navy assumes these vessels will be providing support for their respective navies. However, at times, these NATO vessels would probably be available for short-duration missions.

WARTIME REQUIREMENTS  
NOT ADEQUATELY DETERMINED

The Navy has estimated that it will require DELETED DELETED vessels with towing capability in wartime. Navy officials told us, however, that this estimate is not very reliable. A study directed by the Chief of Naval Operations, and done by the Center for Naval Analyses, indicated a significantly higher requirement. But the Navy Program Planning Director, in the accompanying transmittal letter, stated:

"The development of wartime requirements used in the study provide for only a preliminary investigation of this requirement and is not considered a credible analysis for development of wartime force level requirements. The assumptions and estimates must be reviewed and modified as necessary to incorporate the best judgment of all concerned."

This review and modification process has not been initiated.

The Navy has stated that force levels should support wartime over peacetime requirements. Accordingly, the Navy should determine accurate or reasonable wartime requirements before beginning any new construction program. It is questionable, whether the current estimate of wartime towing requirements, based on the methodology used, is adequate to support the current force level objective. Some of the areas that need to be evaluated or reevaluated are:

- Battle-damaged combatants required to be towed. The provided data referred us to a review of World War II battle-damaged destroyers that resulted from underwater weapons. In light of the advanced technology, different warfare tactics, modern weaponry, and modern warships, we believe the evaluation needs restudy.
- Attrition assumptions that apply to towing and salvage ships. The data provided by the Navy applied the attrition rate used for combatants in a Navy study. Navy officials are not satisfied that the same factors for combatants should be applied to support vessels.
- Amphibious task group support. Although mentioned as a requirement and mission of towing and salvage ships in the data provided, it has not been quantified.
- Requirements for harbor clearance operations need to be determined.
- The level of augmentation that can be expected from other sources (e.g., U.S. merchant marine, allies, etc.).

Use of commercial assets in wartime is anticipated by the Navy, but the capability required has not been evaluated. The major missions of Navy towing and salvage assets include towing battle-damaged ships, recovering beached amphibious assault ships, and harbor clearance operations. How much support, if any, that could be provided by the merchant marine in support of these missions has not been addressed by the Navy. Use of commercial assets for harbor clearance and towing battle-damaged ships are two distinct possibilities recognized by the Navy, but never evaluated. One possible method of use follows:

A battle-damaged ship is towed by a Navy asset out of the immediate battle area and transferred to a commercial vessel. The commercial vessel proceeds to tow the damaged ship to its destination. Meanwhile, the Navy vessel is free to provide whatever combat support may be required, as opposed to possibly being involved in a tow that would exclude it from activity during a critical time.

Such a concept, if determined feasible, could reduce the overall wartime force level requirement.

#### PEACETIME REQUIREMENTS OVERSTATED

Navy testimony in 1977, supporting the request for the new tugs indicated that historically, it has had an ocean tug requirement of 4,400 shipdays annually. The testimony was based, however, on somewhat dated analyses of demands during the period of the Vietnam conflict.

The part of that 4,400 shipday demand actually supplied by the 24 tugs then in service amounted to 3,122 days. The remainder represented tug services supplied by salvage and rescue vessels and demands for support rejected.

More recent data supplied by the Navy suggests that current peacetime requirements are substantially less. However, we were unable to ascertain from the Navy data the amount of work fleet ocean tugs actually did. The information showed that the 20 tugs and 15 salvage and rescue vessels combined supplied about 3,900 shipdays of support services.

By 1981, the Navy will have fewer operating tugs and salvage/rescue ships, but will not experience a commensurate decrease in level of service capability. The newer tugs already being constructed will be far more productive than those they are replacing. Commercial augmentation will most likely be required, however, and a need for the Navy to accurately establish and monitor its requirements for tug services will become more important.

#### SUMMARY OF POTENTIAL SAVINGS

A decision not to procure the three tugs approved in fiscal year 1978 would result in savings of

- \$51 million for the initial procurement (\$17 million a tug),
- \$2 million in one-time phase-up costs (\$665,000 a tug), and
- about \$3 million annually in operating costs.

## PRIOR STUDIES

The Navy's desire to obtain additional fleet ocean tugs is based in part on a Navy Towing Requirements and Force Levels Study--done by the Center for Naval Analyses in July 1974. The study concluded that

- due to technical limitations, the use of commercial ocean tugs to meet the Navy's peacetime requirements was not feasible, although the least costly;
- an estimated \$200 million could be saved over a 10-year period if 10 new fleet ocean tugs, constructed to the basic design of the commercial offshore supply tug, were operated by Military Sealift Command rather than by the Navy fleets;
- all old tugs should be retired as soon as possible;
- additional capability needed for peacetime be obtained by commercial spot charter; and
- a greater wartime reliance on ocean tug resources from private industry would result from the above program.

Although we agree with some findings of the study, there are several areas of the evaluation which need further analysis. For example, the analysis of commercial tug availability neglected to consider oil exploitation vessels, which includes the offshore supply tug. The study reported 473 commercial tugs, with 2,000 horsepower or larger and built since 1955, available for some Navy tasks. As discussed earlier, we found about 1,000 commercial vessels, using the same horsepower and age criteria, available when oil exploitation vessels are included. By removing this criteria, our universe of commercial vessels increased to over 3,000. Although it is doubtful that all 3,000 vessels would be suitable for Navy work, it is probable that enough can qualify to satisfy more of the Navy's ocean towing requirement than is presently done or planned for the future.

Although the study came up with what we believe to be only a partial evaluation of commercial capability, the authors still made the following statement:

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"All that we're proposing is that the Navy consider, on a trial basis, a limited shift toward more commercial use. If the commercial market proves responsive, the Navy would have more confidence in trying further commercial use. A gradual approach would allow time to iron out procedural problems and allow the Navy to see whether commercial tug operators were inclined to expand their fleets to handle the growing Navy business."

The Navy has not done this.



CHAPTER 3

ALTERNATIVES TO NEW FLEET OILERS SHOULD BE CONSIDERED

We reviewed the Navy's fleet oiler replacement program and peacetime and wartime underway replenishment requirements to determine (1) the effect on readiness that would result by deviating from the current program, (2) the extent to which the merchant marine could provide capable and cost effective fueling at sea service to the Navy, and (3) if the Navy had adequately considered other alternatives in the development of its program. The impact on readiness is the most critical consideration since a serious degradation resulting in an impediment to mission accomplishment would make less costly alternatives unacceptable.

We found that

- based on wartime requirements and mission of the fleet oiler, it is questionable whether the Navy needs the number and type of oiler desired;
- viable lower cost alternatives to the Navy's replacement fleet oiler have not received adequate consideration; and
- little has been done to enhance U.S. commercial tanker capability as an effective supplement to the Navy's underway replenishment capability.

NEW OILER MAY NOT BE MOST  
SUITABLE SHIP FOR INTENDED MISSION

There are two scenarios which affect fleet oiler requirements. The first is the unilateral military action, under which it is assumed that convenient ports and sources of fuel will be denied. If petroleum, oil, and lubricants (POL) are to come from U.S. ports, the longer pipeline between the POL source and the users will create a greater demand for oilers. There was no attrition assumption for oilers in this scenario; therefore, the controlling force of the requirement is the long transit distance.

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The second scenario, a worldwide conventional war with the Soviet Union and its allies, assumes that ports of U.S. allies are available. Here the requirement is controlled by consumption rates rather than resupply distances.

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The oiler requirements for the above scenarios were determined from daily fuel demand, cycle time (time required to load and unload plus the round-trip transit time), and the capacity of the new oiler. The following table shows current and projected oiler assets available to meet wartime requirements:

Fleet Oiler Assets  
(Number of ships at end of fiscal year)

<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
16	16	DELETED	

While the POL capacity required for each scenario may be valid, we do not believe the Navy's new oiler represents the best asset to accomplish the wartime missions. The oiler's primary mission, which is to shuttle POL products from the supply source to multiproduct station ships, does not require it to be fully capable. <sup>1/</sup> In our opinion, the shuttle ship mission is controlled by consumption and transit distance, which equates to efficient ton-mile productivity. This is not accomplished with the oiler, which has an acquisition cost of more than \$160 million, operating costs of \$12 million annually (1976 dollars), and a capacity of only 120,000 barrels.

1/Fully capable--These are ships that are task force integrable. This means they should have speed and maneuverability characteristics compatible with the ships they serve, and they should be equipped with adequate command, control, and communication features. Additionally, these ships possess some degree of survivability (although not normally as extensive as warships) in the form of equipment and systems redundancy, damage control features, and weapon systems. Fully capable oiler also means that the ship is designed, equipped, and manned for direct interface with customer ships at sea, and can deliver products to these ships through the use of on-board transfer gear.

This makes the oiler uneconomical as well as inefficient when compared to other alternatives. Also, the lack of attrition estimates in the first scenario suggests that oilers would operate in a little or no threat environment--further questioning the need for full capability.

The Navy's desire for full capability is essentially based on the oiler's secondary mission to replace multiproduct station ships if they become nonoperational. However, attrition estimates of station ships indicate that only a few backup ships would be required. Additionally, the oiler does not possess the same product carrying versatility as the station ship. This means that another ship, probably an ammunition ship, in addition to the oiler would be required to replace the station ship. As a result, the combat effectiveness of the combatants may be reduced because station ships are designed to minimize the alongside logistics time.

As can be seen from the contrasting wartime missions of shuttle ships and station ships, the Navy's new fleet oiler is too sophisticated for a shuttle ship and is an inferior substitute as a station ship. Some alternatives to the Navy oiler are available which offer comparable required capability at significantly lower cost. These are discussed below.

#### ALTERNATIVES NOT ADEQUATELY CONSIDERED

A joint Navy/Maritime Administration (MarAd) design team, in early 1974, developed a cost and feasibility study for a merchant type tanker to be used for point-to-point POL delivery and consolidation of POL to other Navy underway replenishment ships. Based on input from the Navy, previously conducted studies, and comments on the studies, the design team developed a set of proposed characteristics. The ship designs developed were called MarAd Preliminary Designs 185 and 186, with each design having two capacity versions--180,000/220,000 barrels. Design 185 is a 16-knot ship, while design 186 is a 20-knot ship.

MarAd officials believe that these ships meet all mission requirements determined by the joint Navy/MarAd design team. The Commander, Naval Ships Systems Command, stated that the 20 knot, 220,000 barrel version offered the greatest naval support capability compared to the options. This particular design, which is fully modified to do the Navy underway replenishment mission, is essentially compatible with the oiler from a performance standpoint. Additionally, this design offers more efficient ton-mile productivity (220,000 barrels compared to 120,000 barrels for the Navy oiler).

Updated acquisition estimates provided by MarAd showed that the cost of one design 186 ship with 180,000 or 220,000 barrel capacity is \$77 million and \$84 million, respectively. A series construction of five ships reduces the cost of each ship to \$70 million and \$78 million, respectively. In comparison to the Navy oiler, the MarAd 20 knot/220,000 barrel replenishment tanker costs about half as much and is about twice as efficient in terms of ton-mile productivity. The primary reason for the large difference in the cost of the MarAd design versus the Navy's oiler is the deletion of many design specifications that would normally be found on a task force integrable ship. (See footnote on p. 18 for examples of such design specifications.)

We were unable to determine why the joint Navy/MarAd design team proposals never went beyond the preliminary stages. Navy officials did state, however, that they believe there would be a funding problem since the ship is a fragmented product that is neither Navy nor commercial.

A 1977 analysis of underway replenishment force level requirements done by DOD's Office of the Assistant Secretary, Program Analysis and Evaluation, suggested the replacement of some single product fleet support ships--oilers and ammunition ships--with a new design concept ship. The proposed ship is called a minimultiproduct oiler (minimulti), and would have the capability of the Navy's new oiler plus an ordnance delivery capability of 1,200 tons or about one-half the capacity of an ammunition ship.

The study determined that the minimulti would be an effective substitution in theaters of operation requiring the services of oilers and ammunition ships. For example, the number of oilers and ammunition ships required in the Mid-Atlantic theater during a worldwide conventional war with the Soviet Union and its allies is [DELETED] and [DELETED] respectively. However, if [DELETED] of the [DELETED] oilers were minimultis, the ammunition ship could be replaced. The study concluded that [DELETED] minimultiproduct oilers could be substituted for [DELETED] oilers and [DELETED] ammunition ships. Based on a 30-year oiler life, this action would result in savings of over \$530 million. This savings was determined from a comparison of the cost to build and operate one minimulti versus the cost to build and operate one oiler, the cost to operate one-half of an ammunition ship, and the replacement cost of one-half of an ammunition ship less residual value.

Other alternatives include placing shuttle ship capability in the National Defense Reserve Fleet 1/ and increasing National Defense Features 2/ put on commercial tankers to enhance their underway replenishment capability. Both of these alternatives would require further study by Navy and MarAd. The defense feature issue should be particularly studied since the Navy has criticized the commercial tankers underway replenishment capability. This criticism is essentially based on the commercial tankers' inability to effectively transfer fuel to any ship at a rate compatible with the Navy's oiler.

ENHANCEMENT OF MERCHANT MARINE COULD  
SIGNIFICANTLY INCREASE NAVY CAPABILITY

There are over 700 merchant tankers owned by U.S. companies, but more than 500 are registered and operated under a foreign flag--primarily Liberia and Panama. In terms of tonnage, all U.S.-owned tankers total more than 60 million deadweight tons. However, about 80 percent of this tonnage is under foreign flag. The U.S.-flag tanker fleet consists of about 250 ships, with only one-third (84) having some type of National Defense Features to enhance their capability to function as a military auxiliary. To facilitate the tanker's underway replenishment role, most with defense features have alongside fueling at sea capability. This capability permits the tanker to function as a shuttle ship because it can transfer fuel to underway replenish ships which as mentioned earlier, includes station ships. Additionally, the capability allows these tankers to transfer fuel directly to aircraft carriers. About 17 tankers have fueling at sea capability, which does not require the customer ship to have fueling rigs.

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1/The National Defense Reserve Fleet consists of ships laid up in a preservation status and maintained by the MarAd. This fleet provides supplemental shipping capacity that the United States can rely on during a military or commercial shipping crisis.

2/National Defense Features--Pursuant to title V of the 1936 Merchant Marine Act as amended--the Secretary of the Navy may suggest changes to the plans and specifications of proposed commercial vessels to be built with the aid of a construction differential subsidy. These proposed changes enhance the merchant ships' ability to function as a naval or military auxiliary in time of war or national emergency.

This permits the tanker to transfer fuel to any Navy ship and those in the NATO fleet, but at a considerably slower rate than the Navy's oilers.

Merchant marine effectiveness  
tested and proven

Although limited, the use of commercial tankers to deliver petroleum products to Navy ships has expanded since 1971 under a program called Charger Log. The program provides the merchant crews with the experience and skills needed to conduct underway replenishment tasks. Between 1971 and 1977, Military Sealift Command controlled tankers have conducted more than 90 underway replenishment operations, with most of the tankers operated by contract union crews and many of the tankers chartered from the merchant fleet.

The first demonstration under the Charger Log program was conducted during a 2-month period in 1972. A chartered commercial tanker, the SS Erna Elizabeth, refueled 40 U.S. and NATO combatant ships to show that merchant marine tankers can perform underway replenishment and can resupply naval forces at sea. During this test, the Erna Elizabeth

- delivered about 10 million gallons of POL without contamination,
- met all commitments on time,
- sailed more than 12,000 miles,
- maintained replenishment speed,
- did not experience any personal injuries, and
- had no equipment or machinery casualties.

Navy's reluctance to use  
merchant marine tankers

Navy officials cited numerous reasons for their reluctance to expand the merchant tanker's role in the area of underway replenishment. At the top of the list was the tanker's inability to effectively transfer fuel to any ship in the fleet at a rate compatible with the Navy oiler. Other objections to the use of commercial tankers include

- the lack of features such as armament, greater compartmentation, and redundancy of essential components, systems, and equipment;
- the merchant tanker's inability to do 20 knots;
- lack of necessary communications equipment;
- less command and control compared to Navy ships;  
and
- the merchant crews inability to conduct operations requiring security clearances.

According to Navy officials, the oiler must be able to operate with the combatant fleet, replenish the fleet with clean fuel, and conduct this operation when required--in less than ideal sea states and/or in combat situations.

Availability of commercial tankers in a contingency is questionable since there are not any provisions for obtaining this capability other than voluntary charter. Several alternatives have been suggested, but not acted on. One means of assured early tanker availability in a contingency is to resurrect an allocation plan, under which commercial tankers would be made available to DOD. Such a plan was last used during the Korean War. It has also been proposed that some tankers be placed in the National Defense Reserve Fleet, thereby reducing the burden that would be on U.S. merchant marines.

#### Expanding the merchant tanker's role

In wartime, the merchant tanker's primary task will be to provide point-to-point resupply of petroleum products. This requires no underway replenishment capability. Additionally, the tankers may be called on to provide

- consolidations with Navy underway replenishment ships,
- opportune underway replenishments with Navy ships when oilers or multiproduct replenishment ships are not available, and
- underway replenishment of convoy escorts.

While the merchant tanker's role in strategic mobility is recognized, industry spokesmen believe this role should be expanded. For example, the astern refueling rig costs about \$100,000, but few tankers have this capability. Although the method may be slow, it enhances the tankers' military auxiliary ability and adds flexibility to the Navy's operational capability. It is also believed that the communications on tankers could be upgraded to include secure systems.

Discussions with industry officials revealed that there are currently no commercial tankers comparable to the Navy's fleet oiler. While such a vessel could be constructed, there would be little savings if any, when built with Navy oiler characteristics. It is questionable though, whether the characteristics demanded by the Navy are needed to accomplish the shuttle ship mission. However, construction of a commercial vessel with the Navy's performance criteria, but without many of the military features, can produce a less costly product. This was evidenced by the MarAd proposal discussed on pages 19 and 20.

While spokesmen for the merchant marine industry recognize that the Navy should have some in-house underway replenishment capability, they also expressed interest in having the merchant marine, through tanker construction and enhancement of existing fleets, provide ships that would closely meet military needs.

#### PRIOR STUDIES

In July 1975, a study sponsored by the Chief of Naval Operations was issued by a private research organization. The study, UNREP Requirements and Forces Study--1984, determined the number and types of underway replenishment ships needed to meet the fleet's requirement for fuel, food, ammunition, and other provisions under various scenarios.

The study identified four methods of achieving cost savings in underway replenishment support to the Navy. They are

- use of less than fully capable shuttle ships,
- automation and reduced manning,
- use of civilian manning, and
- use of commercial ships which would save acquisition costs plus operating expenses.



Major findings of the study were that

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(2) increased reliance on the commercial sector is required, and (3) reliance on merchant marine and limited capability ships represents a moderate risk, but an effective UNREP force is possible. The study presented various force level options, and the one suggested called for a mix of DELETED fully capable oilers, and DELETED limited capability oilers. This force level also requires substantial augmentation from the merchant marine. The primary reason for at DELETED fully capable oilers is their secondary mission as backup station ships.

In 1972, another study titled, "Role of Merchant Ships in Wartime Defense Mission," was issued by the Center for Naval Analyses. This study was jointly sponsored by the Navy and MarAd. Part of the study compared the merchant ship to the naval ship's capability to conduct underway replenishment missions. It did not examine all features related to wartime capability, but examined whether the merchant ships are sufficiently attractive to justify further study of these features. The study found that

--partially modified merchant designs greatly reduce costs to the Government but would take much longer time to transfer at sea than would Navy ships and

--additional transfer facilities would permit merchant ships to replenish combatants almost as quickly as Navy ships.

The study also found that if these fully modified merchant ships were built or chartered by the Navy in peacetime, the Navy could save over \$600 million in all operating areas over a 10-year period. The savings would be due to the larger size and simpler construction of merchant ships. Size and simpler construction, however, would create some operational problems and some features would be missing that are normally found on Navy ships. The study concluded that the potential savings from using merchant ships for wartime underway replenishment are large enough to justify further, more detailed analysis, and fleet testing.

## CHAPTER 4

### CONCLUSIONS AND RECOMMENDATIONS

#### CONCLUSIONS

The Navy's plan to replace aging fleet oilers and ocean tugs requires further evaluation and study. The high cost of the ships, coupled with budget constraints and the low priority given to Mobile Logistics Support Force ships relative to combatants seems to suggest that the Navy needs to develop and adopt less costly alternatives capable of providing effective fleet support. GAO believes these alternatives exist, but have not been considered or they have been prematurely discounted. The merchant marine's role in this area of fleet support should be increased.

Economics are not the only reasons for looking at other alternatives. The merchant marine needs to receive some direction if it is to be a viable military auxiliary, as mandated by the Merchant Marine Act of 1936. Much of this could come from the Navy. The merchant marine cannot develop capabilities of national defense value unless criteria are first established. Closer coordination between the Navy and the commercial sector to foster a viable merchant marine could enhance the readiness of the Navy's fleet support capability.

#### RECOMMENDATIONS

With respect to the Navy's fleet ocean tug program, we recommend that the Secretary of Defense direct the Secretary of the Navy to

- defer construction of additional fleet ocean tugs beyond the four currently being constructed,
- develop criteria from which more adequate peacetime and wartime requirements can be determined,
- maximize peacetime use of commercial assets, and
- in light of the anticipated wartime reliance on commercial assets, develop, coordinate, and implement a plan of action with appropriate merchant marine officials.

With respect to the Navy's fleet oiler program, we also recommend that the Secretary of Defense direct the Secretary of the Navy to

- reevaluate the need for fully capable oilers to accomplish the primary wartime mission--that of a shuttle ship;
- reevaluate the suitability of the oiler to function as backup station ship;
- in coordination with MarAd and commercial operators, identify areas in merchant marine tanker fleets that could improve national defense value and enhance overall readiness. Specific attention should be given to National Defense Features, the tankers' role in fleet support, methods effecting responsive and timely availability, and construction alternatives that optimize commercial and defense value; and
- determine if the National Defense Reserve Fleet could play a greater role in providing auxiliary shuttle capability.

## CHAPTER 5

### SCOPE OF REVIEW

Our examination included a review of pertinent documents and records concerning the operation of fleet oilers and ocean tugs. We interviewed and obtained from Navy officials, construction-cost data on the new fleet oilers and tugs and the demand/force level requirements for fleet support ships during peacetime and wartime operations.

MarAd officials were also interviewed to obtain cost data/studies conducted by them on commercial built tankers. We obtained related operating cost for both types of fleet support ships from the Military Sealift Command.

During our visit at the Naval Station, Norfolk, Virginia, we discussed and obtained the operating data, as well as mission requirements, for both types of fleet support ships. At the fleet site, we toured numerous support ships.

Industry officials were interviewed to determine their capabilities and cost to provide tug and oiler support for the Navy.

COMPARISON OF THE CHARACTERISTICS  
OF THE OLD AND NEW FLEET TUGS

	<u>WWII tug</u>	<u>New tug</u>
Length overall	205 ft.	225 ft.
Maximum beam	38.5 ft.	42 ft.
Maximum draft	15.5	15 ft.
Maximum full-load displacement	1,675 tons	2,000 tons
Engines	Diesel electric	Diesel
Shafts	One	Two
Speed	15 knots	15 knots
Shaft horsepower	3,000	4,500
Accommodations	85 men	20 men (plus austere accommodations for 20-man transient towing/salvage team)
Towing system	Constant tension winch	Single drum winch and traction machine

CHARACTERISTICS OF NEW OILER

Length	550 ft.
Beam	88 ft.
Draft	32 ft.
Displacement	27,500 tons
Speed	20 knots
Shaft horsepower	24,000
Propulsion	Steam turbine, single shaft, 2 boilers
Manning	180
Cargo capacity	120,000 barrels
60 percent marine diesel fuel	
40 percent aviation fuel	