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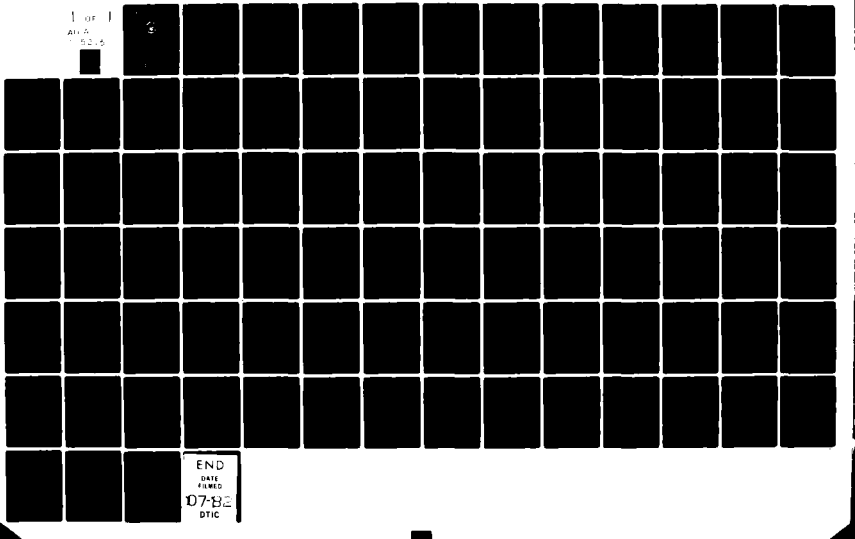

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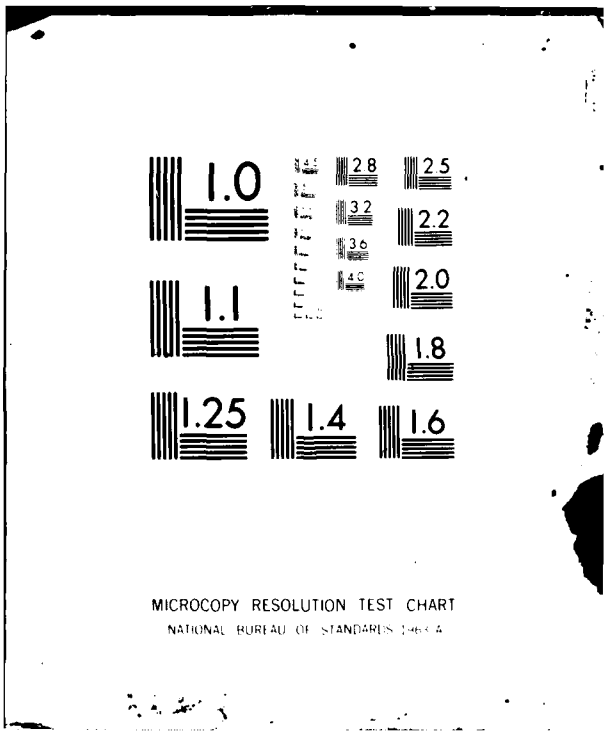
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NAVAL POSTGRADUATE SCHOOL
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THESIS

AN ANALYSIS OF THE UNITED STATES MARITIME INDUSTRY SUBSIDY PROGRAM AND NATIONAL DEFENSE: A RATIONAL APPROACH TO SEALIFT READINESS

by

Leonard Lewis Proctor

December 1981

Thesis Advisor: D. C. Boger

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This study examines the United States (U.S.) Maritime Industry as a potential defense force, its present defense capabilities and the government programs and legislation designed to support it. The current government subsidy program is determined to be inadequately structured to meet the nation's needs for a merchant marine of modern, efficient and competitive vessels.

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An Analysis of the United States Maritime Industry Subsidy Program and National Defense: A Rational Approach to Sealift Readiness

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Submitted in partial fulfillment of the
requirements for the degree of

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This study examines the United States (U.S.) Maritime Industry as a potential defense force, its present defense capabilities and the government programs and legislation designed to support it. The current government subsidy program is determined to be inadequately structured to meet the nation's need for a merchant marine of modern, efficient and competitive vessels. Defense mobility has also declined as a result of ineffective programs. Included is a brief history of the Merchant Marine and its commercial and national defense objectives. The analysis discusses the criteria for selecting a viable ship design to fulfill the U.S. Merchant Marine requirements for commercial and defense missions. Conclusions and recommendations are described.

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I. INTRODUCTION

The capability of the United States (U.S.) Merchant Marine to adequately fulfill its objectives of carrying a substantial portion of waterborne foreign commerce and serving as a military auxiliary for national defense is currently open to question. Doubt exists because of the erratic history of the Merchant Marine throughout past periods of conflict, when massive shipbuilding efforts had to be undertaken in order to provide adequate shipping.

Since World War (WW) II, the decline of the U.S. flag merchant fleet has indicated that too little usable shipping capacity exists to directly support the U.S. defense effort or to carry any significant portion of world trade. Only after the crisis situations of the Korean and Vietnamese conflicts did the U.S. marshal its capacities and construct the necessary tonnage to support the fighting forces. The potential for history to repeat itself exists today.

Massive government subsidy programs, as they currently exist, have not turned the tide for the U.S. flag fleet. Today's U.S. Merchant Marine plays only a minor role in international oceanborne commerce, carrying less than five percent of U.S. foreign trade in 1979 [1:33]. This means that the U.S. must depend on foreign ships to carry ninety-five percent of American imports and exports. This reflects the relatively

small size and capacity of the fleet as compared to those of other countries.

Relatively few ships under U.S. registry today have the genuine capability to meet military needs. Containerships, with rare exceptions, are not equipped with cranes to handle their cargoes. Their military usefulness depends upon the availability of adequate cranes at the objective area, or helicopters able to lift thirty or more tons. Heavy-lift ships, vessels with booms and winches with single lift capacity of 200 tons, are desirable to handle military equipment. Break-bulk ships, vessels of proven value in the military support role because they can accept the assorted and odd-shaped impedimenta of an expeditionary force, are decreasing in number as more and more trade routes are converted to containerized traffic. The military need for these ships, however, remains. Roll-on/Roll-off ships can accommodate large numbers of outsize vehicles, and can deliver them to any harbor where they can drop their stern ramps to a platform. There are, unfortunately, very few ships of these types in the U.S. fleet.

Given its present status, of what value would the Merchant Marine be should the U.S. be called upon to fight another war, a war on the scale of the previous World Wars such as a Russian invasion of Europe?

This research effort examines the defense mobility capability of the U.S. Merchant Marine and its requirement to

fulfill the role of a military auxiliary in time of war or national emergency.

In this analysis, the author describes a general history of the Merchant Marine and the various government subsidy programs which have been infused into the industry in an effort to achieve its stated objectives.

Following this background, a description of today's Merchant Marine will be presented with facts and figures on its relative world position. A description of the methods used by the government in acquiring ships to augment its naval assets is followed by a section which analyzes those ship types most suitable for both commercial and military support applications.

The last section will deal with conclusions and recommendations based on the analysis conducted.

II. BACKGROUND AND HISTORY OF UNITED STATES MERCHANT MARINE

A. BACKGROUND AND HISTORY

Except for periods of war, over the past century, the United States commercial shipping industry has been in a state of constant decline. This trend has been both in capital equipment, i.e., numbers and capabilities of ship types, and in percentage of U.S. commercial business transported. This decline has been in spite of the expenditure of great sums of money through massive subsidization programs. This depicts the current situation of our maritime industry; some historical background will help show how today's situation came about.

Ships and shipping suffered through growing pains in the history of early America. For the early colonists, lumber for shipbuilding was plentiful and trade a necessity for survival. Costs of American-built vessels were low and gradually this country became pre-eminent in the building of wooden ships. In 1790 U.S. ships carried almost ninety percent of the nation's exports and imports. By the early 1850's the U.S. Merchant fleet was rapidly overtaking that of Great Britain, traditionally the world's dominant sea power. However, when steamships were invented in the early part of the nineteenth century, America declined to take expeditious advantage of such vessels, leaving an open invitation to the British to develop them. Instead, America dedicated time

and money to the wooden sailing ship, culminating in the design of the fast, sleek clipper ships in the 1840's. England, meanwhile, was investing heavily in iron steamships.

By 1860, the two main merchant fleets in the world were those of Great Britain with 5.7 million tons and the United States with 5.3 million tons. Until this point in U.S. history, American flag ships had been favored by the navigation laws of the major maritime nations and coupled with the superior carrying capacity, speed and seaworthiness of American ships, our merchant fleet was placed in a superior competitive position in the ocean-carrying trade. However, with the replacement of wood by iron and steel in the shipbuilding craft, U.S. flag ships began to lose this competitive edge.

The Civil War accelerated the decline for the U.S. Merchant Marine. To avoid losing any further ships in the war effort, large numbers were transferred to foreign registry with the restriction that those that were transferred would not be permitted to return to U.S. registry. As much as one third of the merchant fleet was sold outright during the four years of the Civil War [2:57]. By 1866 only 32 percent of American trade was carried in American ships [2:58].

America's post Civil War interests turned towards the development of the railroads and the opening of the West. Maritime matters received less and less attention by the government. This resulted in the merchant fleet's decline from a once prominent position to a level in 1914 where only nine

percent of the value of foreign commerce was carried in American ships [3:18].

A law passed in 1817, requiring ship owners to buy only American-made ships, heavily restricted the potential growth of the merchant fleet [2:53]. The basic problem, which still exists today, was that high costs associated with American shipyards made U.S. flag ships more expensive to purchase than their foreign counterparts. American manufactured ships were faced with initial high fixed costs which made them less competitive than those built in Europe. Coupled with high production costs was the Seaman's Act of 1915, which directed that the crew of U.S. merchant flagships had to be American. American crews were traditionally more expensive than the foreign nationals most often used on the ships of other flags.

Laws such as these, while presumably benefitting shipyards and merchant seamen, worked to the disadvantage of the industry as a whole since fewer ships were built. For example, the policy to protect American shipyards from overseas competition raised the price of ships to U.S. operators by 40 to 50 percent [4:30]. The response of the industry was to maintain utilization of out-dated technology so that as late as 1890 the majority of the fleet was comprised of wooden sailing ships [4:30].

In World War I, and later in World War II, massive shipbuilding efforts were undertaken. The outbreak of war in Europe in 1914 forced foreign nations to withdraw their ships, leaving U.S. ports overcrowded with cargo and no means of transport.

Congress was spurred to enact the Shipping Act of 1916 which gave temporary authority for foreign built ships to be registered in the United States for use in foreign trade. This act also spurned a surge of ship construction, resulting in the mass production of over 2,000 units [5:5]. As a result of this program the American merchant fleet grew from 6.8 percent of the world's total (gross tons) in 1914 to 22.2 percent in 1920 [6:19].

At the conclusion of World War I, the United States was confronted with the problem of disposing of the excess tonnage in surplus government-owned ships. Two pieces of Congressional legislation, the Merchant Marine Acts of 1920 and 1928 were enacted in an attempt to alleviate the overcrowded harbors following World War I. They tried to establish a definitive policy regarding the Merchant Marine:

> ...That it is necessary for the national defense and the proper growth of the foreign and domestic commerce that the United States shall have a merchant marine of the best equipped and most suitable types of vessels sufficient to carry the greater portion of its commerce and serve as a naval auxiliary in time of war or national emergency ... ultimately to be owned and operated by citizens of the U.S. [5:5]

These two pieces of legislation are the roots of ongoing and current subsidy programs to the shipping industry. They established trade routes to be sold to American citizens and directed that all U.S. Mail be carried in U.S. ships. The 1928 Act established a subsidy program for mail carriers and the construction of a few new ships was also accomplished. But despite its intended effects, the two acts of the 1920's

could not produce the trade necessary to support the excess ships manufactured for the war effort. Excess inventory was sold to private citizens at reduced prices with no incentives for innovative technology. The U.S. Merchant Marine was headed for a point when the whole fleet would be obsolete at once. Unless public funds were provided the merchant fleet would shrink still further into decline.

In response to this impending disaster Congress passed the Merchant Marine Act of 1936. This legislation represented a new and costly approach to the ills of the maritime industry. Direct subsidies were granted in the forms of construction and operating differentials to increase the number of ships built in American shipyards, to provide jobs and high wages for merchant seamen caught in the jaws of the Depression and to ensure a capable merchant fleet as part of the national defense program. It also established the Maritime Commission to monitor the subsidy program and the industry in general.

The idea of a subsidized program to the industry was the key issue in the Merchant Marine Act of 1936. The federal government was now involved with direct funding of a major portion of the costs associated with the construction and manning of U.S. flag vessels.

The Construction-Differential Subsidy (CDS) involved government funding the shipyard the difference between what the American yard charged and what a foreign shipyard would charge. Shipowners paid up to that amount which would be charged by a

foreign construction yard and the government paid the difference, within certain percentage limits. Initially, the government paid only 33 percent. This was subsequently raised to a 50 percent limit. The 50 percent limit remained in effect until 1960, when it was raised to 55 percent. The 1970 Merchant Marine Act took steps to reduce this percentage differential and in 1976 the limit was reduced to 50 percent [2:79].

For a shipyard to be eligible to participate in the CDS program, certain criteria have to be met:

1. The vessel constructed must be utilized in foreign trade;
2. Crew members on subsidized ships must be American citizens;
3. The Navy Department must approve construction plans to determine the vessel's suitability for use;
4. The vessel must be registered in the U.S. for at least twenty-five (25) years [2:80].

In essence, the construction-differential subsidy is a direct subsidy to the shipbuilding industry. Funds paid out by the federal government under the CDS program in 1978 totalled $156 million. The total cost of this program from 1936 through 1978 has been over $2.8 billion in federal funds [1:97].

The other subsidy program which was established by the Merchant Marine Act of 1936, is called the Operating-Differential Subsidy (ODS). The intentions of the program, as effected by direct payments to certain shipowners/operators, was to offset

the difference in cost in operating an American flag ship as opposed to a foreign flag vessel, which traditionally is much cheaper. The amount of the ODS:

> ... shall equal the excess of the subsidizable wage costs of the United States officers and crews, ... cost of insurance ... and maintenance over the estimated fair and reasonable cost of the same items (less the cost of defense related items) if such vessels were operated under the registry of a foreign country ... [2:83]

Eligible ships had to be constructed in the United States and be efficient and competitive in foreign trade.

Approximately 85 percent of the ODS goes to wages, old-age pensions and unemployment benefits. Insurance accounts for about 8 percent and maintenance about 7 percent [2:84]. Federal outlays under the ODS program were over $303 million in 1978, with a total since 1936 to $5.2 billion [1:97].

The Merchant Marine Act of 1936 was designed to establish a fleet which would provide vital shipping services for American manufactured and agricultural products at comparable rates to those offered by foreign competitors. The program proved to be of tremendous value to the U.S. effort at the outbreak of World War II in that it provided an impetus to the required expansion of the shipbuilding industry. Between 1940 and 1945, U.S. yards built 5,037 merchant vessels of 2,000 gross tons and over [4:53]. However, once the war was over and the post-war shipping boom had run its course, the U.S. again had an over-abundance of ships.

Excess tonnage was reduced with the passage of the Merchant Ship Sales Act of 1946. U.S. citizens and friendly foreign countries, whose fleets had been drawn down during the war, purchased the government surplus. Eight hundred and forty-three of these vessels were transferred to American-flag operators and 1,113 vessels went to foreign flags, primarily England, Norway and France [2:91]. Those remaining, over 1800, were retired to the National Defense Reserve Fleet (NDRF) [2:91]. The U.S. Merchant Marine fell back into a period of decline for much of the same reasons as post World War I: not enough trade to support worldwide fleets.

As other nation's fleets and shipbuilding industries became more progressively larger, more productive and more competitive, the U.S. flag fleet continued to decline to the point where by 1969, it carried only five percent of the nation's foreign trade as compared to eleven percent in 1960 [4:73].

The Vietnam Conflict held off the forecasted shrinking of the merchant fleet due to its internal use during the middle to late 1960's. A downward trend which had existed since World War II was stalled, for a short time, due to the Vietnam War. Table 1 shows the total number of ships of 1000 tons or over from 1960 - 1973.

The Merchant Marine Act of 1970 attempted to bolster both the Merchant Marine and the shipbuilding industry. The 1970 Act reflected the change in climate which had come about in both industries. It recognized that the merchant marine had

TABLE 1

TREND OF MERCHANT SHIPS - 1960-1973

Registered in the U.S.
of 1000 tons or more

YEAR	NUMBER OF SHIPS
1960	945
1961	903
1962	885
1963	911
1964	916
1965	946
1966	957
1967	918
1968	919
1969	811
1970	768
1971	698
1972	598
1973	568

These figures do not include the National Defense Reserve Fleet. [4:206]

changed from a labor-intensive industry to a capital-intensive industry. It also reflected the shift from the liner-dominated foreign trade of 1936 to the bulk carrier-dominated trade of the 1970's. Approximately 90 percent of the U. S. foreign trade volume (by ton-miles) is in bulk commodities.

With regard to the shipbuilding facet, the 1970 Act reflected the idea that U. S. yards could become more efficient and competitive on a world market basis. Towards this end, the Act called for the production of 300 new vessels between 1971 and 1980 [2:93]. By promoting standard designs, it sought to encourage economies of scale as the number of ships produced increased. Shipyards were now given the opportunity to request the CDS funds to build ships in advance of a firm order from a shipowner.

To preclude long delays encountered in waiting for American production of subcomponents, the Act allowed the Secretary of Commerce to purchase foreign built components for ship construction. This Act, along with new subsidies, spurred the shipbuilding industry.

While the 300 new-ship construction goal has not been reached, approximately 175 ships were constructed in the decade of the 1970's [1:31]. These new vessels replaced older ones which were retired or sold overseas so that the total number of ships available has not changed drastically.

There has, however, been an increase in total tonnage available between 1973 and 1979.

B. THE MERCHANT FLEET - 1981

Today's active private ocean going fleet is composed of a mix of ships which, as of 1 January 1981, included 545 vessels, totaling 20.5 million deadweight tons (dwt), as compared to 586 ships, totaling 13 million dwt on 1 September 1973 [4:204]. The various types included in this mix are: general cargo freighters, containerships, barge carriers known as Lighter Aboard Ship (LASH) and SeaBee ships, tankers, roll-on/roll-off (RO/RO) ships, and liquid petroleum gas (LPG) carriers, among others. The following breakdown applies:

VESSEL TYPE	NUMBER IN 1981
Combination Pass/Cargo	5
Freighters *	103
Bulk Carriers **	18
Tankers	269
Intermodal ***	150
TOTAL	545

* Includes partial containers and break bulk ships

** Oil/Bulk/ORE (OBO) Carriers

*** Full containerships, RO/RO, LASH, and SeaBee types [7:8]

Merchant vessels under contract in private U.S. shipyards as of 1 July 1981 included the following:

NEW CONSTRUCTION

VESSEL TYPE	NUMBER
Intermodal	6
Tankers	19
Bulk Carriers	3
Tug-Barge	16

CONVERSIONS

VESSEL TYPE	NUMBER
Tankers	4

A sampling of some ships constructed in 1981 includes:

1. The 41,521 dwt lighter-aboard ship EDWARD RUTLEDGE constructed in Avondale Shipyard for Waterman Steamship Corp. Cost, $69.8 million; CDS 40.08%.

2. The 32,100 dwt dry bulk carrier PRIDE OF TEXAS, constructed in Levingston Shipyard for Levingston Falcon I Corp. Cost, $40 million; CDS 49.95%.

3. The 39,500 dwt tug barge OXY TRADER, constructed in Avondale Shipyard for Sulvanell River Corp. Cost, $52.7 million; CDS 49.98%.

4. The 39,500 dwt tug barge OXY PRODUCER, constructed in Avondale Shipyard for Sulvanell River Corp. Cost $51.7 million; CDS 49.98% [8:8].

1. The Maritime Administration

One of the federal agencies established by the Merchant Marine Acts to oversee the U.S. Merchant Marine is the Maritime Administration (MarAd). As an agency of the U.S. Department of Commerce since 1950, MarAd is tasked with the promotion of the U.S. Merchant Marine and America's private shipbuilding industry. To carry out this task, the organization provides financial aid for both shipbuilders and ship operators alike; sponsors research and development; promotes port development and growth; negotiates international agreements; operates the U.S. Merchant Marine Academy in New York; and maintains the National Defense Reserve Fleet (NDRF) located in various sectors of the country for wartime mobilization [9:1].

The most visible aspect of MarAd's functions relate to the subsidies paid out annually in the interests of improving the maritime industry in the United States. From 1973 to 1979 these payments averaged $500 million per year [1:99].

Proponents of the subsidy program advance two arguments for their continuation. First, the impact on the balance of payments achieved by a strong merchant marine with a competitive edge in international trading and second, national defense [2:22].

With respect to the first argument, that subsidies are intended to produce a competitive U.S. flag fleet, consider the fact that today's U.S. Merchant Marine plays only a minor role in international oceanbound commerce, carrying less than five percent of U.S. foreign trade in 1979 [1:33]. This means that

the U.S. must depend on foreign ships to carry ninety-five percent of American imports and exports. This reflects the relatively small size and capacity of the fleet as compared to those of other countries. Tables 2 and 3 indicate the trends the U.S. Merchant Fleet has followed over recent years.

Of the 545 ships in the U.S. flag oceangoing fleet in 1981 approximately 226 were actively engaged in foreign commerce with the rest involved primarily in trade along the Atlantic, Pacific, and Gulf coasts of the U.S. [8:8].

With this insignificant impact on oceanborne foreign commerce and subsequent minor impact on the balance of payments, it is apparent that government subsidies have not achieved a competitive U.S. flag fleet, although the fleet would probably be in an even worse situation without the subsidies.

The second argument, national defense, must therefore possess the soundest argument for public assistance to the U.S. maritime industries. Supporters of this argument allege that if assistance to these industries were ever terminated and their services were lost to the nation, the security of the United States would be gravely weakened. As the history of the merchant fleet has indicated, this argument is as old as the Republic. The important services rendered by these industries to the nation surely deserves to be taken seriously. It is unquestionably more credible than the economic arguments for maritime assistance. However, the current program of subsidies is not tailored to the security needs of this country.

TABLE 2

MAJOR MERCHANT FLEETS OF THE WORLD - DECEMBER 31, 1978

COUNTRY	NO. SHIPS	RANK	DWT. (1,000)	RANK
Liberia	2,627	1	157,788,300	1
Japan	1,846	5	62,455,300	2
Norway	978	7	52,568,600	3
United Kingdom	1,377	6	51,105,500	4
Greece	2,379	3	49,825,000	5
Panama	2,041	4	31,250,500	6
France	415	13	20,815,100	7
U.S.S.R.	2,456	2	20,480,500	8
United States	584	10	18,982,000	9
Italy	601	8	18,565,000	10
Germany	592	9	14,664,400	11
Spain	479	12	12,195,200	12
Sweden	286	15	11,965,000	13
Singapore	574	11	11,889,800	14
India	363	14	8,890,600	15
All Others	6,509		100,235,200	-
TOTALS	24,096		641,308,500	

[1:32]

TABLE 3

U.S. OCEANBORNE FOREIGN TRADE/COMMERCIAL CARGO CARRIED

TONNAGE (Millions)

CALENDAR YR.	1947	1948	1949	1950	1951	1952	1953	1954	1955
TOTAL TONS	142.2	139.0	133.2	117.5	193.1	187.9	178.0	177.0	226.2
U.S. FLAG TONS	81.9	67.0	60.3	49.7	76.8	64.4	51.7	48.7	53.1
PERCENT OF TOTAL	57.6	48.2	45.2	42.3	39.8	34.3	29.1	27.5	23.5

CALENDAR YR.	1956	1957	1958	1959	1960	1961	1962	1963	1964
TOTAL TONS	260.1	289.3	253.3	267.0	277.9	272.4	296.8	311.6	332.8
U.S. FLAG TONS	53.9	50.8	30.9	27.1	31.0	26.3	29.6	28.5	30.5
PERCENT OF TOTAL	20.7	17.6	12.2	10.2	11.1	9.7	10.0	9.2	9.2

CALENDAR YR.	1965	1966	1967	1968	1969	1970	1971	1972	1973
TOTAL TONS	371.3	392.3	387.6	418.6	427.5	473.2	457.4	513.6	631.6
U.S. FLAG TONS	27.7	26.2	20.5	25.0	19.8	25.2	24.4	23.8	39.9
PERCENT OF TOTAL	7.5	6.7	5.3	6.0	4.6	5.3	5.3	4.6	6.3

CALENDAR YR.	1974	1975	1976	1977	1978
TOTAL TONS	628.9	615.6	698.8	775.3	777.0
U.S. FLAG TONS	40.9	31.4	33.8	34.8	31.9
PERCENT OF TOTAL	6.5	5.1	4.8	4.5	4.1

[1:33]

TABLE 3 (continued)

U.S. OCEANBORNE FOREIGN TRADE/COMMERCIAL CARGO CARRIED

DOLLAR VALUE ($Billions)

CALENDAR YEAR	1956	1957	1958	1959	1960	1961	1962	1963	1964
TOTAL VALUE	20.6	22.8	20.9	22.8	24.7	24.7	25.9	27.5	30.0
U.S. FLAG VALUE	7.0	7.3	6.0	6.0	6.5	6.3	6.5	6.9	7.7
PERCENT OF TOTAL	33.8	32.1	28.6	26.1	26.4	25.6	25.1	25.1	25.8

CALENDAR YEAR	1965	1966	1967	1968	1969	1970	1971	1972	1973
TOTAL VALUE	32.4	36.4	36.6	41.1	41.9	49.7	50.4	60.5	84.0
U.S. FLAG VALUE	6.9	8.2	7.9	8.5	8.1	10.3	9.9	11.1	15.9
PERCENT OF TOTAL	21.4	22.5	21.7	20.7	19.3	20.7	19.6	18.4	18.9

CALENDAR YEAR	1974	1975	1976	1977	1978
TOTAL VALUE	124.2	127.5	148.4	171.2	195.8
U.S. FLAG VALUE	22.0	22.4	26.4	28.0	30.7
PERCENT OF TOTAL	17.7	17.5	17.8	16.4	15.7

[1:33]

2. Federal Maritime Commission (FMC)

The Federal Maritime Commission (FMC) is an independent agency established by Congress composed of five commissioners appointed by the President with the advice and consent of the Senate. The FMC carries out the following duties:

a. Regulation of services, rates, practices, and agreements of common carriers by water;

b. Acceptance or rejection of rates filed by carriers;

c. Investigation of discriminatory practices;

d. Licensing of independent ocean freight forwarders; and

e. Rendering of decisions, issuing of orders, making rules and regulations governing and affecting common carriers by water, terminal operators, freight forwarders, and other persons subject to the Commission's jurisdiction [4:83].

The FMC was established to administer the regulatory responsibilities outlined under the Shipping Act of 1916, the Merchant Marine Act of 1920, the Intercoastal Shipping Act of 1933, and the Merchant Marine Act of 1936. These laws give the FMC jurisdiction over waterborne movements between the United States and foreign countries as well as to noncontiguous ports of the United States.

3. Flags of Convenience

To avoid the restrictions and regulations imposed by the United States on its Merchant Marine, ship-operating firms frequently register their ships in another country. The vessel flies the flag of the other country and this procedure is called

the establishment of a "flag of convenience." U.S. firms, especially petroleum firms with large tanker fleets, own and operate vessels under foreign flags of convenience.

The concept and practice of using "flags of convenience" is old, dating back to the sixteenth century, when English merchants used Spain as a flag of convenience to participate in the Spanish West Indies trade. Immediately prior to World War II, U.S. vessels were transferred to foreign registry so they could carry supplies to Britain without violating the neutrality pacts. The current large-scale ownership of flags of convenience vessels came after World War II.

Flags of convenience allow ship-operators to avoid the high labor costs associated with manning a U.S. flag vessel with a U.S. crew, which would be required if the vessel was registered in the U.S. Labor costs for a U.S. manned ship are more than two and one-half times the cost of an Italian manned ship, which are themselves thirty to fifty percent higher than certain other countries [10:100].

Another aspect which makes the flag of convenience attractive to operators is that with few exceptions, U.S. flag vessels must be constructed and repaired in the U.S. American shipyards have not been competitive in the world market, with an American vessel sometimes costing more than twice what it would cost to construct that same vessel in a foreign yard [2:160].

This duality of high labor costs and high construction costs has effectively priced American vessels out of the world market. Without government assistance the only way an American vessel could compete in the world market, while minimizing costs as a private industrial carrier, is to utilize a flag of convenience.

Table 4 lists the number of ships, gross tons and dead-weight tons of foreign flag ships owned by U.S. companies in 1972.

A significant number of these ships owned by Americans, but registered abroad, are legally available to the U.S. in times of national emergency. Under the concept of "Effective United States Control" (EUSC), the owners of these ships enter into agreements with MarAd to make their vessels available in times of emergency [2:168]. As of 1977, 339 tankers, 102 bulk carriers, and 28 liners representing over 20 million deadweight tons, were designated as EUSC vessels [1:71].

While the flags of convenience represent a sizable force, which by agreement may be used by the U.S. in crises, in reality, much controversy has been raised over the true availability of these vessels and the potential benefit they might serve. The EUSC fleet is scattered throughout the world and, therefore, control over such ships is very decentralized and weak. Additionally, this fleet is manned by multi-national crews whose loyalties may be inconsistent with those of the U.S. and, hence, make these seamen unreliable.

TABLE 4

FOREIGN FLAG SHIPS OWNED BY UNITED STATES COMPANIES OR FOREIGN AFFILIATES OF UNITED STATES COMPANIES INCORPORATED UNDER THE LAWS OF THE UNITED STATES AS OF DECEMBER 31, 1972

TOTAL

	NO.	GROSS TONS	DEAD-WEIGHT TONS
Liberia	238	9,267,005	17,998,842
United Kingdom	109	3,977,188	7,309,869
Panama	95	2,062,453	3,622,392
France	11	695,999	1,324,689
Netherlands	16	621,416	1,088,535
Germany	12	452,387	813,277
Spain	4	325,354	613,382
Italy	10	333,880	494,091
Norway	10	254,917	453,895
Belgium	9	188,216	299,682
Denmark	6	109,455	181,649
Venezuela	6	116,113	172,569
Canada	7	59,841	90,237
Uruguay	2	50,766	85,830
Honduras	11	56,323	52,070
Australia	1	15,000	24,000
South Africa	1	14,560	23,421
Finland	4	7,999	10,878
TOTAL	552	18,608,872	34,659,308

[11:6]

Also, since most EUSC ships are not subject to American government and military inspection and not built in U.S. shipyards, their military value is difficult to determine at any given time.

C. SUMMARY

The U.S. flag merchant fleet has waxed and waned during the course of the nation's history. In an effort to offset a series of ineffective acts, and facing the realization that the U.S. Merchant Marine was in need of help, Congress addressed themselves to new and effective legislation. The result was the Merchant Marine Act of 1936, which represents the foundation of the present posture of the U.S. Merchant Marine.

Towards the attainment of the objectives set forth in the act of 1936, provisions were enacted for the infusion of government subsidies into the maritime industry. To administer these subsidy programs and to aid the development, operation and promotion of a strong, modern American Merchant Marine the Maritime Administration was established.

In spite of the act of 1936, which was later amended in 1970, the attempts to bolster both the merchant marine and the shipbuilding industry have failed to produce significant improvements with regard to oceanborne foreign commerce carried in U.S. bottoms.

III. THE PROBLEM OF MEETING OBJECTIVES

A. GENERAL

In this chapter some discussion will be set forth regarding the current problems of the U.S. Merchant Marine in meeting its stated objective of serving as a military auxiliary for national defense. With respect to this problem area the following items will be discussed:

1. The procedures in acquiring segments of the merchant fleet for wartime use;

2. The relationship of the National Defense Reserve Fleet (NDRF) and the Military Sealift Command (MSC) in this process;

3. The most recent large military use of merchant vessels - Vietnam;

4. And finally the intent of the subsidy program.

B. OBJECTIVES OF THE MERCHANT MARINE

The Declaration of Policy in the Merchant Marine Act of 1936 states:

> "It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine sufficient to carry a substantial portion of water-borne foreign commerce and capable of serving as a naval and military auxiliary in time of war or national emergency."

This passage clearly states that national defense is a primary policy objective of the U.S. Merchant Marine.

The U.S. Merchant Marine has been called the "Fourth Arm of Defense," supposedly ready to integrate with the Army, Navy, and Air Force in times of conflict to protect U.S. interests overseas, and at the same time provide a continuing supply of raw materials at home [12:53]

Even in this age of advanced nuclear technology, when wars may be fought and won in hours, there are still strong possibilities that conventional long-term wars will be fought. The strategic concept of flexible response places great emphasis on the ability of the United States to rapidly deploy combat forces, equipment, and supplies to Europe to counter an attack by Warsaw Pact forces or to intervene in a Middle East conflict. The degree of required responsiveness of strategic mobility forces is dependent on interrelated factors such as the nature of the threat or developing conflict, the capabilities of the enemy, and the nature of the forces to be transported. To support these conventional efforts a strong sealift capability is required.

1. National Defense

Ocean transportation resources have made significant contributions to the national security since the early days of the Republic. These resources, and the sealift capability they produce, have developed through a series of peaks and valleys. Over the years U.S. military and civil sealift assets have been subject to planned reductions after each war, and have required extraordinary effort in order to be reconstituted to meet new

military requirements. While it is understandable that the reductions in wartime shipping to levels that can be economically maintained in peacetime are necessary, it is difficult to comprehend the logic that allows sealift capability, particularly that required for initial military responsiveness, to fall below minimum required levels.

a. Ship Procurement/Requisitioning

The Department of Defense (DOD) relies heavily on the merchant fleet. In order to be able to requisition these merchant assets, the government first must determine if existing DOD assets are sufficient to cover the requirements of the situation. The first group of ships to be considered are those of the Military Sealift Command (MSC).

The Military Sealift Command provides sea transportation support on a regular basis for the Department of Defense. Maintaining a small fleet of twenty-seven ships, six government owned and twenty-one chartered vessels, MSC is the initial source of sealift capability in an emergency [4:1].

The next group of ships to be called upon would be regular civilian merchantmen through standard charter procedures. Should the MSC fleet be considered inadequate, the government would resort to the hiring of commercial vessels, if available. The reasoning behind this is for the U.S. to offer business to its own merchant fleet in order to support it before calling on the National Defense Reserve Fleet (NDRF).

The NDRF is a fleet of 317 ships stored in three locations around the country for use in contingency situations. They are located in James River, Virginia (157 ships); Beaumont, Texas (49 ships); and Suisun Bay, California (111 ships) [1:80]. Table 5 shows the history of the NDRF since 1945.

Although these ships do exist their number has generally been decreasing over the years primarily due to the sale, for scrap, of the WW II vintage members of the fleet. This has resulted in speculation that the NDRF, the bulk of which is over twenty-five years old, is inadequate in today's environment to be of much utility. One reason for this is the age of these ships; the technology is old and not many seamen are around with the knowledge to operate these ships. If these personnel are available, they are most likely already gainfully employed and difficult to obtain for this purpose.

These manpower deficiencies were illustrated when these ships were returned to service in support of the Vietnam war. There were shortages of skilled marine engineers and deck officers. As a result, in 1969, 135 NDRF sailings experienced a cumulative delay of 649 days or 4.8 days per ship. In 1967 and 1968 there were a total of 201 delayed sailings for an average of 3.4 or 4.8 days per ship [13:12].

In 1975 MarAd initiated a new concept called the Ready Reserve Force (RRF). This program was to provide a sea-lift capability of approximately 340,000 measurement tons (Mts) by Fiscal Year 1981. These ships are to be capable of

TABLE 5

NATIONAL DEFENSE RESERVE FLEET 1945-1979

FISCAL YEAR	SHIPS	FISCAL YEAR	SHIPS
1945	5	1962	1862
1946	1421	1963	1819
1947	1204	1964	1739
1948	1675	1965	1594
1949	1934	1966	1327
1950	2277	1967	1152
1951	1767	1968	1062
1952	1853	1969	1017
1953	1932	1970	1027
1954	2067	1971	860
1955	2068	1972	673
1956	2061	1973	541
1957	1889	1974	487
1958	2074	1975	419
1959	2060	1976	348
1960	2000	1977	333
1961	1923	1978	306
		1979	317

[1:83]

activation within five to ten days for deployment during emergencies [1:77]. This time frame is far shorter than the 21-45 day window given for the regular NDRF, which is apparently optimistic given prior experience.

However, in order to break ships out of the National Defense Reserve Fleet, several decisions have to be made involving DOD, the Navy, and the Department of Commerce. The Merchant Ship Sales Act of 1946 provides the authority to withdraw ships from the NDRF but only if the threat to requisition commercial shipping exists:

> A vessel placed in such reserve shall in no case be used for any purpose whatsoever except that any such vessel may be used for account of any agency or department of the United States during any period in which vessels may be requisitioned under section 902 of the Merchant Marine Act of 1936. [14:93].

As stated, this means that activation cannot take place unless requisitioning appears imminent. The principle behind this is that commercial shippers want all the government business they can handle. Since the U.S. maritime industry has a poor competitive position in world trade, it looks to the government for business on a regular basis. Thus, the industry desires to be fully utilized before allowing more ships to be pushed into the pool.

The government has adhered to policies geared to keep the merchant ships busy. A public law passed in 1954, and still in force today, requires that fifty percent of all government cargo being shipped overseas be transported in U.S. bottoms [15:145].

Furthermore, a document called the Wilson-Weeks Agreement, signed in 1954, between Secretary of Defense Charles E. Wilson and Secretary of Commerce, Sinclair Weeks, has as one of its purposes to prioritize the acquisition of sea assets and services. While recognizing the MSC controlled fleet, it also sought to protect commercial business. In essence it dictates that the U.S. government will make full use of merchant fleet assets before calling out the NDRF or resorting to foreign vessels.

2. Merchant Marine Involvement in Vietnam

The importance of strategic mobility and military re-supply with regard to the U.S. Merchant fleet was demonstrated in the Vietnam crisis. Some ninety-eight percent of the military cargoes to Vietnam were carried by ship [2:92]. During the three primary buildup years of the Vietnamese conflict, 1965 - 1968, 172 NDRF ships transported in excess of 6,800,000 tons or twenty-eight percent of all military cargo shipped to Southeast Asia. MSC ships carried 1,700,000 tons or seven percent. Commercial ships carried 15,400,000 tons or sixty-five percent [13:6-10].

C. SUBSIDIES - WHAT IS THE INTENT?

Towards the achievement of the objectives of the Merchant Marine, stated at the beginning of the chapter, the Merchant Marine Act of 1936 provided for subsidies to be granted to ship-operators, in the form of the Operating Differential

Subsidy (ODS) and to shipyards, in the form of Construction Differential Subsidies (CDS).

Subsidies shall be defined here as monetary assistance granted by a government to a person or a private commercial enterprise. Note that the definition does not state the purpose of the grant. The difficulty in which the U.S. Merchant Marine finds itself today seems to stem from a similar lack of statement of purpose in our national policy.

What purpose justifies channeling funds from the federal treasury to the privately owned, profit-seeking U.S. maritime industry? If it is to fulfill a valid purpose, then every effort must be advanced to achieve it.

In international shipping there is a marked disparity in costs between the ships serving a trade route. Survival and the attainment of a high cost modern fleet is made possible only by the infusion of government funds. The purpose of this infusion should be expressed clearly as support of a merchant marine which is aggressive, competitive, and able to carry a significant share of the available commercial cargo.

A collateral purpose of the subsidy is to assure that ships operated with government aid are designed, built, and maintained so that they require a minimum of conversion if requisitioned for military use.

The Merchant Marine Act of 1936, while it is the cornerstone of the subsidy program, has some major shortfalls regarding the

attainment of these objectives. Since the Merchant Marine Act of 1970 contained only minor modifications, shortfalls still exist.

First, the stipulations concerning the portion of ship-building costs to be paid for by the government, i.e., fifty percent, are restrictive in that they do not equalize U.S. and foreign costs. This subsidy is computed on the total cost of construction with no allowance for the disadvantage the ship-owner incurs by paying higher annual amortization and interest charges than his foreign competitor.

Second, there are no provisions to encourage greater efficiency and more effective employment of the merchant fleet.

Third, the acts contain only the generalized statement that vessels built with construction differential subsidies shall be for economical and speedy conversion into military auxiliaries.

When the Merchant Marine Act of 1936 was written it centered on developing the mechanics of a system to subsidize the U.S. merchant fleet. The purpose of the subsidy program was omitted, although the objectives of the Merchant Marine are clear.

The U.S., as a major marketplace of the world, attracts to its ports the ships of every maritime nation. Rivalry among these carriers for the favor of U.S. commerce is intense, and is evident in their employment of the most modern ships and the most innovative techniques of operation. Importers and exporters do not patronize inferior or obsolescent ships; they choose

ships which give the best results at the lowest cost regardless of nationality. United States shipowners, therefore, must be in the position to respond quickly to challenges, especially when new ships are placed in service by foreign competition.

Currently, the Acts specify that the amount of subsidy for new construction shall be the difference between the cost of building the ship in a U.S. yard and building that same ship, to the U.S. specifications, in a foreign shipyard, but in no event shall the subsidy exceed fifty percent of the U.S. cost. This provision creates an obstacle to achieving the purpose of establishing and maintaining a modern merchant fleet.

For example, the requirements of those U.S. agencies which supervise shipbuilding are higher and more inflexible than those of many other maritime nations. It is unrealistic to expect, as the 1936 Act does, that a foreign corporation would build a ship to meet U.S. standards and thereby increase its costs. United States shipowners point this out in their complaint that the limitations on construction differential subsidy deny them full parity with foreign ship builders.

There is also keen competition among the world's shipbuilders, and unexpected low prices might be obtained by systematic canvassing of qualified yards. This cannot be done under the U.S. system. The Maritime Administration makes every effort to determine accurately what the lowest foreign building cost may be, but its procedures are only estimates made in Washington, D.C.

These are very different from evaluations of request for proposals from competing yards to build one or more ships in conformity with carefully prepared plans and specifications. United States shipowners reinforce their plea for genuine parity in ship acquisition costs by referring to the fact that construction subsidy awards are predicated upon these theoretical calculations.

The search for ways and means to increase efficiency of men and machines has been a crusade on the part of U.S. business for generations. The Merchant Marine Acts, however, contain no provisions for encouraging greater efficiency in the management and use of the merchant fleet, nor does it reward superior achievement.

The third, and from the military viewpoint, most critical deficiency in the act lies in the failure to specify the purpose of incorporating national defense features in ships built with construction subsidies. Two lessons emerge from history. One is that it is possible to develop a single design which fits the ship to the needs of commerce and many of the major requirements of the Navy. The example of the twelve ships of the CIMARRON class should not be forgotten. These tankers were built by the Standard Oil Company (New Jersey) in 1938. The company's architects collaborated closely with the design teams of the Navy Department and the original Maritime Commission (now MarAd), and embodied at government expense many desirable - and as they later proved, vital - national defense

features. The result was extolled as the finest commercial tanker built in the United States up to that time [16:31]. All 12 of the CIMARRON class were absorbed into the Navy; eight were converted into fleet oilers and four became small aircraft carriers.

The other lesson is that national defense features must not become a means by which the government absorbs more than the statutory limit of one-half the U.S. building cost. When the UNITED STATES was under construction during 1950 - 52, many "cost adjustments" in the government's share were made to keep the price within the amount the operator was willing to pay for the ship. Because the "Big U" was never used by the Department of Defense, there is still no answer to the question whether the "adjustments" served the national interest. What is obvious, however, is that the purpose of national defense features must be so clearly set forth in the statute that there is no room for either questionable "adjustments" or excuses for ignoring the requirements in future construction.

Relatively few ships under U.S. registry today have the genuine capability to meet military needs [16:31]. These vessels were designed to meet commercial requirements. When the plans for new ship construction were completed, the Navy inspected them and made recommendations as to the national defense features desired. The lesson of the CIMARRON class tankers appears to have been overlooked or forgotten, possibly because the purpose of the national defense features is not

set forth in positive terms in the act. If the full potential of the U.S. Merchant Marine as a military auxiliary is to be realized, those features of design and construction which have only military value must be incorporated in the design by joint action of naval architects representing the owners, the Maritime Administration, and the Navy.

D. SUMMARY

In order to achieve the objectives of the U.S. Merchant Marine, which are to carry a substantial portion of ocean borne foreign commerce and to be capable of serving as a naval and military auxiliary in a national emergency, the government infuses monetary assistance into the maritime industries in the form of subsidies. In that, neither of these objectives are being attained subsidies are being condemned on the grounds that they insulate the beneficiary from competitive pressures, reduce the need to be aggressive in the pursuit of business, and discount efficiency in performance [16:31].

The fact remains that by offering a reward for increased efficiency in management and operation, the incentive is established to be aggressive in seeking new ways to meet the commercial objective. By making it possible for U.S. shipowners to acquire ships built in U.S. shipyards, to U.S. standards and specifications, but sold at prices which grant true parity with foreign shipowners, fair costs, competition on even terms, and aggressive performance can be demanded. By stipulating the

underlying purpose of installing national defense features in ships, the potential role of the merchant marine as a military auxiliary in time of war or national emergency can become more significant and of greater value.

Based on the above discussion the next chapter will analyze ship types which are deemed most suitable in fulfilling the combined objectives of the Merchant Marine.

IV. ANALYSIS OF SHIP TYPES MOST SUITABLE FOR MEETING MERCHANT MARINE OBJECTIVES

A. GENERAL

Considering the sharply reduced funding for construction subsidies, the high cost of an American built ship, and the decline in the number of oceangoing merchant vessels, it is apparent that the U. S. Merchant Marine shipbuilding program should be revitalized. The U. S. must improve and modernize the merchant marine to develop a formidable strategic military support force and to provide a general cargo fleet capable of competing in world trade, a task already accomplished by the Soviets.

The Reagan Administration has announced a program to rebuild the U. S. merchant fleet. The proposed program involves increased new merchant ship construction. Since the Department of Defense (DOD) makes extensive use of the U. S. Flag merchant shipping to fulfill the bulk of its sealift needs and with the advent of a major new maritime shipbuilding program, the following analysis is intended to evaluate those ship types most suitable for DOD utilization. The analysis will investigate both the capability of the vessel to support wartime defense missions and its commercial utility.

The following ships are considered in selecting the ship type most suitable for the U. S. Merchant Marine to operate for commercial applications and wartime defense support missions:

a. Roll-on/Roll-off (RO/RO) ship

b. Containership

c. Combination RO/RO-Containership (Multi-Purpose Mobilization Ship)

B. ROLL-ON/ROLL-OFF (RO/RO) SHIP

The conventional RO/RO ship has the capability to move wheeled military equipment, fully operational and loaded with divisional equipment. This capability makes the RO/RO ship valuable to military planners. Its design evolved from the needs of the Armed Forces in World War II when transporting vehicles and permitting vehicles to be loaded and discharged under their own power became a requirement. The Landing Ship Docks (LSD) and Landing Ship Tank (LST) were developed to allow tanks, guns, and vehicles to be loaded under their own power and, when in the area of operation, to deploy immediately over the beaches.

1. Concept

The fundamental concept used by the RO/RO ship is that cargo is moved into or out of the ship without recourse to the conventional cargo handling systems of booms and cranes. Cargo is loaded into the ship by means of stern and/or side ramps and moved into position within the ship by internal ramps. These ramps can be an integral part of the ship or may be carried by the ship. Signal systems and traffic flow patterns within the ship are used to avoid congestion and to route the vehicles to

their assigned locations in the fastest manner possible. Figure 1 is an example of a typical RO/RO traffic flow pattern.

2. Advantages

The greatest assets attributed to the RO/RO ship are the flexibility in the types and size of cargo that can be carried and the rapidness by which this cargo can be loaded and discharged. The resultant reduced port time increases the utilization factor of the ship and enables the operator to accrue more productive days per year and thereby decrease cost.

Commercial carriers in their advertising stress that this ship can carry any combination of different sized trailers or containers on chassis, or any cargo as long as it can move onto and off the ship on wheels.

Military planners view the RO/RO ship as desirable in that it has the capability of using the normal wharves and piers available for port loading and unloading operations. This capability opens the use of many ports which are closed to most of the containerships because of the requirements for extensive shoreside discharge/loading equipment.

3. Disadvantages

The RO/RO concept has made only slight inroads into the shipping industry. It is a viable means of eliminating the costly and time consuming break-bulk operations, and it furnishes the flexibility to the shipper of hauling oversized cargo. However, a major disadvantage is the loss of a large percentage of the gross cargo capability because of the

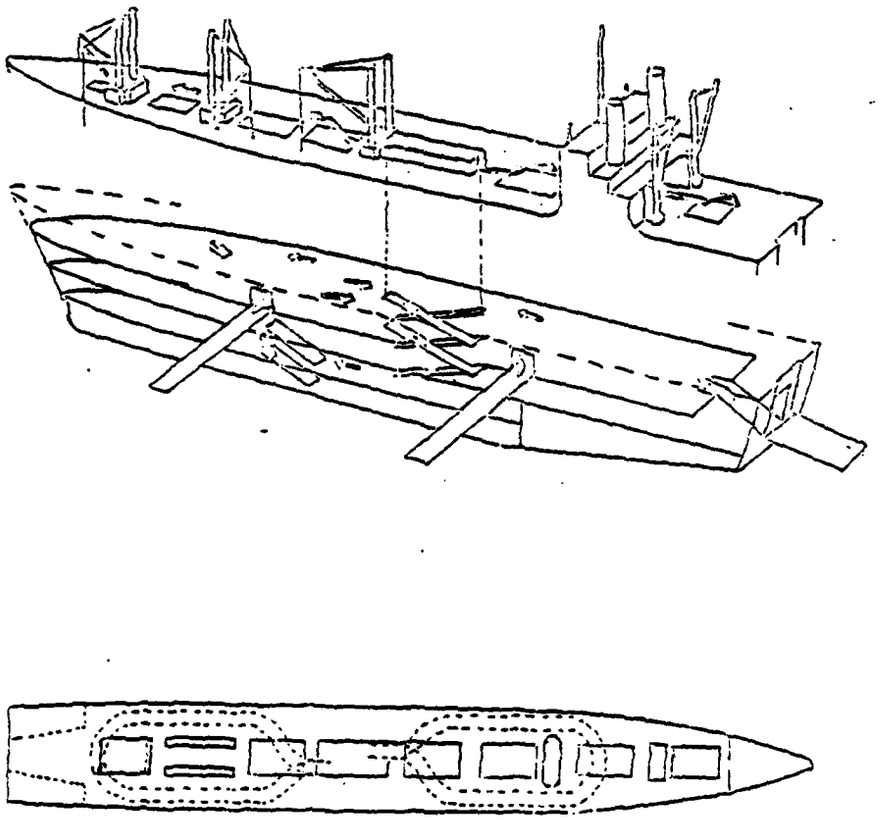


FIGURE 1

TRAFFIC FLOW PATTERN OF A TYPICAL RO/RO VESSEL

broken stowage caused by the vehicles wheels and undercarriage. A study was conducted on comparative ship types for handling general cargo and the findings indicated only 40 percent of the total volume of the cargo capacity of the RO/RO was utilized because of broken stowage. [17:695-699]

General cargo without wheels must be handled only by palletizing it and utilizing forklift trucks. These forklifts cannot however climb the normal ramps on board a ship of this type. Therefore, lift-on/lift-off equipment, either shore or deck cranes, booms, etc. are required.

The RO/RO, because of its speed in discharging and loading does require special terminal facilities. The shoreside facilities must have a good network of highways branching out and a sizeable marshalling area for incoming and outgoing vehicles.

The requirement for these facilities must be viewed in light of the concept of utilization for RO/RO's in contingency plans. In many foreign areas port and terminal facilities have not kept pace with the rapid development of the new ships in the fleet and in many cases the procedures and practices used in cargo handling are no further advanced than they were at the beginning of the twentieth century. The problem in utilizing underdeveloped ports for the RO/RO would be that discharge rates would be slowed because of congestion in the port facility and some loss of cargo space on the main deck, if side port ramps had to be transported.

4. Design Characteristics

The design characteristics of the basic RO/RO's in service at present are similar to those presented in table 6.

Table 6

Design Characteristics of a RO/RO Vessel

Length:	650-700 feet
Beam:	100 feet
Draft:	35 feet
Speed:	23-25 knots
Cargo Capacity:	160,000 square feet

[18:77]

5. Construction and Operation Costs

Construction and operation costs for the RO/RO ship are presented in table 7. Costs are in 1980 dollars.

C. CONTAINERSHIP

Since the mid-1960's, the principal vessel employed in the carriage of general cargo has been the containership [19:99]. The U. S. Armed Forces first used containers for shipping valuable and pilferable military cargoes during World War I. Containerization on the North Atlantic began with the Scotch whiskey trade between Glasgow and the United States. The containers were stuffed with cases of Scotch at the exporters' warehouses, sealed for transit, and emptied at the importers' warehouses. The entire investment of substituting a high-capital, low-labor cost system of containerized cargoes for the

TABLE 7

CONSTRUCTION AND OPERATION COSTS FOR THE RO/RO VESSEL
(1980 Dollars)

a.	Construction Costs per vessel	$ 90,000,000.00
b.	Operating Expenses (based on a 90% utilization factor and 1980 costs)	
	NbR days/voyage	51
	NbR trips/year	6.86
Vessel Operating Expenses		
	Wages	$ 2,008,000.00
	Subsistence	68,000.00
	Stores, Supplies & Effects (S.S.&E.)	164,000.00
	Maintenance & Repair	498,000.00
	Insurance	709,000.00
	Other	55,000.00
	Annual V.O.E.	3,502,000.00
	70% ODS	- 2,451,000.00
	Total Annual V.O.E.	$ 1,051,000.00
Fuel Cost		
	At-Sea	2,593,000.00
	In-Port	211,000.00
Total Annual Fuel Cost		$ 2,804,000.00
Voyage Expenses U.S.		
	Pilotage	$ 33,000.00
	Tugs	35,000.00
	Line Handling	5,000.00
	Dockage	39,000.00
	Wharfage	150,000.00
	Cargo Handling Costs	367,000.00
	Other Port Expenses	1,000.00
Total Annual U.S. Voyage Costs		$ 630,000.00
Total Annual Foreign Voyage Costs		722,000.00
Total Annual Voyage Costs		$ 5,207,000.00

[18:35]

high-labor, low-capital cost system of break-bulk cargoes was justified by the reduction in pilferage of cases of Scotch handled as break-bulk cargo on the U. S. waterfront. Except for a hijacked container or two, the savings from reduced "inventory shrinkage" economically sustained the start of the transformation of the international trade of goods from break-bulk to containerized cargoes.

Since the traditional wharves and warehouse terminals for break-bulk cargoes were not designed to handle large numbers of containers, specialized container terminals were built on empty tracts of land to provide ample storage space for containers.

1. Concept

Like ships, barges, railroad cars, motor freight trailers and mounted truck bodies, containers may be modified to allow carriage of nearly any type of transportable commodity. Most specialized containers are adaptations of the standard general purpose cargo containers which serve as the mainstays of the industry. A general purpose container is eight feet high, eight feet wide and twenty, thirty, or forty feet long. It is permanently enclosed on three sides, the top and the bottom with a set of double doors for loading at one end. The standard container is capable of carrying a load of dry cargo which is not heat sensitive and which will weigh, in combination, no more than thirty tons, the maximum weight which most container handling cranes are able to accommodate. General purpose

containers are constructed from three basic types of materials: steel, aluminum, or fiberglass-reinforced, plastic-laminated plywood. The choice of construction material, or combination of materials, must be based on the requirements of the user, the necessary amount of protection from weather and pilferage and the expected useful life of the unit.

Containerized vessels are cellular in nature with installed angle bars to guide the loaded container into its proper position and hold it in place laterally and longitudinally. Most fully containerized vessels are capable of carrying stacks of six containers in their highest hold, with the number decreasing toward the extremes and in the areas of machinery and other mounted shipboard equipment. In addition to the boxes which can be loaded into the hulls, container vessels are capable of compensating for the loss of internal space by loading the weather decks with stacks of secured containers which may be three or four high.

An automatic ballast and list equalizing system is a innovation which allows loading and discharge of containers to proceed at a rapid rate during the ship's port call. Water ballast is either added or removed from tanks in the sidewall structure of the ship to compensate for the container load in any configuration. During periods of time when the ship is underway, the sidewall and double bottom ballast tanks and mounted stabilizers maintain the stability based on the load, the sea state and the speed and direction of the ship. In

newer ships, adjustments may be made automatically in response to inputs from sensors which monitor every variable.

2. Advantages

Large shore-based ship-to-shore cranes serve the needs of many container vessels rather than requiring each vessel to be geared or self-sustaining with onboard crane facilities. Coupled with the increased cargo volume achieved by loading the weather decks with stacks of containers, the speed with which containerships can be loaded and unloaded accounts for its greatest commercial advantage. Containerization has brought a revolution to the commercial shipping industry by allowing in port turn-around-time to be approximately 24 hours. [19:94]. This kind of efficiency means a ship can spend nearly all its time at what it was built for -- hauling cargo.

3. Disadvantages

Containerships lack the flexibility to carry out-sized cargo. With rare exceptions these ships are not equipped with cranes to handle their cargoes. Their military usefulness depends upon availability of adequate cranes at the objective area, or helicopters able to lift thirty or more tons. Heavy-lift ships -- vessels with booms and winches with single-lift capacity of 200 tons -- are desirable to handle military equipment. There are two of these ships, each of about 2,700 deadweight ton capacity under the U.S. flag. Break-bulk ships, which are vessels of proven value in the military support role because they can accept the assorted and odd-shaped impediments

of an expeditionary force, are decreasing in number as more and more trade routes are converted to containerized traffic.

4. Design Characteristics

The design characteristics of the typical containership in service at the present are similar to those presented in table 8.

Table 8

Design Characteristics of Containership

Length:	650-700 feet
Beam:	90 feet
NbR boxes carried:	1500-2000
Speed:	20-25 knots
Cargo Capacity:	30-35,000 tons

[18:96].

5. Construction and Operation Costs

Construction and operation costs for the containership are presented in table 9. Costs are in 1980 dollars.

D. COMBINATION (MULTI-PURPOSE MOBILIZATION SHIP)

One of the specific functions of the Maritime Administration is to provide shipping capability during declared national emergencies and full-scale wartime mobilization, when massive movements of military supplies may be needed. As a step in fulfilling this need, MarAd has developed a "mobilization ship design" that can be mass-produced during wartime. The objectives of this vessel are to provide the wartime shipping

TABLE 9

CONSTRUCTION AND OPERATION COSTS FOR CONTAINERSHIP
(1980 Dollars)

Construction and Operation Costs		
a.	Construction Costs per Vessel	$ 54,277,000.00
b.	Operating Expenses (based on a 90% utilization factor)	
	NbR days/voyage	35
	NbR trips/year	10.00
Vessel Operating Expenses		
	Wages	$ 2,008,000.00
	Subsistence	68,000.00
	S.S.&F.	164,000.00
	Maintenance & Repair	300,000.00
	Insurance	428,000.00
	Other	55,000.00
	Annual V.O.E.	3,023,000.00
	70% ODS	- 2,116,000.00
Total Annual V.O.E.		$ 907,000.00
Fuel Cost		
	At-Sea	$ 2,033,000.00
	In-Port	106,000.00
Total Annual Fuel Cost		$ 2,139,000.00
Voyage Expenses U.S.		
	Pilotage	$ 48,000.00
	Tugs	51,000.00
	Line Handling	8,000.00
	Dockage	35,000.00
	Wharfage	135,000.00
	Cargo Handling Costs	397,000.00
	Other Port Expenses	1,000.00
Total Annual U.S. Voyage Costs		$ 675,000.00
Total Annual Foreign Voyage Costs		957,000.00
Total Annual Voyage Costs		$ 4,678,000.00

[18:35]

capacity needed during long-term conflicts in addition to providing a feasible ship type for commercial applications.

1. Concept

The multi-purpose mobilization ship offers the capability of efficient stowage of standard twenty and forty feet containers. Alternatively, it also is capable of carrying generalized outsized cargo via the lift-on/lift-off mode of cargo handling using the ship's installed gear and cranes. A sizeable amount of roll-on/roll-off cargo can also be accommodated. Several options of the ship type have been developed including: the addition of a cargo midbody, installation of a variety of machinery plants, an option with gantry cranes, and an option with emphasis on stowing roll-on/roll-off cargo.

This vessel, although not in operation or under construction has completed various phases of development by MarAd. The first phase has resulted in the development of working papers which reviewed needed shipping capabilities, shipyard production problems, engineering system alternatives and possible ship concepts and design constraints. It was recognized during this phase that a variety of vessel types and sizes would be required for commercial acceptance on various trade routes.

The second phase has also been completed. It began with the development of three conceptual designs;

a. the "500 General" which featured a 489 foot length between perpendiculars (LBP) and 73.5 foot beam vessel with five general cargo holds.

b. the "670 RO/RO" which had a 655 foot LBP and 105 foot beam and was designed primarily for roll-on/roll-off cargo.

c. the "550 Combination" which had 560 feet LBP and 97 foot beam. This vessel featured the multi-purpose cargo handling approach. Eight cargo holds were serviced by cranes with hatch covers forming a container guide structure, which when in a vertical position, allows the easy loading of containers. A stern ramp also provided for roll-on/roll-off cargo access to the second deck.

These designs have been reviewed by MarAd with commercial inputs, the Office of the Chief of Naval Operations (OPNAV), Naval Sea Systems Command (NAVSEA), Military Sealift Command (MSC), the U.S. Army, and others. Of the three concept designs, the "550 Combination" received strong preference as the building block of the mobilization fleet because it is a general cargo/roll-on, roll-off container design [20].

2. Advantages

The "550 Combination" is well suited for commercial operation to developing countries in that it is capable of being converted to more sophisticated containerized operations as the trading area's capabilities increase.

As previously mentioned, it was determined that the primary military mission would be the resupply of equipment

and consumables necessary in a massive ground war, generally to developed ports that may or may not have shoreside cargo handling equipment usable. These considerations dictate a ship with self-contained cargo handling capabilities. Military considerations also lend to a requirement for redundancy in cargo handling, i.e., access to holds by different cranes or both RO/RO and lift-on/lift-off access.

To meet a wide variety of possible but uncertain requirements the key is a combination of the concepts of flexibility and versatility. Flexibility, the quality of being adjustable to change or being capable of modification, and versatility, the quality of being competent in many things or able to turn easily from one occupation to another, are prime considerations in the "550 Combination" design effort.

3. Disadvantages

It is often suggested, based on the thought one cannot be all things to all people or users, that the concept of a combination ship is of dubious utility because it has no clearly defined role. It should be emphasized from the outset that this ship is not intended to do everything. It is however designed to be flexible enough to meet the varying requirements on many trade routes and flexible enough to change with the trades as those trade routes develop. Initially however, the combination ship is best suited for trade on those routes that provide commercial trade to underdeveloped countries.

4. Design Characteristics

The original preliminary design characteristics of the multi-purpose mobilization ship are presented in table 10.

5. Construction and Operation Costs

Construction and operation costs for the multi-purpose mobilization ship are presented in table 11. Costs are in 1980 dollars.

E. COMPARATIVE ANALYSIS

A comparative economic analysis of the three proposed ship types was made by the Department of Commerce in 1978, in order to obtain a perspective of the commercial and wartime defense support viability of each [22:30]

1. Combination (Multi-Purpose Mobilization Ship)

Required freight rates, the commercial freight rates required for the transport of goods, were calculated for a variety of loading conditions and utilization rates in order to determine the sensitivity of the mobilization ship to changing market conditions. As a ship which is expected to operate on a developing trade route, its commercial success may well depend on its ability to be competititve in varying market conditions.

A key portion of the analysis was a comparison of the change in the required freight rates (RFR) for varying market conditions. To simplify the analysis, the RFRs were calculated on a "break-even" basis, that is, allowing for no profit.

TABLE 10

DESIGN CHARACTERISTICS OF THE MULTI-PURPOSE MOBILIZATION SHIP

Length Overall	FT	609
Beam (Molded)	FT	97
Capacities (Maximum)		
a. Total Volume in Holds (Molded)*	FT^3	1,657,000
b. Bale Cubic on Holds*	FT^3	1,491,500
c. Liquid Cargo (Permanent) (Molded)	FT^3	119,100
d. Liquid Cargo (Optional) (Molded)	FT^3	123,500
e. RO/RO Deck Area (Total)*	FT^2	86,000
(Permanent)*	FT^2	68,000
(Portable(autos))*	FT^2	18,000
f. Containers (Total)*	TEU	926
On Deck (20x8xvarious)*	TEU	328
Below Deck (20x8x8½)	TEU	598
Speed at Design Draft (Steam)		
a. Trial	KNOTS	21.5
b. Service	KNOTS	20.7
Speed at Ballast Draft (Steam)		
a. Trial	KNOTS	22.5
b. Service	KNOTS	21.2

* These capacities are not mutually exclusive. RO/RO deck area available trades off with container or hold cubic capacities.

TABLE 11

CONSTRUCTION AND OPERATION COSTS FOR
THE MULTI-PURPOSE MOBILIZATION SHIP

a.	Construction Costs per Vessel	$ 85,000,000.00
b.	Operating Expenses (based on a 90% utilization factor)	
	NbR days/voyage	46
	NbR trips/year	7.91
Vessel Operating Expenses		
	Wages	2,007,000.00
	Subsistence	68,000.00
	S.E.&E.	164,000.00
	Maintenance & Repair	470,000.00
	Insurance	670,000.00
	Other	54,000.00
	Annual V.O.E.	3,435,000.00
	70% ODS	- 2,405,000.00
Total Annual V.O.E.		$ 1,031,000.00
Fuel Cost		
	At-Sea	$ 1,989,000.00
	In-Port	316,000.00
Total Annual Fuel Cost		$ 2,305,000.00
Voyage Expenses U.S.		
	Pilotage	$ 36,000.00
	Tugs	$ 39,000.00
	Line Handling	6,000.00
	Dockage	56,000.00
	Wharfage	110,000.00
	Cargo Handling Costs	1,118,000.00
	Other Port Expenses	1,000.00
Total Annual U.S. Voyage Costs		$ 1,366,000.00
Total Annual Foreign Voyage Costs		1,566,000.00
Total Annual Voyage Costs		$ 6,268,000.00

[18:31]

Operating Differential Subsidy was assumed at seventy percent of the vessel operating expenses (V.O.E.) and construction Differential Subsidy was taken at fifty percent of the construction cost.

This analysis assumed a round trip distance of 12,000 miles with two U.S. ports and three foreign ports, with an open sea speed of twenty knots and a crew of thirty-four. Containers were assumed to weigh twenty-four long tons per forty foot equivalent, with the non-containerized cargo an equal mix of break-bulk and RO/RO Cargo. A backhaul cargo equal to that of the outgoing and of the same cargo mix was assumed.

Required Freight Rates were calculated for utilization rates of fifty, seventy, and ninety percent and for ten, sixty and 100 percent of cargo in containers, for a total of nine conditions. All costs were for a ship operating in 1980. Operating expenses are presented in Table 12. The construction cost of the ship were amortized over twenty-five years at eight percent per year with an assumed salvage value of seventeen percent of the construction cost (Capital Recovery Factor = .0937) [22:30]. A summary of comparison ship operating expenses is presented in Table 13.

The results are presented in Figure 2 and Figure 3 as a non-dimensional RFR versus percent utilization and percent cargo in containers. Each of the nine calculated RFR's were divided by a base RFR, chosen to be that for sixty percent cargo

TABLE 12

SUMMARY OF OPERATING EXPENSES FOR MULTI-PURPOSE MOBILIZATION SHIP

CONFIGURATION	40 FT CONTAINERS			60 FT CONTAINERS			100 FT CONTAINERS		
UTILIZATION FACTOR	50%	70%	90%	50%	70%	90%	50%	70%	90%
No. Days/Voyage	32	35	36	37	41	46	43	50	56
No. Trips/Year	10.94	10	9.72	9.46	8.54	7.61	8.14	7.0	6.24
Vessel Operating Expenses									
Wages	$2,007,000	—	—	—	—	—	—	—	—
Subsistence	68,000	—	—	—	—	—	—	—	—
S.S.&E.	164,000	—	—	—	—	—	—	—	—
Maintenance & Repair	470,000	—	—	—	—	—	—	—	—
Insurance	670,000	—	—	—	—	—	—	—	—
Other	54,000	—	—	—	—	—	—	—	—
Annual V.O.E.	3,435,000	3,435,000	3,435,000	3,435,000	3,435,000	3,435,000	3,435,000	3,435,000	3,435,000
70% OOS	2,405,000	2,405,000	2,405,000	2,405,000	2,405,000	2,405,000	2,405,000	2,405,000	2,405,000
Total Annual V.O.E.	1,031,000	1,031,000	1,031,000	1,031,000	1,031,000	1,031,000	1,031,000	1,031,000	1,031,000
Fuel Cost									
At Sea	2,859,000	2,614,000	2,541,000	2,473,000	2,232,000	1,989,000	2,128,000	1,829,000	1,496,000
In Port	137,000	183,000	190,000	230,000	273,000	316,000	292,000	345,000	420,000
Total Annual Fuel Cost	2,997,000	2,797,000	2,731,000	2,703,000	2,505,000	2,305,000	2,420,000	2,174,000	1,826,000
Voyage Expenses U.S.									
Pilotage	52,000	48,000	46,000	43,000	41,000	36,000	39,000	33,000	30,000
Tugs	55,000	51,000	49,000	48,000	43,000	39,000	41,000	36,000	32,000
Line Handling	9,000	8,000	8,000	8,000	7,000	6,000	7,000	6,000	5,000
Dockage	23,000	31,000	30,000	40,000	45,000	56,000	51,000	59,000	94,000
Wharfage	88,000	112,000	140,000	76,000	96,000	110,000	66,000	79,000	91,000
Cargo Handling Costs	258,000	314,400	407,000	783,000	953,000	1,118,000	939,000	1,111,000	1,262,000
Other Port Expenses	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Annual U.S. Voyage Costs	$ 486,000	$ 566,000	$ 882,000	$ 999,000	$1,186,000	$1,366,000	$1,143,000	$1,324,000	$1,514,000
Total Annual Foreign Voyage Costs	550,000	792,000	1,252,000	1,380,000	1,283,000	1,566,000	1,293,000	1,562,000	1,672,000
Total Annual Voyage Costs	$5,063,000	$5,185,000	$5,897,000	$6,113,000	$6,006,000	$6,268,000	$5,886,000	$6,090,000	$6,044,000

[22:31]

TABLE 12 (continued)

CONFIGURATION	FULL CONTAINERS			60% CONTAINERS			10% CONTAINERS		
UTILIZATION FACTOR	50%	70%	90%	50%	70%	90%	50%	70%	90%
Number of Ships	1	—	—	—	—	—	—	—	—
Construction Cost Per Vessel	$85,000,000	—	—	—	—	—	—	—	—
Sea Speed	20.	—	—	—	—	—	—	—	—
Total Voyage Days	32	35	36	37	41	46	43	50	56
Voyages Per Year	10.94	10.0	9.72	9.46	8.54	7.61	8.14	7.00	6.25
Avg. Cargo per Voyage, Each Way									
No. of TEU's @ 12 LT/TEU	496	694	892	298	417	535	50	69	89
RO/RO Cargo, Tons	—	—	—	1,187	1,663	2,140	2,675	3,751	4,816
Break Bulk Cargo, Tons	—	—	—	1,187	1,663	2,140	2,675	3,751	4,816
Total Cargo One Way, Tons	5,950	8,330	10,700	5,950	8,330	10,700	5,950	8,330	10,700
Total Cargo Per Year, Both Ways	130,186	167,000	208,000	112,600	142,300	162,900	96,900	116,600	133,800
Annual Voyage Costs (70% CDS)	5,063,000	5,185,000	5,897,000	6,113,000	6,006,000	6,268,000	5,886,000	6,090,000	6,044,000
Ship Amortization (50% CDS)	2,628,000	2,628,000	2,628,000	2,628,000	2,628,000	2,628,000	2,628,000	2,628,000	2,628,000
Container Amortization	1,888,500	1,888,000	1,889,000	1,133,000	1,133,000	1,133,000	189,000	189,000	189,000
Administration & Overhead (1% of Expenses)	157,000	159,000	169,000	161,000	159,000	163,000	144,000	147,000	146,000
TOTAL EXPENSES	$ 9,737,000	$9,861,000	$10,583,000	$10,035,000	$ 9,927,000	$10,193,000	$ 8,847,000	$ 9,054,000	$ 9,007,000
Break-even RFR, $/Ton	74.79	59.19	50.88	89.14	69.77	62.59	91.33	77.64	67.34
RFR/(RFR 60% Containers, 70% Utilization)	1.07	0.85	0.73	1.28	1.00	0.90	1.31	1.11	0.97

[22:32]

TABLE 13

SUMMARY OF COMPARISON SHIP OPERATING EXPENSES

SHIP	FULL CONTAINERS			60% CONTAINERS		
UTILIZATION	50%	70%	90%	50%	70%	90%
No. Days/Voyage	31	33	35	38	45	51
No. Trips/Year	11.29	10.60	10.00	9.21	7.78	6.86
Vessel Operating Expenses						
Wages	2,008,000	—	—	2,008,000	—	—
Subsistence	68,000	—	—	68,000	—	—
S.S.&E.	164,000	—	—	164,000	—	—
Maintenance & Repair	300,000	—	—	498,000	—	—
Insurance	428,000	—	—	709,000	—	—
Other	55,000	—	—	55,000	—	—
Annual V.O.E.	3,023,000	—	—	3,502,000	—	—
70% OOS	-2,116,000	—	—	-2,451,000	—	—
Total Annual V.O.E.	907,000	—	—	1,051,000	—	—
Fuel Cost						
At Sea	2,295,000	2,155,000	2,033,000	3,481,000	2,941,000	2,593,000
In Port	72,000	90,000	106,000	156,000	190,000	211,000
Total Annual Fuel Cost	2,367,000	2,245,000	2,139,000	3,637,000	3,131,000	2,804,000
Voyage Expenses U.S.						
Pilotage	54,000	50,000	48,000	44,000	37,000	33,000
Tugs	57,000	54,000	51,000	47,000	39,000	35,000
Line Handling	9,000	8,000	8,000	7,000	6,000	5,000
Dockage	22,000	29,000	35,000	24,000	33,000	39,000
Wharfage	85,000	112,000	135,000	93,000	120,000	150,000
Cargo Handling Costs	249,000	328,000	397,000	273,000	324,000	367,000
Other Port Expenses	1,000	1,000	1,000	1,000	1,000	1,000
Total Annual U.S. Voyage Costs	$ 477,000	$ 582,000	$ 675,000	$ 489,000	$ 560,000	$ 630,000
Total Annual Foreign Voyage Costs	539,000	814,000	957,000	675,000	805,000	722,000
Total Annual Voyage Costs	$4,290,000	$4,548,000	$4,678,000	$5,852,000	$5,347,000	$5,207,000

[22:33]

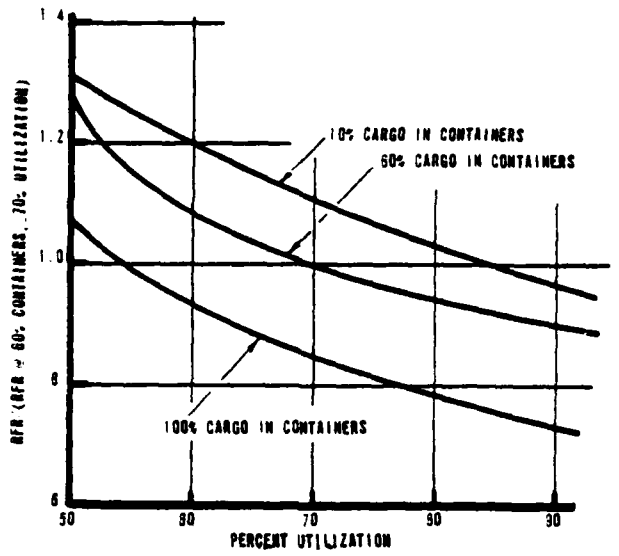
TABLE 13 (continued)

SHIP						
	FULL CONTAINERS			60% CONTAINERS		
UTILIZATION	50%	70%	90%	50%	70%	90%
Number of Ships	1	—	—	1	—	—
Construction Cost per Vessel	$54,277,000	—	—	90,000,000	—	—
Sea Speed	20	—	—	23	—	—
Total Voyage Days	31	33	35	38	45	51
Voyages per Year	11.29	10.60	10.00	9.21	7.78	6.86
Average Cargo per Voyage Each Way						
No. of TEU's @ 12 LT/TEU [1]	464	650	835	375	525	675
RO/RO Cargo, Tons	—	—	—	3,000	4,200	5,400
Break Bulk Cargo, Tons	—	—	—	—	—	—
Total Cargo One Way, Tons	5,568	7,800	10,020	7,500	10,500	13,500
Total Cargo Per Year, Both Ways	125,700	165,400	200,400	138,000	163,000	185,000
Annual Voyage Costs (70% ODS)	4,290,000	4,548,000	4,678,000	5,852,000	5,347,000	5,207,000
Ship Amortization (50% CDS)	1,678,000	1,678,000	1,678,000	2,783,000	2,783,000	2,783,000
Container Amortization	1,770,000	1,770,000	1,770,000	1,430,000	1,430,000	1,430,000
Administration & Overhead (11% of Expenses)	116,000	120,000	122,000	149,000	142,000	140,000
TOTAL EXPENSES	$ 7,854,000	$ 8,116,000	$ 8,248,000	$10,214,000	$ 9,702,000	$ 9,560,000
Break-even RFR, $/Ton	62.48	49.07	41.16	73.93	59.38	51.61

[22:34]

FIGURE 2

REQUIRED FREIGHT RATE (RFR) VERSUS PERCENT UTILIZATION



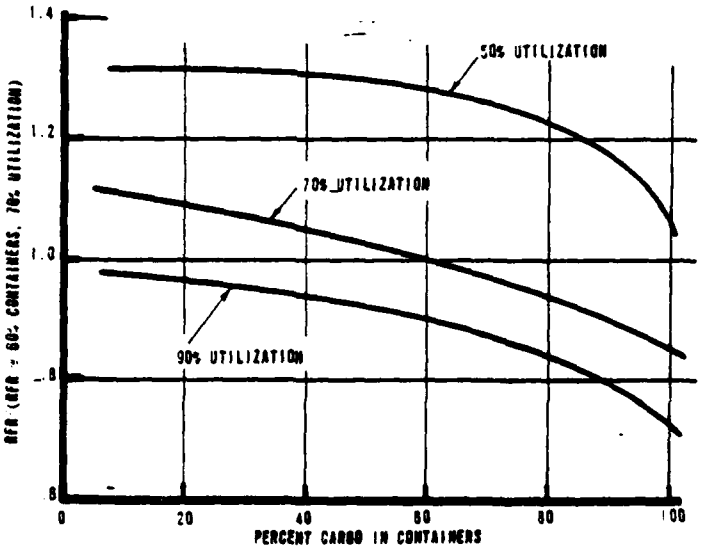


FIGURE 3

REQUIRED FREIGHT RATE (RFR) VERSUS PERCENT CARGO IN CONTAINERS

in containers and seventy percent utilization, in order to simplify comparison between the cases. The RFR drops as the utilization becomes higher and as the percent cargo in containers increases. For the sixty percent cargo in containers case, the RFR drops from 1.27 for fifty percent utilization to 0.89 for ninety percent utilization. It is noteworthy that it would be more profitable to carry all containers at a lower utilization rate, fifty or seventy percent, than all break bulk cargo at a higher utilization rate, seventy or ninety percent.

2. Containership

The containership is slightly smaller than the mobilization ship and operates at the same design speed. It was assumed to be operating on a full container service and since the ship lacks cargo handling capability, shore-side cargo handling gear was assumed. A full container ship, operating in a container trade, has lower RFR's than the combination multi-purpose ship, ranging from fifteen to twenty percent less depending on the utilization factor. This difference is due to the higher capital costs of the mobilization ship, which includes cargo handling gear the containership does not have. This lack of cargo handling gear is also a major disadvantage for strategic mobility in defense missions.

3. Roll-on/Roll-off

The Ro/Ro ship is somewhat larger than the combination mobilization ship and operates at a design speed of twenty-three

knots compared to the mobilization ship's design speed of twenty knots. It was assumed to carry fifty percent of its cargo in containers. Since the Ro/Ro is primarily designed for Ro/Ro cargo, most of the containers were assumed to be carried on by fork lifts with resultant longer cargo handling times. The Ro/Ro ship has RFR's about seventeen percent lower than the combination ship throughout the range of utilization rates examined. Factors contributing to these lower RFR's include the fact that the Ro/Ro is a larger ship than the combination ship though the capital costs for the Ro/Ro are about the same, again due to the less sophisticated cargo handling equipment.

F. SUMMARY

The comparative analysis indicates that while the mobilization ship is not as economically desirable as a specialized ship operating on a specialized trade route it is an attractive alternative for operating on a trade route to developing countries. The versatility of the vessel is perhaps its most important feature, both from a commercial and mobilization standpoint.

In order to meet the combined objectives of the U. S. Merchant Marine the versatility of the multi-purpose mobilization ship is most desirable. Its design and options provide the flexibility of efficiently handling and stowing containerized, roll-on/roll-off, heavy lift, and general cargo. This

flexibility is necessary due to the uncertainty of a particular cargo mix in a mobilization situation. The cost is high because the design must meet present day as well as future military wartime contingencies and commercial requirements.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL

As indicated in the previous chapters, problems do exist concerning the commercial success and national defe.. .e requirements of the U. S. Merchant Marine. The discussion of those particular problems leads to the conclusions and recommendations that follows.

B. CONCLUSIONS

There is a need for a strong merchant marine not only for the reliable transportation of American commerce, but also for utilization in military support roles in time of national emergency. With the United States (U.S.) carrying less than five percent of its own materials in its own ships, it could be potentially very dangerous in time of emergency if the U.S. had to depend on other countries to continue to transport U.S. goods as they do now.

Additionally, since the U.S. does not have a reputation for stockpiling raw materials, import missions bringing in such raw materials as oil and a variety of metals necessary to support wartime production levels would likely increase. These increases would strain the merchant fleet and add to the competition for available vessels with military planners.

While the Military Sealift Command (MSC) controlled fleet and the National Defense Reserve Fleet (NDRF) could be called

upon, in all out war requiring immediate response, these two fleets would be inadequate. The NDRF would be inadequate due to time delays in activation and manpower shortages once on line, and the MSC fleet because of its small size. Consequently, the U.S. merchant fleet would have to be called upon.

It is uncertain just how many ships would be available in the inventory to adequately cover contingencies currently confronting the U.S. and its allies, such as an invasion of Europe by the Warsaw Pact countries or a requirement to intervene in a Middle East conflict.

With current U.S. commitments around the globe, a fleet of 545 ships carrying less than five percent of U.S. commerce cannot be considered as a potent force in a total mobilization situation.

As for ships in current construction programs, too little is being spent to prepare them for defense contingencies. A $35 million ship constructed under subsidy may get a $50 thousand defense package which usually means some deck strengthening to accommodate a crane or non-self sustaining container ships, or a small landing platform for helicopters. These measures are considered token when compared to the early 1960's when defense features included nuclear water washdown systems, extra generators and weapons platforms [23:227]. Since that time shipowners have resisted the installation of equipment of potential use by the military, which exceed commercial

requirements, even when the initial cost is absorbed completely by the government because the expense of operating and maintaining such equipment is not included in the operating differential subsidy.

Preparedness for war is an expensive matter. Ships well adapted to serve as military auxiliaries might never be called upon to perform in that role. Should the need arise, however, the fact that the ship has all the equipment installed and in use could save much time and effort, as well as the problem of procurement on an emergency basis.

Lacking a specific statement in the Merchant Marine Acts of 1936 and 1970 concerning the purpose of including national defense features in the design of ships built under subsidy, the resistance of owners for their inclusion has met with sympathetic acceptance by both the Department of Defense and the Maritime Administration. The initiative in the design of ships has been left to the merchant marine industry. Only after the design is completed does the Navy have the privilege of studying the plans and specifications. By that time the opportunity to incorporate major defense applications has been lost. The result has been that less and less has been demanded and the commercial orientation has completely overshadowed the national defense requirements.

Further indications of the disparity among goals between various merchant marine related factions can be seen in this testimony before Congress by a memember of the MarAd.

> ... the failure of the current maritime program to provide an adequate and well balanced U.S. flag fleet is attributable to the fact that the commercial market for U.S. flag ships has generated a fleet inadequate for national security needs. For instance our bulk fleet can carry only a small fraction of essential U.S. imports and the liner fleet has only a small number of the roll-on/roll-off ships which are the most desirable for support of military deployments [23:200].

In summary the following conclusions may be drawn from the study presented:

1. The United States needs a strong, capable merchant fleet which at present does not exist in those terms;

2. The NDRF and the MSC controlled fleets are inadequate to handle the quick surge force in shipping occasioned by mobilization;

3. Current subsidy programs are not designed to accomplish their intended purpose;

4. In spite of government assistance the U.S. Merchant Marine is not a major carrier in international trade;

5. The national defense and security of this country require the maintenance of strong U.S. flag merchant marine and shipyard industries;

6. The current merchant fleet inventory of ships is not designed to support military re-supply operations.

7. There is no coordinated transportation policy in the United States regarding the shipping industry.

C. RECOMMENDATIONS

The U.S. Merchant Marine has been in a continual state of decline regarding its size and the amount of tonnage carried since World War II. To revitalize it to the forefront of world fleets, able to support the U.S. in both peace and war, new policies have to be instigated. Programs of massive subsidies

have not prevented its decline. Several strategies are suggested which might alleviate the current situation.

1. Design ships for military support missions

Build ships designed for military support purposes, putting them directly into the National Defense Reserve Fleet to revitalize that resource, or, as an alternative, leasing those ships to private industry for operation in peacetime commercial applications. The lease arrangement would include a commitment to make them available in an emergency. Prime consideration should be given to the multi-purpose combination ship described and analyzed in Chapter Four. As indicated in the analysis, its versatility is considered applicable to both commercial and military missions.

2. Utilize In-place Incentive Programs

The Reagan Administration has proposed to eliminate $107 million in new Construction Differential Subsidy (CDS) money for FY 1982 [24]. In that it is in the best interest of the Department of Defense to continue the subsidy programs to the Maritime Industries to guarantee the existence of a sea-lift capability in time of war, the CDS program should be tailored to ensure that ships designed for military support missions are built with CDS funds. Specialized commercial designs, such as non-self sustaining containerships, would not qualify for CDS funds.

To implement this alternative military planners must take an active and aggressive role in the design and specifications for ship types in the early stages of development.

3. Department of Defense (DOD) Budget for Subsidies

The Maritime Administration (MarAd) currently administers the subsidy program to the Maritime Industry. The industry is MarAd's constituency. The industry in fact considers MarAd as part of its own family, which in part can account for the commercial orientation and subsequent assuagement of the defense features requirements.

By reallocating the subsidy budget to DOD, defense features for merchant ships and other programs intended to improve sealift readiness will be greatly enhanced.

4. Congressional Legislation

Congress is currently studying programs facing the U.S. Merchant Marine and various proposed solutions, however, they are not ready to take the bold steps necessary to help the merchant fleet.

Congress should take immediate steps to permit the Defense Department to acquire ships designed for military support operations.

5. Further Study

In conclusion, the problems associated with the Merchant Marine require continuing attention and study. If action is taken courageously and quickly the means to remedy the errors of the past can be accomplished. The strategies of the past forty years have not served the national interest. New technologies and innovations need to be developed and explored.

Increased emphasis on the relationship between the Departments of Transportation (MarAd) and the Department of Defense (Navy) must take place. All members of the United States government involved in this area must work together for common goals, to ensure that the U.S. has an adequate Merchant Marine.

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