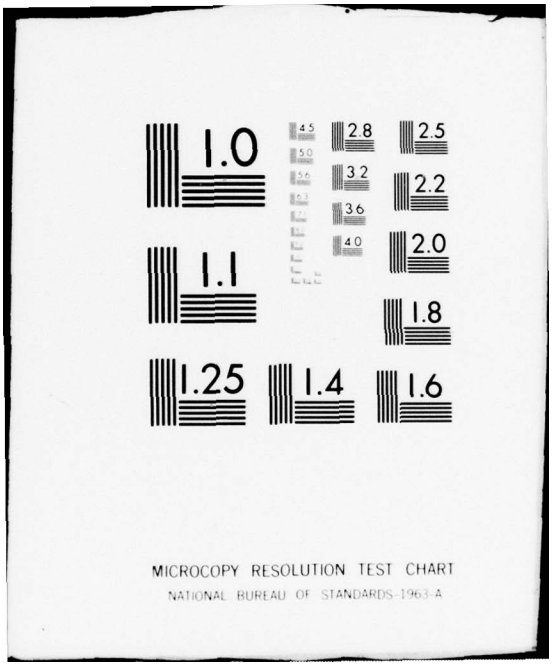
AD-A062 199 NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF F/G 13/10
AN ANALYSIS OF THE CONSTRAINTS ON THE ACTIVATION OF THE NATIONA--ETC(U)
SEP 78 W B EVERS

UNCLASSIFIED NL

1 OF 2
AD A062199


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2) LEVEL II

DDC FILE COPY AD A062199

NAVAL POSTGRADUATE SCHOOL
Monterey, California

DDC
RECEIVED
DEC 18 1978
B

(9) Master's thesis

THESIS

(6) AN ANALYSIS OF THE CONSTRAINTS ON THE ACTIVATION OF THE NATIONAL DEFENSE RESERVE FLEET IN A NON-MOBILIZATION CONTINGENCY

by

(10) William Barton/Evers

(11) September 1978

(12) 155 p.

Thesis Advisor: J. D. Horton

Approved for public release; distribution unlimited

78 12 11 183

251 450

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) An Analysis of the Constraints on the Activation of the National Defense Reserve Fleet in a Non-Mobilization Contingency		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; September 1978 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) William Barton Evers		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE September 1978 13. NUMBER OF PAGES 154
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

National Defense Reserve Fleet
Reserve shipping
Fleet material condition
Drydock availability

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The study analyzes the problems associated with the activation of a substantial number of ships from the National Defense Reserve Fleet (NDRF), this country's sole source of reserve shipping. After a review of past NDRF contributions, a discussion of its present capability is presented. Five major areas which would serve to constrain future activation efforts are then examined, including fleet material condition and drydock availability.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. (continued)

Next, these areas are analyzed in the context of a non-mobilization scenario in an attempt to determine the response capability of the NDRF. In the final chapter, conclusions are drawn regarding the NDRF's ability to respond to a fast-breaking contingency in the foreseeable future.

ACCESSION for
NTIS White Section
DDC Buff Section
UNANNOUNCED
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. AVAIL. and/or SPECIAL
A

Approved for public release; distribution unlimited

An Analysis of the Constraints on the Activation of the National Defense Reserve Fleet in a Non-Mobilization Contingency

by

William Barton Evers
Lieutenant, United States Navy
B.S., North Carolina State University, 1972

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
September 1978

Author William Barton Evers

Approved by: J. G. Hunter
Thesis Advisor

R. W. Bauchom
Second Reader

Chairman, Department of Administrative Sciences

Dean of Information and Policy Sciences

ABSTRACT

The study analyzes the problems associated with the activation of a substantial number of ships from the National Defense Reserve Fleet (NDRF), this country's sole source of reserve shipping. After a review of past NDRF contributions, a discussion of its present capability is presented. Five major areas which would serve to constrain future activation efforts are then examined, including fleet material condition and drydock availability. Next, these areas are analyzed in the context of a non-mobilization scenario in an attempt to determine the response capability of the NDRF. In the final chapter, conclusions are drawn regarding the NDRF's ability to respond to a fast-breaking contingency in the foreseeable future.

TABLE OF CONTENTS

I. INTRODUCTION----------10

A. PROBLEM----------10

B. STATEMENT OF PURPOSE----------10

C. STATEMENT OF ASSUMPTIONS----------11

D. BACKGROUND----------12

E. SUMMARY----------18

II. NDRF OPERATIONS: PAST AND PRESENT----------19

A. INTRODUCTION----------19

B. HISTORY OF THE NDRF----------19

C. ADMINISTRATION AND FUNDING OF THE NDRF----------29

D. PRESENT STATUS OF NDRF----------30

E. READY RESERVE FORCE----------35

F. NDRF IMPLEMENTATION PROCEDURES----------47

G. SUMMARY----------51

III. EXAMINATION OF THE CONSTRAINTS ON NDRF ACTIVATION----------54

A. INTRODUCTION----------54

B. KOREAN AND VIETNAM ACTIVATION EXPERIENCE----------55

C. MATERIAL CONDITION OF RESERVE SHIPS----------67

D. REGULATORY CONSIDERATIONS UPON ACTIVATION----------73

E. PUBLIC VESSEL COMPLIANCE WITH REGULATORY REQUIREMENTS----------84

F. SUPPLY SUPPORT----------84

G. REPAIR FACILITY AND DRYDOCK CONSTRAINTS----------87

H. SEAGOING MANPOWER CONSTRAINTS----------90

I. LEGAL CONSIDERATIONS----------94

J. SUMMARY---------- 98

IV. ANALYSIS OF NDRF FUTURE ACTIVATION CAPABILITY-------- 99

A. INTRODUCTION---------- 99

B. SCENARIO----------100

C. OPTIMISTIC CASE----------104

D. PESSIMISTIC CASE----------111

E. CONCLUSION----------118

V. CONCLUSIONS AND RECOMMENDATIONS----------120

A. CONCLUSIONS----------120

B. RECOMMENDATIONS----------122

APPENDIX A: MSC CONTROLLED FLEET----------124

APPENDIX B: U.S. FLAG GENERAL CARGO FLEET----------125

APPENDIX C: SRP TIME-PHASED COMMITMENT----------126

APPENDIX D: NDRF STATUS AS OF JUNE 30 1978----------127

APPENDIX E: INITIAL BREAKDOWN COST OF FIRST 47 VICTORY SHIPS ACTIVATED FOR VIETNAM SERVICE----------128

APPENDIX F: CONDITION STATUS OF 130 VICTORY SHIPS IN NDRF----------130

APPENDIX G: MAJOR TOPSIDE REPAIR FACILITIES----------137

APPENDIX H: SHIPYARDS HOLDING MASTER REPAIR CONTRACTS----------141

APPENDIX I: SHIP REPAIR CAPABILITY----------148

REFERENCES----------151

INITIAL DISTRIBUTION LIST----------154

LIST OF TABLES

TABLE 1 NDRF BUDGET AS PART OF TOTAL MARAD BUDGET------ 31

TABLE 2 NATIONAL DEFENSE RESERVE FLEET: 1945-1978----- 32

TABLE 3 NDRF INVENTORY AS OF JUNE 1978---------- 34

TABLE 4 READY RESERVE FORCE AS OF 30 JUNE 1978-------- 45

TABLE 5 SAMPLE RRF SHIP MIX---------- 46

TABLE 6 EXPECTED RRF COMPOSITION, FY 77 - FY 80-------- 47

TABLE 7 MARAD PROJECTION OF C-4 MARINER TRADE-INS, FY 78 - FY 82---------- 48

TABLE 8 ACTIVATION PERIODS OF 101 NDRF SHIPS---------- 58

TABLE 9 MAJOR PROBLEM AREAS CAUSING INITIAL BREAKDOWNS---------- 62

TABLE 10 SHIP SAILINGS DELAYED IN VIETNAM USE DUE TO CREW SHORTAGES---------- 63

TABLE 11 SHORTHANDED COMPLEMENTS FROM JANUARY 1966 TO JUNE 1967---------- 64

TABLE 12 GENERAL AGENCY AGREEMENT VESSEL MAINTENANCE AND REPAIR COSTS IN SOUTHEAST ASIA PROGRAM----- 66

TABLE 13 U.S. COAST GUARD INSPECTION REQUIREMENTS------- 75

TABLE 14 AMERICAN BUREAU OF SHIPPING INSPECTION REQUIREMENTS---------- 81

TABLE 15 NUMBER OF REPAIR YARDS CAPABLE OF DRYDOCKING VICTORY-SIZE SHIPS---------- 89

TABLE 16 SIZE OF THE MERCHANT FLEET, 1964-1977---------- 92

TABLE 17 MANNING LEVEL BY SKILL CATEGORY FOR A VICTORY SHIP---------- 95

TABLE 18 REPAIR FACILITIES AVAILABLE UNDER OPTIMISTIC ACTIVATION CONDITIONS----------108

TABLE 19 ACTIVATION OF 129 VICTORY SHIPS UNDER OPTIMISTIC CONDITIONS----------112

TABLE 20 ACTIVATION OF 129 VICTORY SHIPS UNDER PESSIMISTIC CONDITIONS----------117

LIST OF FIGURES

FIGURE 1	VICTORY CLASS SHIP	36
FIGURE 2	PRINCIPAL CHARACTERISTICS OF VICTORY CLASS SHIP	37
FIGURE 3	MORMACPRIDE CLASS SHIP	38
FIGURE 4	PRINCIPAL CHARACTERISTICS OF MORMACPRIDE CLASS SHIP	39
FIGURE 5	SEATRAIN PUERTO RICO CLASS SHIP	40
FIGURE 6	PRINCIPAL CHARACTERISTICS OF SEATRAIN PUERTO RICO CLASS SHIP	41
FIGURE 7	NDRF ACTIVATION PROCEDURES	52
FIGURE 8	CUMULATIVE NDRF ACTIVATION EXPENSE	60
FIGURE 9	MONTHLY NDRF ACTIVATION COST	61
FIGURE 10	NDRF ACTIVATION FLOW CHART	106
FIGURE 11	OPTIMISTIC ACTIVATION SEQUENCE	110
FIGURE 12	PESSIMISTIC ACTIVATION SEQUENCE	116

LIST OF ABBREVIATIONS

1.	NDRF	-	NATIONAL DEFENSE RESERVE FLEET
2.	RRF	-	READY RESERVE FORCE
3.	MSC	-	MILITARY SEALIFT COMMAND
4.	MARAD	-	MARITIME ADMINISTRATION
5.	DOD	-	DEPARTMENT OF DEFENSE
6.	DOC	-	DEPARTMENT OF COMMERCE
7.	MSTS	-	MILITARY SEA TRANSPORTATION SERVICE
8.	ROS	-	REDUCED OPERATING STATUS
9.	FOS	-	FULL OPERATING STATUS
10.	NSA	-	NATIONAL SHIPPING AUTHORITY
11.	SEP	-	SEALIFT ENHANCEMENT PLAN
12.	SRP	-	SEALIFT READINESS PROGRAM
13.	M/T	-	MEASUREMENT TON
14.	GAA	-	GENERAL AGENCY AGREEMENT
15.	FCC	-	FEDERAL COMMUNICATIONS COMMISSION
16.	ABS	-	AMERICAN BUREAU OF SHIPPING

I. INTRODUCTION

A. PROBLEM

The capability of the United States to provide adequate reserve shipping to support the rapid deployment of U.S. forces in the event of a limited war in the 1980's is in serious question.

The National Defense Reserve Fleet (NDRF), comprised mostly of World War II surplus Victory ships, is relied upon by the Department of Defense (DOD) to provide the bulk of any required supplemental shipping in a contingency situation. In the past, this fleet has been most responsive to defense needs and has proven its value perhaps to a much greater degree than originally envisioned. However, in the 1980's, these Victory ships will be of extraordinary, perhaps unprecedented, age. Irrespective of actual operating years, the essential soundness and ability of these ships to respond to an emergency call-up is a matter of particular concern.

Against this background, the primary objectives of this thesis are to examine the constraints on reserve fleet activation and analyze its time-phased capability to respond to a fast-breaking contingency in the 1980's.

B. STATEMENT OF PURPOSE

The purpose of this study is twofold in nature: 1) to examine the problems associated with the activation of the NDRF and 2) to determine the extent to which the NDRF can provide reserve shipping in a responsive manner within a non-

mobilization environment.

The questions which have served as a guide in the research for this study and which provoke significant uncertainty among sealift planners are listed below:

1) What is the material condition of the ships in the reserve fleet under the current Maritime Administration preservation program?
2) How long would it take to break out, drydock, repair, and refit a reserve Victory ship in an emergency situation?
3) Would there be enough qualified manpower to man a substantial number of reserve ships if the need arose?

These questions are examined and answered in Chapters Three and Four.

C. STATEMENT OF ASSUMPTIONS

It is pertinent before proceeding to discuss the general assumptions used in the development of this study. They are listed as follows:

1) It is assumed that policies such as strategic mobility and strategic deterrence form the basis for sealift support requirements and that such policies will continue in the future.
2) It is assumed that the effectiveness of NDRF can be determined by measuring its ability to provide reserve shipping in a manner responsive to DOD requirements. Further, the value of the NDRF lies in its relatively

rapid and economic accessability to the National Shipping Authority when the need arises instead of building new vessels to meet requirements.

3) It is assumed that having a reserve shipping capacity is not merely a convenience but an operational necessity. That is, a withdrawal of commercial shipping for military use would have an economically adverse impact on private shipping companies and adoption of such an alternative would not, therefore, provide a viable reserve shipping capacity.

D. BACKGROUND

Sealift services are provided for the Department of Defense (DOD) by the Military Sealift Command (MSC). As the single manager agency for such services, MSC performs the following fourfold mission. It -

1) provides sealift capability for deployment and support of U.S. forces and material in an emergency;
2) develops plans for expansion of sealift capability during an emergency or in wartime;
3) provides peacetime logistical support by worldwide sealift of supplies, equipment, and material;
4) provides, mans, and operates ships used for non-transportation purposes such as oceanographic and hydrographic research, support of the space program, and cable laying and repair. (1:59)

78 12 11 183

With respect to the above mission areas, MSC operates and maintains a small dry cargo fleet of 27 ships, comprised of 6 government-owned (nucleus) ships and 21 privately-owned (chartered) ships.[1] (2:1) Collectively, these ships are known as the MSC controlled fleet and represent the only organic sealift capability readily available to provide logistic support to DOD in a contingency (see Appendix A). All other assets are subject to control by the maritime industry or the Department of Commerce and are accessible only by invocation of various agency or contractual commitments.

Due to MSC's limited organic resources, many sealift planners have naturally turned to the U.S. Merchant Marine as a source of contingency shipping in a non-mobilization situation. In considering this sealift source, the following observations can be made:

1) The U.S. flag general cargo fleet is a lean fleet composed of the world's most technologically-advanced ships. Today, it contains approximately 290 ships, about half of the 1969 total, and a total well below the 5,000 available at the end of World War II (see Appendix B). (2:25,62;1:59)

---

[1]Charter ship - A charter ship refers to a privately-owned ship made available for hire either on a time or voyage or bare boat basis. In the context of this thesis, charter ship refers to a U.S. flag dry cargo ship leased by the government for a specific period of time.

2) Of more significance than the general reduction in the number of ships is the fact that the breakbulk ships[2] - ships of high military value due to their self-sustaining nature - are quietly vanishing from the U.S. flag inventory. The majority of these ships are fast approaching the age of retirement, are not economically competitive with newer designs, and are not being replaced. The 150 or so that remain are largely operated by scheduled carriers. (2:25)

3) A major concern that arises in the increasing dependence on high-technology ships (container ships, etc.) is the fact that the sophisticated cargo-handling equipment necessary to work the ships might not be available when needed. It is not difficult to imagine any number of contingencies where this would be the case. (3:32)

4) The viability of the domestic charter market as a source of sealift is highly dependent upon the economic trends within the shipping industry. In a contingency situation, if market demand for shipping is high, MSC will find it difficult to procure adequate supplemental shipping in a responsive time frame.

At present there are two potential sources of shipping available to augment the MSC controlled fleet in non-mobilization contingencies when merchant shipping cannot be chartered. These are the MSC Sealift Readiness Program (SRP) and the NDRF. Under

---

[2]Breakbulk ship - a breakbulk ship refers to a conventional dry cargo ship with its own gear for loading and unloading cargo. The general cargo handled by this ship is generally not packaged in containers but rather stowed piece by piece in the ship's hold.

the SRP, merchant shipping companies who wish to move DOD cargo in peacetime must commit half of their ships to military operations in the event of a contingency, with specific commitments time-phased after initial callup (see Appendix C). (1:48)

Because it is fully operational in peacetime, the SRP fleet can be marshalled more quickly for non-mobilization contingencies than the NDRF. However, in a contingency of long duration, with business as usual except in the contingency area, as in the Vietnam case, the diversion of berth-line ships[3] from their regular trade routes would create a vacuum likely to be filled by foreign-flag carriers. Post-contingency reentry into trade on these routes would probably be slow and, in some cases, impossible. With loss of trade, ships would be dropped, and the shipping mobilization base for a major war would be further reduced. (1:49-51)

The NDRF is thus needed to meet military logistic support requirements in potential long-term non-mobilization contingencies. In some cases it would be possible to charter foreign-flag ships to meet emergency non-mobilization requirements, but the foreign-flag fleets may not be a reliable resource, particularly in emergencies where U.S. policy is not supported by countries upon which the United States must depend for shipping assistance. (4:124)

It would be dangerous to underestimate the significance of the current and future requirement for a national surge shipping

---

[3]Berth-line ships - merchant ships providing common carrier-type service with scheduled sailings over definite routes which must be published in advance to permit shippers to book cargoes on specific voyages.

reserve. The need is now more critical than at any time since World War II because the vast reserve of World War II-built shipping that was in the tramp fleet[4] and the reserve fleet has all but disappeared.

Up to the end of the Vietnam War, MSC was able to expand its chartered fleet as necessary without drawing to any great extent upon ships operated in the regularly scheduled berth-line trade. Although the MSC controlled fleet could probably be augmented at any given time by a few underutilized or laid-up berth-line ships, the 21 ships now in the controlled fleet comprise the better part of the U.S. dry cargo charter fleet. Furthermore, since few of the controlled fleet ships are commercially viable, it is probable that most of them will be converted, scrapped, or offered for foreign sale when they are redelivered to their owners - if they are not required for the NDRF.

In short, the excess in the U.S. fleet that was drawn upon in military and non-military contingencies since World War II has now dwindled to the small remnant in the current NDRF. Unless the NDRF is properly maintained, there will be no alternative but to draw upon the active berth-line fleet in non-mobilization emergencies and such an action would severely degrade that important national asset.

---

[4]Tramp (irregular) fleet - that segment of the merchant fleet which does not adhere to a schedule of sailings, but rather generally seeks cargo which moves in large bulk lots.

In recognition of the necessity of maintaining a reserve shipping capacity readily available to DOD, the Navy/MSC has sponsored a series of programs geared at improving its logistical and sealift capabilities. These programs are generally referred to under the heading of the Sealift Enhancement Plan (SEP). One element of this plan is to provide funds to enable MSC to maintain underutilized shipping capacity. Controlled fleet ships that are not needed to meet current requirements are put in reduced operating status (ROS). These ships are maintained in a high state of readiness (crews assigned) and can be put in operation in three to ten days. The availability of funds dictates the number that can be maintained in ROS at any given time (usually five to seven). (5:72,6:14-17)

In addition, the SEP provides funds to enhance the surge capability of the NDRF. In response to current DOD planning that requires supplementary shipping be ready within the first two weeks of commitment of U.S. forces, the Maritime Administration and the Navy have established a Ready Reserve Force (RRF) within the NDRF. Under this program, ships are upgraded and maintained in a state of readiness so as to provide a dedicated fleet which can be placed in service within ten days. Unfortunately, this force consists of only 9 ships at present, although there are plans to increase the number to 25 by fiscal year 1980. (5:72)

Although the RRF is a step in the right direction, it is only a stop-gap measure. Out of necessity, heavy reliance by

DOD must still be placed on the NDRF's ability to provide reserve shipping within the time frame dictated. However, the very existence of the Sealift Enhancement Plan indicates that there is a growing uneasiness among sealift planners on such reliance.

E. SUMMARY

In a non-mobilization contingency, the only assets over which DOD has any reasonable control consist of a small controlled fleet of government-owned and chartered ships, the RRF/NDRF combination, and the ships in the Sealift Readiness Program. Of these, the one which is least disruptive to the U.S. shipping industry and upon which MSC must depend to provide the bulk of any surge capability is the reserve fleet. Accordingly, the NDRF assumes a critical role in this nation's strategic mobility. However, heavy reliance upon a fleet of ships most of which are over 30 years old is questionable and is of growing concern within DOD.

Against this background, the extent to which the NDRF will be able to meet future DOD contingency requirements will now be investigated by examining the constraints on its timely activation.

II. NDRF OPERATIONS: PAST AND PRESENT

A. INTRODUCTION

The purpose of this chapter is to present basic background information on the National Defense Reserve Fleet. This information will be used as a point of departure in the next chapter to examine the various constraints on NDRF responsiveness. As a basis for the examination, it is first necessary to convey a fundamental understanding of current NDRF status and operations so that potential complications and problem areas may be fully appreciated. Also, prior to evaluating future reserve fleet effectiveness, it will be beneficial to examine the origin and past contributions of the NDRF to this country's economic and national security.

B. HISTORY OF THE NDRF

In September 1945, the United States government was the owner and operator of the largest merchant fleet in the world. During the eight-year period between 1937 and 1945, approximately 6,400 merchant ships were constructed under the auspices of the U.S. Maritime Commission. After accounting for wartime losses and transfers, at the end of World War II the government held title to more than 5,000 ships. Upon careful consideration, the Maritime Commission (forerunner of MARAD) determined that a structured disposal of surplus ships was a prerequisite to re-establishing worldwide commerce. (3:27)

The legislation developed to deal with the disposal and management of the government fleet is the Merchant Ship Sales

Act of 1946. The provisions of this act were designed to provide the following:

1) preference to U.S. citizens under liberal sales terms toward the purchase of war-built merchant ships;
2) authorization for the Maritime Commission to accept older American-built and registered ships in exchange for or as a credit towards newer government-owned ships;
3) sales to foreign nationals under the provision that the ships sold were not necessary to the defense of the United States or the promotion of the merchant marine

However, even at "give-away" prices for American and foreign operators, the Maritime Commission expected that a substantial number of ships would not be sold. These inactive but potentially useful ships posed a problem. On this basis, the Ship Sales Act of 1946 was also designed to accommodate the creation of a government-owned and administered National Defense Reserve Fleet. (3:28) Specifically, the act states:

> The Commission shall place in a National Defense Reserve (1) such vessels owned by it as, after consultation with the Secretary of War and the Secretary of the Navy, it deems should be retained for national defense, and (2) all vessels owned by it on December 31, 1947, for the sale of which a contract has not been made by that time ... a vessel placed in such reserve shall in no case be used for commercial operation, except that any such vessel may be used during any period in which vessels may be requisitioned under Section 902 of the Merchant Marine Act of 1936, as amended. (1:52)

Furthermore, the act gave the U.S. Maritime Commission responsibility for the preservation and upkeep of this reserve shipping asset. In July 1946, there were 1,421 ships in the NDRF at nine anchorages located throughout the United States (James

River, Va.; Baltimore, Md.; Hudson River, N.Y.; Wilmington, N.C.; Beaumont, Tex.; Mobile, Ala.; Astoria, Ore.; Olympia, Wash.; and Suisun Bay, Calif.). (1:52)

During the period between 1947 and 1950, the reserve fleet steadily increased in size. With the postwar demand for shipping subsiding, companies began to return war-built ships, mostly Liberties, and to place orders for newer, more economical ships specifically designed for their trade routes. Thus, by July 1950, the NDRF reached its all-time high of 2,277 ships. (3:28)

The 1946 Ship Sales Act did not require that every ship currently in the NDRF be set aside for indefinite retention. In fact, it specifically delineated that preservation be considered for only those ships which had a potential national defense purpose or which could be utilized to augment the merchant marine during periods of excess shipping demand. In order to clarify this point, an amendment to the Sales Act was passed in 1950 which authorized the chartering of NDRF ships in cases where service was not adequately provided by U.S. private operators under reasonable conditions and rates. (3:28)

In 1951, the authorization for the sale of reserve ships to commercial trade operators expired. From that point on, for all practical purposes ships could be sold only for scrap or for use in non-transportation roles. (3:28)

The initial test as to the soundness of the concept of maintaining the merchant fleet in reserve came in 1950. The decision by the United States to provide military support to South Korea posed a sealift problem that the private shipping

industry could not quickly meet. The obvious solution was the reactivation of a select number of ships from the NDRF. The vehicle used to accommodate the operation, manning, and maintenance of these reserve ships was the General Agency Agreement. Under the provisions of this agreement, reactivated ships were operated by private shipping companies but were under the operational control of the Military Sealift Command (then called the Military Sea Transportation Service).

The shipping companies were given the administrative responsibilities of providing a crew, directing maintenance operations, and supplying provisions for the NDRF ships in their custody. The expenses incurred, including overhead costs and set fees to the companies for services rendered, were borne by the Department of Defense (DOD). Additionally, DOD paid the breakout and activation costs. At the height of the Korean War, about 400 NDRF ships were utilized to provide logistics support for U.S. operations. (3:28)

The year 1950 was important for solidifying the NDRF concept. In the winter of that year, a worldwide shortage of bulk shipping posed a problem U.S. private shipping was unable to overcome. A primary cause of the shortage was a significant increase in the exportation of U.S. coal to Europe. The 1950-51 winter in northern Europe was the most severe on record. The cost of shipping coal from the eastern United States to Europe increased more than threefold ($3.50 per ton in March of 1950 to $13.00 per ton in February of 1951). (3:28)

In order to drive down freight rates and thus insure that an inordinate amount of the Marshall Plan Aid would not be lost to shipping charges, authorization was given for the breakout of additional shipping assets from the NDRF. Moreover, as soon as the above situation was under control, another shipping crisis developed. Massive crop failures in India made it essential that enormous quantities of grain be shipped immediately to that country. As before, the only source which could provide the necessary surge shipping capability was the NDRF. (3:29)

The performance of the NDRF in its first trials as a source of sealift is summarized in the following excerpt from the 1951 Annual Report of the Federal Maritime Board/Maritime Administration:

> The increased tonnage, without which it would have been impossible to meet supply commitments in Korea and foreign aid commitments elsewhere, came entirely from the National Defense Reserve Fleet of the Maritime Administration. Over an 18-month period beginning with Korean hostilities, 778 government-owned ships were withdrawn, repaired, refitted, and put into service at a rate of more than three vessels every two days.

By 1953, the need for additional shipping assets had shown a marked decrease. In January of that year there were only 160 NDRF ships in an active status; the rest had been returned to their various reserve sites. However, within a few months the NDRF assumed another unique role in shipping circles, one that kept it gainfully employed for the next ten years. In March 1953, the Department of Agriculture submitted a request which proposed to the Maritime Administration the use of 50 Liberty ships as temporary silos for the storage of surplus grain.

The program worked so well that by February 1954 a total of 317 ships were used to store approximately 72 million bushels of grain. By 1959, the peak of this operation, a total of 400 ships had been utilized to store a reported 136 million bushels. Although the program was quite successful, it was concluded in 1964 with the release of all grainships by the Department of Agriculture. (3:29)

In the latter part of 1955, demand for ocean shipping throughout the world again rose and, as to be expected, there was an upward trend in associated shipping and charter rates. A contributing factor was an increase in U.S. overseas shipments of military and foreign aid cargo. This was the world shipping situation when in July 1956 the Egyptians nationalized the Suez Canal. The seizure of the canal by Anglo-French forces precipitated the scuttling of numerous ships by Egyptian authorities and precluded the full use of this vital waterway by international commerce until April 1957. (3:29)

As a consequence of the "Suez crisis," there was an immediate worldwide demand for additional shipping because the routes between Europe and the United States on the one hand and the Persian Gulf on the other had to be extended around the Cape of Good Hope. In some instances, the total distance traveled doubled. This had the effect of increasing charter rates by as much as 300 percent in some cases. As in the European coal situation of 1951, these exhorbitant shipping rates placed an additional financial burden on the U.S. Treasury in terms of various aid programs. In order to reduce costs, and

for the second time in four years, the United States was compelled to call upon its reserve merchant shipping asset, the NDRF. (3:30)

In summary, the 1950's was a decade in which the NDRF justified the need for its continued existence beyond doubt. Coal shipments to Europe, logistic support of U.S. forces during the Korean War, foreign aid to India in the form of grain shipments, and increased tonnage demands resulting from closure of the Suez Canal all testified to the worth of having a merchant shipping capability in reserve. Additionally, the government benefitted from the utilization of the NDRF as temporary grain silos. (3:30)

In 1960, as a result of a joint Navy-MARAD review group, a determination was reached that numerous ships in the NDRF no longer warranted preservation for national emergency purposes. These ships, classified as non-priority, were composed mostly of Liberty-class vessels and were disposed of by scrapping. The ships selected for retention, a total of 891, were composed of what was termed Navy-priority ships and MARAD-priority ships. The former consisted of ships earmarked for DOD logistical support in a contingency or a national emergency while the latter consisted of ships earmarked to augment commercial tonnage in times of severe shortages. The two groups were subdivided further with respect to priority for maintenance and repair. (3:30)

As the United States entered the 1960's, the NDRF received little attention. NDRF preservation funding was given low

priority in MARAD budget submissions. If any emphasis was placed on funding, it was usually confined to the sale of non-retention ships instead of improving the condition of those selected for retention. By 1965 the NDRF consisted of 1,594 ships, of which 960 were in the priority retention category. In addition to this category, 388 Liberty ships were designated as an emergency reserve in which limited preservation work was scheduled. (3:30)

If the first half of the 1960's witnessed the NDRF slide into ignominity, the second half did not. With the buildup of U.S. forces in Southeast Asia, it once again became apparent that the U.S. shipping industry did not have the available assets to meet both commercial and military requirements. As during the Korean conflict, the decision was made to reactivate large numbers of NDRF ships. By June 1966, 105 reserve ships, mostly Victories, had been withdrawn. From 1965 to 1970, 172 of these ships moved more than 30 percent of all cargo to Southeast Asia. (1:54) In November 1970, with the winding down of operations, the last reserve ship activated for service in Vietnam was returned to inactive status. Once again, the concept of having a merchant fleet in reserve had proved its worth. However, the twin strains of age and neglect were apparent. By 1970 it became obvious, as the fleet approached unprecedented age, that the NDRF concept required a thorough review. (3:30)

The passage of the Merchant Marine Act of 1970 marked a major attempt by the United States to revitalize its merchant marine. Although the need for such action was clear with regard to the future of the NDRF, no unanimity existed with regard to

actions to be taken. Opinion at the Washington level was divided among three basic areas:

1) continuing the existing policy concerning NDRF status; or
2) upgrading the NDRF; or
3) scrapping the NDRF.

A proponent of the third view, the Maritime Committee of the AFL-CIO petitioned Congress to recognize the fact that the NDRF was a part of the past and that to continue to support it would be a grave mistake. However, when the Merchant Marine Act of 1970 was signed by President Nixon, it was mute with respect to the future of the reserve fleet. (3:30)

In 1971, under the auspices of DOD, an inter-agency review was conducted to examine the sources of U.S. sealift. The result of this review, titled The Sealift Procurement and National Security Study (SPANS), is a comprehensive, four-part analysis which has proven to be a landmark in terms of assessing sealift capability. One major recommendation was that the NDRF be updated with used ships from private industry (1950 versions) which had exceeded their economic life.

MARAD, thinking along the same lines, recommended that ten used breakbulk ships be purchased outright for mothballing in the NDRF. The 1972 Department of Commerce Budget contained $30 million specifically for that purpose. However, the request was rejected by the Office of Management and Budget (OMB) on the grounds that "the role of the NDRF is clearly military in nature and determination regarding the need for improving the capability

of that fleet is a military responsibility." In effect, OMB asserted that if funds were needed to upgrade the fleet, these funds should appear in the DOD budget. The following year, MARAD appealed the decision by OMB but funds were still denied. (3:31)

Also in 1972, in order to facilitate its own planning and to more accurately determine the cost, time, and associated problems in breaking out a priority ship in a contingency situation, MARAD sponsored the partial reactivation of the SS Greely Victory. This test indicated that a Victory ship could be refitted in an average of 21 days at a cost of $800,000. (3:31) Although these figures were approximate, the Military Sealift Command (MSC) took exception to the time estimate and stated it would take approximately three times as long.

By 1973, the number of reserve fleet sites had been reduced to three and the MARAD list of retention ships was down to 315; of these, 130 Victories were classified as priority ships. (3:31)

In 1974, MARAD's chief concern turned to the implementation of the shipbuilding program which the Merchant Marine Act of 1970 had authorized. As a result, it became necessary to reduce the number of personnel at reserve sites; this made just staying abreast of the required preservation work a virtual impossibility. Although MARAD continued to exhibit some interest in the NDRF, the NDRF was dropping on its list of priorities. For fiscal year 1975, out of the total MARAD budget request of $586,162,000, only $4,358,000 was slated for the reserve fleet. This amounted to less than 1 percent. (3:31)

On January 2, 1975, President Gerald Ford signed the Mariner Bill (Public Law 93-605) which, as an amendment to the Merchant Marine Act of 1936, authorized MARAD to supervise the acquisition of used Mariner-class ships for lay-up in the NDRF. These ships, which might otherwise have been scrapped, were to be taken into the NDRF in exchange for obsolete reserve ships scheduled for scrapping. The express purpose of this bill was to upgrade the reserve fleet with relatively newer ships. While the idea was well considered and long overdue, it was not executed. On January 2, 1977, the time provision in the Mariner Bill expired without the exchange of one Mariner-class ship. Probably the major reason for this lack of success was the fact that most of the Mariner-class ships were still within their economic life spans and were able to earn profits. (7:439)

In summarizing the role of the NDRF in the 1960's and 1970's, it can be seen that the "ravages of time, tide, and indifference" (3:29) have taken their toll. In spite of neglect and reduction in numbers during the early 1960's, the NDRF proved its conceptual viability by providing necessary shipping in support of the Vietnam conflict. However, during the 1970's the NDRF has shown signs of its age and obsolescence, factors which prompt considerable concern and uncertainty about its future.

C. ADMINISTRATION AND FUNDING OF THE NDRF

As indicated in the previous section, MARAD, an agency of the Department of Commerce, is charged with the responsibility of preserving and maintaining the NDRF. Aside from preservation

duties, MARAD is responsible for administering the sale of designated reserve ships, is authorized to transfer ships from reserve sites to any government agency, and is authorized to release ships to U.S. companies when (U.S. flag) privately-owned ships are not available for charter.

As reserve fleet administrator, MARAD receives the necessary funding through the annual Maritime Appropriations Authorization Act. Under this bill, the NDRF appears as a line item along with other expense items such as construction-differential subsidies (CDS), operating-differential subsidies, research and development, and maritime training. For fiscal year 1978, MARAD requested $5,137,000 to provide for preservation and security of the ships on its retention list. (7:5) This sum included the normal preservation maintenance of hulls, machinery, and electrical equipment along with dehumidification of ship interiors and cathodic protection of bottoms. Also in this year's program, additional funding was requested for the MARAD portion of the joint Navy-MARAD program (Ready Reserve Force) to improve the activation response time of the NDRF. (7:9) A survey of MARAD-requested funding for NDRF preservation for the past six years is provided in Table 1.

D. PRESENT STATUS OF NDRF

With few exceptions, the NDRF has steadily declined in size over the past 25 years (see Table 2). Since 1958, approximately 2,270 ships have been sold for scrap or non-transportation purposes with the proceeds ($192.2 million) returned to the U.S. Treasury. (8:65) With this reduction in fleet size came the

FY	NDRF BUDGET REQUEST	TOTAL MARAD BUDGET REQUEST	PERCENT
1972	$4,318,000	$507,650,000	.85
1973	3,900,000	455,000,000	.85
1974	3,773,000	531,315,000	.71
1975	4,358,000	586,162,000	.70
1976	4,242,000	593,618,000	.72
1977	4,560,000	444,782,000	1.06
1978	5,137,000	549,224,000	.94

Table 1

NDRF Budget as Part of Total MARAD Budget

*Source: U.S. Congress, Senate, Committee on Commerce, Merchant Marine Subcommittee, Maritime Appropriations FY 1971 - FY 1978, Hearings, Washington, D.C.

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 (30 June 78)	308

Table 2

National Defense Reserve Fleet: 1945-1978

*Source: U.S. Department of Commerce, MARAD '77, (8:69)

closing of six of the previous nine reserve sites. Currently, the ships of the NDRF are divided into three separate fleets located at Suisun Bay, California; James River, Virginia; and Beaumont, Texas. Each fleet is under the direction of a regional superintendent and consists of the necessary manpower, service craft, and equipment to preserve the ships in its care. However, no assets are designated for any repair maintenance or upgrading of these ships. Theoretically, such work would be accomplished at nearby repair facilities and drydocks upon activation of the ships. (9:6,7) Table 3 indicates the status of the NDRF as of 30 June 1978. Ships assigned to each fleet are subdivided into six categories, according to method of preservation, ownership, and retention plan.

Of the 308 ships currently laid up at the various fleet sites, only 147 are of general cargo types. (10:1) The remainder are naval auxiliary types and non-retention candidates. The naval auxiliaries consist of mine-sweepers, tugs, and other types not appropriate for the transportation of military cargo. The non-retention group consists of special program ships, i.e. fish reef program, military assistance programs, ships being held for spare parts support, and ships being held for scrap. (11:3)

Of the general cargo ships now in the reserve fleet, 130 are Victory-class ships. These World War II freighters are driven by steam turbine power plants which enable them to maintain speeds between 15 and 17 knots. (11:3) With a lift capacity of approximately 10,800 dead weight tons (dwt) and

CATEGORY	RETENTION PLAN	FLEETS			TOTAL SHIPS
		JAMES RIVER	BEAUMONT	SUISUN BAY	
I	MARAD VICTORIES	46	25	59	130
II	MARAD OTHER RETENTION	13	1	1	15**
III	NAVY RETENTION	25	13	29	67
IV	MARAD SCRAP	13	2	8	23
V	NAVY SCRAP	-	-	1	1
VI	MARAD SPECIAL PROGRAMS	41	7	22	70

TABLE 3

NDRF INVENTORY AS OF JUNE 1978

*Source: U.S. Department of Commerce, Ships in the National Defense Reserve Fleet - by Design (10:1)

**Total does not include SSs Maine and Puerto Rico which are undergoing RRF Phase I and II

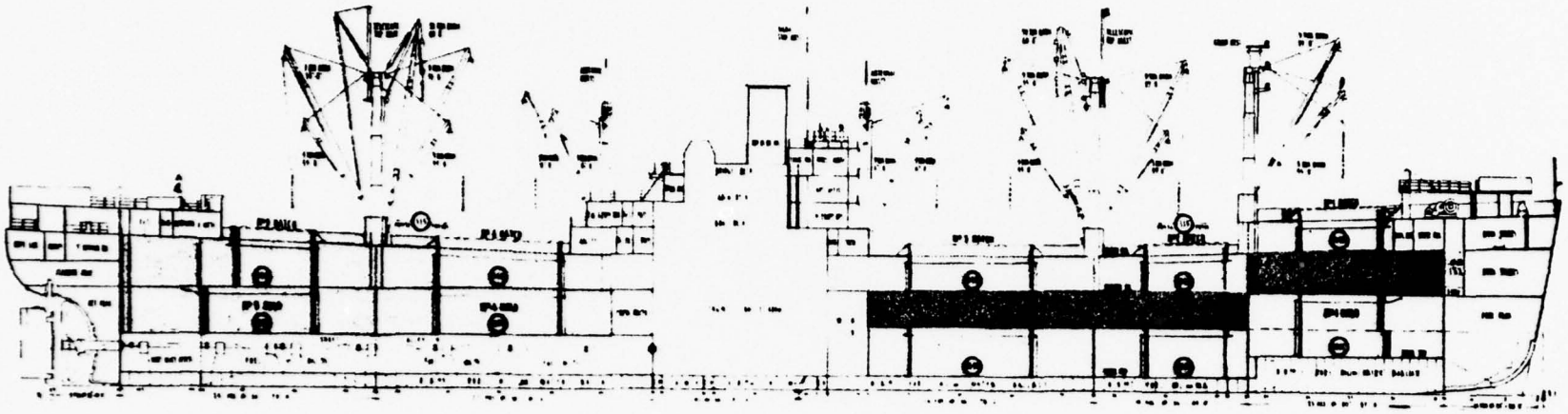
permanently installed cargo handling equipment, each ship has the flexibility to provide sealift to almost every overseas destination. Figures 1 and 2 illustrate the basic configuration and characteristics of the Victory-class ships.

The remaining ships in the general cargo category consist of 11 Seatrains, 1 container carrier (P-6-SE-PSI), and 5 Mormac Pride-class ships (C-3-S-33A). (5:1) The Seatrain ships were used extensively in Vietnam as an efficient way to transport vehicles and helicopters. (18:65,11:3) The general characteristics and configuration of the Seatrain ships are illustrated in Figures 3 and 4. The Mormac Pride-class ships, relatively new additions to the NDRF, were built in the early 1960's and possess the characteristics of being bigger, faster, and more suited to current-day sealift requirements. Figures 5 and 6 illustrate the basic characteristics and design of this class ship. A summary of the ships currently in the NDRF by ship type, number, and location is given in Appendix D.

E. READY RESERVE FORCE

A memorandum of agreement between the Department of Commerce and the Department of the Navy, signed 2 November 1976, set forth provisions for the establishment, preservation, and control of a Ready Reserve Force (RRF). The purpose of this new force, an element of the NDRF, was to "... provide a small number of ships with characteristics particularly desirable for military use, in a short period of time for a less-than-full mobilization or for the initial phase of a full mobilization." (2:21, 12:1)

Victory Class



Bale Capacity **453,210 Cu. Ft.**

Measurement Tons **11,330 Tons**

FIGURE 1

*Source: MARAD slide presentation, The National Defense Reserve Fleet

Principal Characteristics

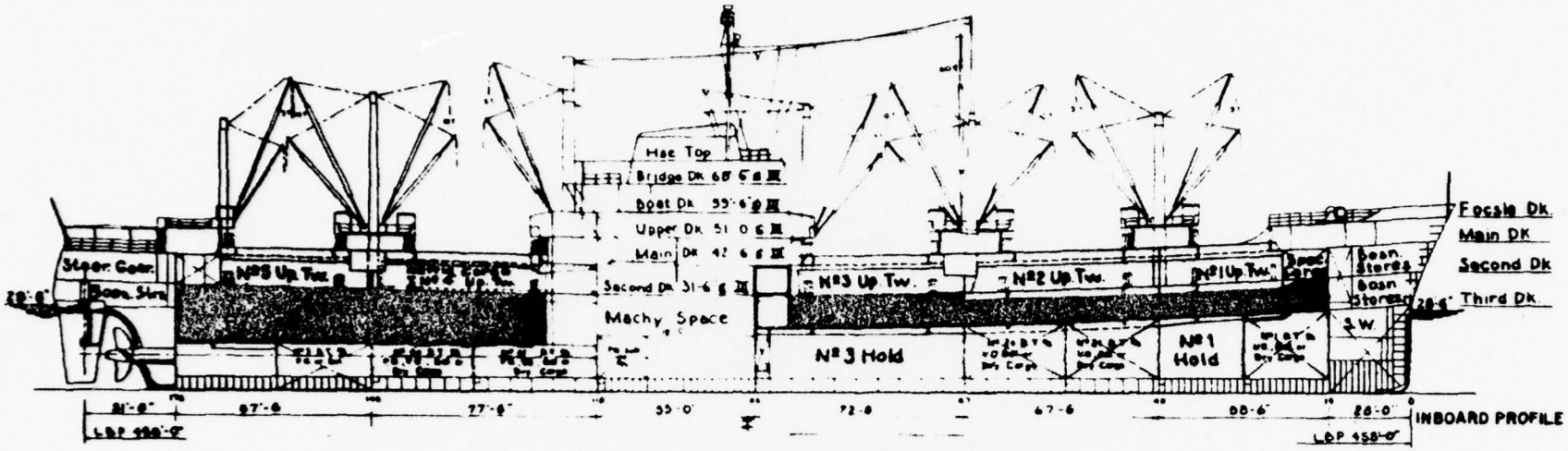
Victory Class
VC2-S-AP 3 Design

Length	455 Feet
Beam	62 Feet
Draft (max. loaded)	28 Feet
Displacement	15,200 Long Tons
Fuel Capacity	19,113 Barrels
Speed	16 Knots
Crew	44

FIGURE 2

*Source: MARAD slide presentation, The National Defense Reserve Fleet

MORMACPRIDE Class



Bale Capacity **544,872 Cu. Ft.**

Measurement Tons **13,621 Tons**

FIGURE 3

*Source: MARAD slide presentation, The Ready Reserve Force

Principal Characteristics

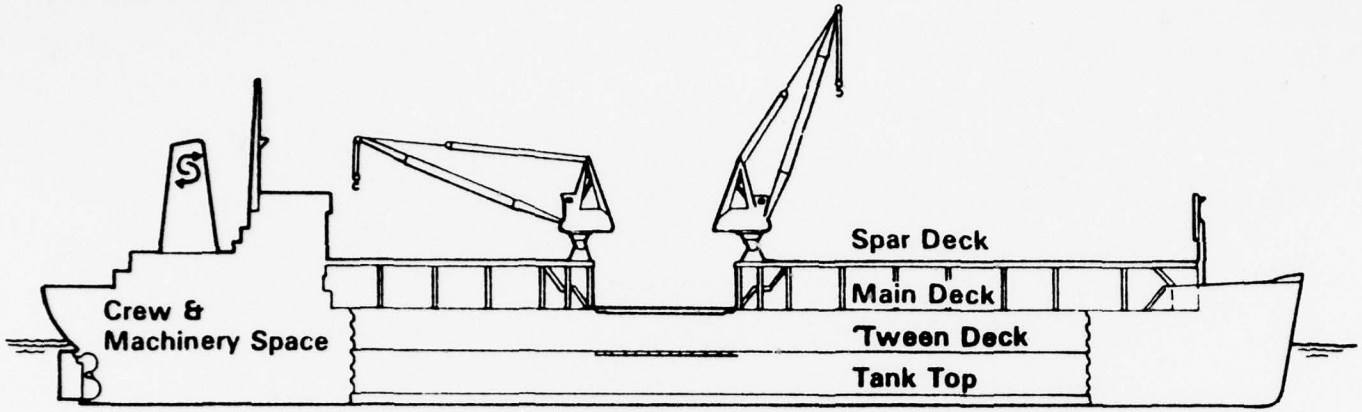
MORMACPRIDE Class
C3-S-33A Design

Length	483 Feet
Beam	68 Feet
Draft (max. loaded)	31 Feet
Displacement	16,400 Long Tons
Fuel Capacity	13,824 Barrels
Speed	18 Knots
Crew	45

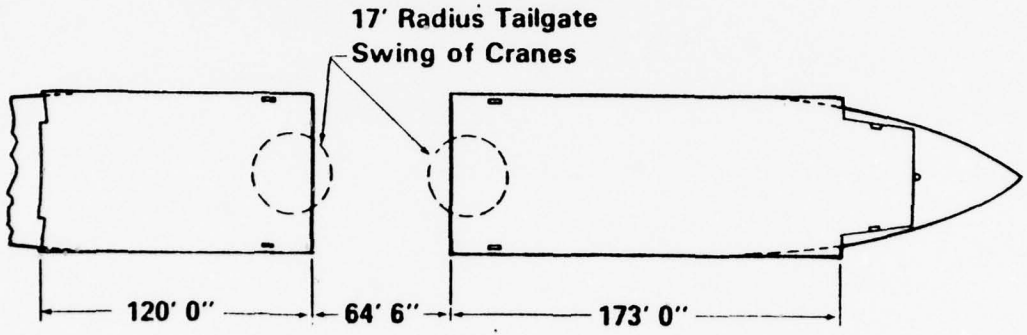
FIGURE 4

*Source: MARAD slide presentation, The Ready Reserve Force

Seatrain Puerto Rico Class



INBOARD PROFILE



SPAR DECK

FIGURE 5

*Source: MARAD slide presentation, The Ready Reserve Force

Seatrain
Puerto Rico Class

Principal Characteristics

Length	560 feet
Beam	68 feet
Draft (max. loaded)	27 feet
Displacement	21,240 long tons
Fuel capacity	16,500 barrels
Speed	16.5 knots
Crew	40

FIGURE 6

*Source: MARAD slide presentation, The Ready Reserve Force

The events which led to the establishment of the RRF began in early 1976 when MARAD, in its role as reserve fleet administrator, conducted an analysis of the time required to break out ships from reserve status. This was prompted by a change in DOD sealift requirements which specifically stated the necessity of a supplemental shipping capacity within five to ten days after notification. The result of MARAD's examination indicated that activation of reserve shipping could not be accomplished in the specified five to ten-day period nor in a time frame closely approaching the DOD requirement. The MARAD activation estimate was 30 to 40 days. (9:1, 11:3,4)

The reasons for this degraded response capability were excessive age, ships maintained in the same degraded material condition as when deactivated, lack of NDRF repair and overhaul equipment, and limited availability of private repair and drydock facilities. The findings were further corroborated by an independent General Accounting Office (GAO) report, dated 6 October 1976, which reported the results of a review of the capability of the U.S. fleet to meet contingency requirements. (13:3-5)

Accordingly, joint action was taken by the Navy and MARAD, after analyzing various alternatives, to upgrade the immediate response capability of the NDRF. Based on DOD requirements and a preliminary feasibility and cost study, MARAD proposed that 30 reserve Victory-class ships be overhauled and refitted via a four-phase Ready Reserve Program. This program consists of:

1) A preactivation phase (Phase I) which entails 148 work items ranging from checking keys to placing the main power plant in operation. This phase would require 40,000 man-hours per ship.

2) A deactivation phase (Phase II) which entails work required to prepare the ships for return to the reserve fleet in a ready status upon completion of Phase I dock work. This phase would require 4,750 man-hours per ship.

3) An active retention phase (Phase III) which entails work necessary to preserve and maintain the ships in RRF status. This phase would require one man-year per ship per year. Also incorporated in this phase are provisions for an annual test (one ship, no prior notice) to validate response time.

4) An activation for service phase (Phase IV) which entails work required to have the ship on berth and ready to take cargo within the ten days. This phase would require 9,400 man-hours per ship.

The MARAD estimated cost for activating a Victory ship via the above procedures was approximately $1.5 million per ship. However, such activation would furnish an operational ship, in "full class" by American Bureau of Shipping (ABS) standards, possessing a current Coast Guard certificate of inspection, fully equipped with all necessary stores and spare parts and ready for service. (11:5)

The Navy concurred with the MARAD proposal, with certain modifications, and requested support funding in its Program Objective Memorandum (POM) submission for fiscal year 1977. (6:15) The major modification was that the time-phase buildup of the RRF, the specific ship mix and type, the total number of ships, and future changes in the composition of the RRF were to be at the discretion of the Chief of Naval Operations (CNO), in accordance with budget constraints and requirement validations, subject to agreement by the Assistant Secretary of Commerce for Maritime Affairs. (3:21) In order to formalize the basic understanding between the Departments of Commerce and the Navy, a memorandum of agreement was signed.

At the start of fiscal year 1977, the Navy transferred $5.2 million to MARAD to fund its share of the joint program. (8:65) Under the RRF program, the Navy is responsible, on a reimbursable basis, for funding the upgrading of the selected ships. Once the ships are brought up to RRF status, however, MARAD funds their preservation and continued maintenance. In fiscal year 1977, seven ships were put into the RRF program, (six at James River, one at Beaumont). (8:65) Currently, as indicated in Table 4, the RRF consists of nine ships, two of which were still in Phase I and II of the program on 30 June 1978. (10:1)

As is also indicated in Table 4, the initial MARAD plan of utilizing 30 Victory ships was abandoned in favor of a more versatile ship mix. This change in policy was due to the unexpected trade-in of five Mormac Pride C-3's and the emphasis placed by the Army and the Marine Corps on Seatrain utilization.

SHIP TYPE	NAME	LOCATION	LIFT CAPACITY**
C3-S-33A	Pride	James River	13,621
C3-S-33A	Bay	James River	13,621
C3-S-33A	Cove	James River	13,621
C3-S-33A	Scan	James River	13,621
C3-S-33A	Lake	James River	13,621
VC2-S-AP2	Catawba Victory	James River	11,330
Seatrain	Washington	Beaumont	19,825
Seatrain	Maine	Phase I & II	19,825
Seatrain	Puerto Rico	Phase I & II	19,825

Table 4

Ready Reserve Force as of 30 June 1978

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Program Considerations (2:23)

**Measurement tons

The Seatrain, with its wide hatches and unobstructed deck space, is ideally suited for the transportation of unit equipment.[5] The current policy is to maintain a ship mix with a lift capacity of 340,000 measurement tons (M/T) which is the approximate equivalent of the lift capacity of 30 Victory ships. (2:24) A sample ship mix is indicated in Table 5.

TYPE	NUMBER	LIFT CAPACITY**
VC-2	1	11,330
C-3	4	54,484
Seatrain	9	178,425
C-4	6	103,218
TOTAL	20	347,457

Table 5

Sample RRF Ship Mix

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Program Considerations (2:24)

**Measurement tons

At present, the future prospects (see Table 6) of the RRF are dependent on the number of C-4 Mariner-class ships traded in to the NDRF. By the end of fiscal year 1978 the RRF will have a minimum strength of 13 ships but it may have as many as 17 due to the increased C-4 turn-in rate that MARAD is experiencing. (14,15) The MARAD C-4 anticipated turn-in rate for fiscal years 1978 through 1982 is indicated in Table 7.

---

[5]Unit equipment: Organic equipment which is assigned to an Army, Navy, or Marine Corps unit, i.e. armored vehicles, trucks, small artillery, helicopters, M-60 tank, etc.

FISCAL YEAR	'77	'78	'79	'80
Seatrain	2	4	7	9
Victory	1	1	1	1
C-3	5	5	5	4
C-4	0	3	6	11
TOTAL	8	13	19	25

Table 6

Expected RRF Composition, FY 77-FY 80

*Source: MSC, "Development of the Ready Reserve Force", Background, No. 78-9, 1 June 1978

F. NDRF IMPLEMENTATION PROCEDURES

Prior to the actual breakout of ships from the NDRF, several administrative decisions must be made by cognizant activities within the Departments of Navy and Commerce to insure activation is warranted. The necessary conditions and procedures for reserve fleet utilization are specified in the following documents:

1) Section 11, Merchant Ship Sales Act of 1946 and Section 902, Merchant Marine Act of 1936;
2) 1954 Memorandum of Agreement between the Department of Commerce (DOC) and the Department of Defense (DOD), often referred to as the Wilson-Weeks Agreement; and
3) 1967 Memorandum of Agreement between MSC and MARAD.

(2:15) Sections 11 and 902 of the Merchant Ship Sales

FISCAL YEAR	NUMBER EXPECTED	SPECIFIC MARINERS
FY 78	0	Export Diplomat
FY 79	5	Export Democracy Iberville John B. Waterman John Tyler
FY 80	5	Arthur Middleton Carter Braxton George Walton Joseph P. Hewes Samuel Chase
FY 81	3	Export Defender Austral Pilgrim Thomas Jefferson
FY 82	3	John Penn Lyman Hall Thomas Lynch

Table 7

MARAD Projection of C-4 Mariner Trade-Ins, FY 78 - FY 82

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Program Considerations (2:24)

Act of 1946 and the Merchant Marine Act of 1936, respectively, provide the basic authority to withdraw ships from the NDRF but only under conditions where the threat of government requisitioning of commercial shipping exists. The pertinent passage of Section 11 reads in part:

> 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, as amended. (16:93)

Additionally, Section 902 stipulates the following:

> Whenever the President shall proclaim that the security of the national defense makes it advisable or during a national emergency declared by proclamation of the President, it shall be lawful for the commission to requisition ... (16:132) .

Thus, a necessary condition prior to activation of the NDRF is that the threat of requisitioning exists. However, the authority to requisition can only be granted by the President when the national security is threatened or when a state of national emergency is proclaimed.

The Wilson-Weeks Agreement, negotiated approximately 24 years ago, is a long-standing document whose basic purpose was (and is) to overcome maritime industry fears of government competition. Its principal features are the recognition of the need for an MSC controlled fleet (formerly MSTS) and the establishment of priorities for the acquisition of sealift assets and services. Specifically it states:

> The Department of Defense and Department of Commerce agree it is essential that the Department of Defense have under its exclusive custody, jurisdiction, and control, at all times, a nucleus fleet of size and composition to meet current conditions and requirements.
> All merchant shipping required by the Department of Defense, in addition to that provided by MSTS nucleus fleet, will be obtained, consistent with military requirements and prudent management, in the following order of priority:
> 1) maximum utilization of available U.S. flag berth space;
> 2) time or voyage charter of suitable privately-owned U.S. flag merchant ships to the extent these are voluntarily made available by the maritime industry. Such time or voyage charters will be kept to the minimum necessary to meet requirements which foresight indicates cannot be met by U.S. flag berth operators;
> 3) shipping provided by National Shipping Authority under General Agency Agreement or other arrangement; or
> 4) in the event suitable U.S. flag shipping is not available under conditions stated above, the Military Sea Transportation Service may employ foreign flag shipping only to the extent necessary to meet urgent military requirements. (1:67)

In summary, only after the MSC-controlled fleet, U.S. charters, and berth shipping have been determined to be inadequate in terms of response time or ship availability, can the NDRF be activated to provide the necessary capability. (2:15)

Once a decision has been reached to augment sealift with reserve ships, the subsequent implementation steps are outlined in the 1967 MSC-MARAD Memo of Agreement as follows:

> Upon receipt of an MSC written request for activation of ships, MARAD will submit to MSC for review an estimate of the total cost of such activation based on the best information available having due regard to the advanced age of the ships. If required by MSC, the ships will be taken from the fleet for the purpose of drydocking, opening up, and performing a complete survey to more accurately prepare the estimates of cost for activation. All costs incident to this survey will be reimbursed by MSC.

> MSC acceptance of such estimates and a written citation of funds to MARAD will constitute authority for MARAD to proceed with the activation or deactivation.

A summary of the administrative decision process prior to NDRF activation is illustrated in Figure 7. A cursory examination of Figure 7 will reveal that one factor in determining NDRF responsiveness is the time spent by respective agencies (MSC, MARAD, etc.) in the decision process prior to actual activation.

The basic prerequisites for activation of the NDRF, as discussed above, also hold true for the RRF with the exception of the procedures outlined in the 1967 Agreement. In its place, a separate 1976 Memorandum of Agreement between the Department of the Navy and the Department of Commerce, covering the RRF exclusively, sets forth the authority and procedures for activation. Basically, once the decision to employ reserve assets has been reached, the authority to initiate an RRF callup rests with the Commander, Military Sealift Command (COMSC). Acting as executive agent for the Chief of Naval Operations (CNO), COMSC determines the ship mix required and the time frame for RRF deployment. This decision, however, is subject to concurrence by the Assistant Secretary of the Navy (Installations and Logistics) and the Assistant Secretary of Commerce for Maritime Affairs. (12:1)

G. SUMMARY

The NDRF, under the care of MARAD, has proven to be a valuable asset to this nation on numerous occasions. Through the decades of the 1950's and 1960's, this fleet provided the

NDRF Activation Procedures

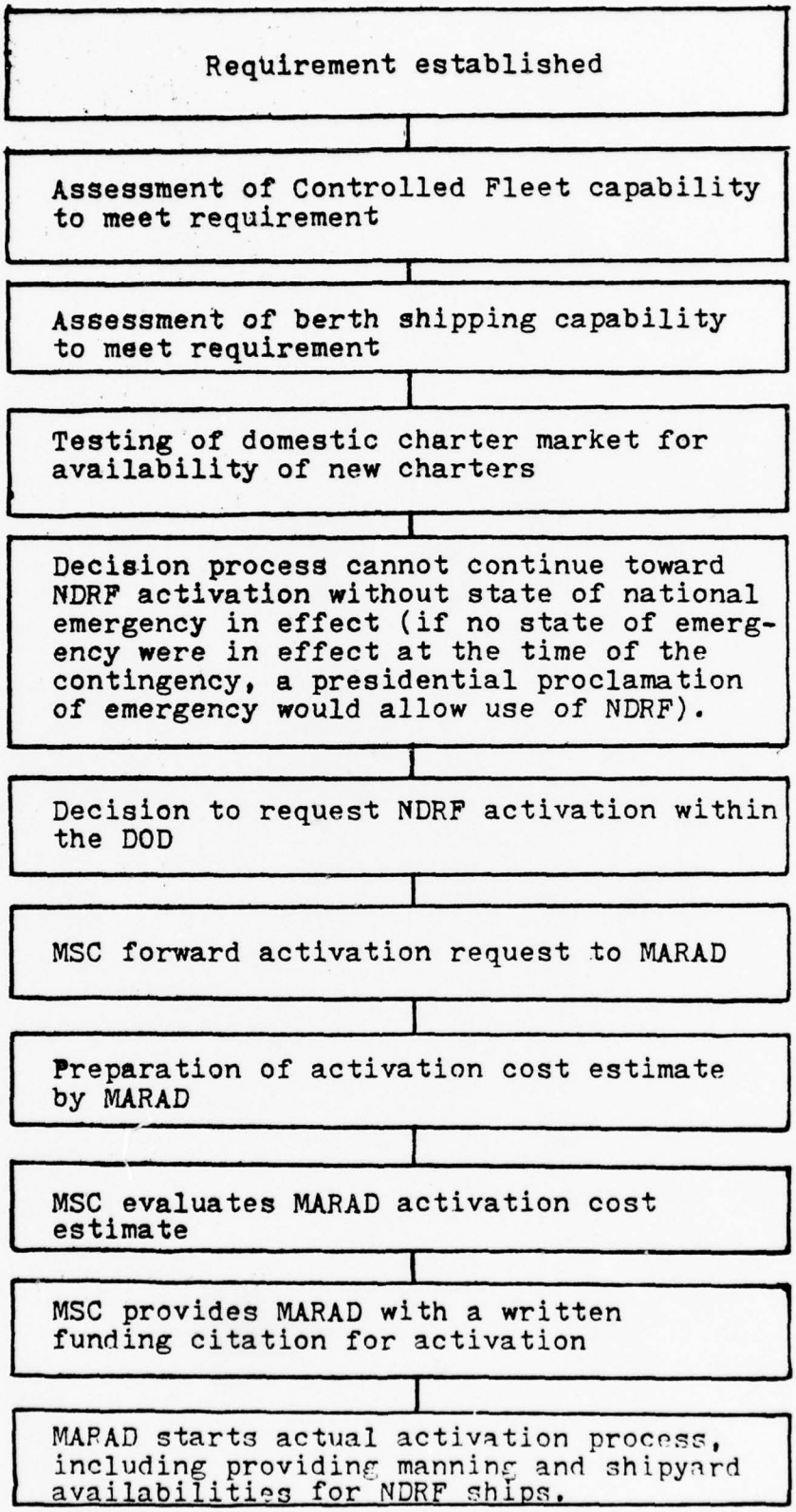


FIGURE 7

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Program Considerations

needed reserve capacity to logistically support U.S. troops in two limited wars and to supplement world shipping when shortages arose. However, with the coming of the 1970's, the excessive age of these ships had many sealift planners speculating as to their future usefulness.

Until an ultimate solution could be devised, MARAD proposed that a Ready Reserve Force be established within the NDRF. Its main purpose was to counteract the lengthy activation period of the aging Victories by providing a small group of general cargo ships which would be maintained in class, certified, and ready for immediate callup. Currently, of the 147 ships in the NDRF which are the nucleus of this nation's sealift capability, only nine have the potential to be activated in less than ten days. By fiscal year 1980, it is expected these nine will be expanded to 25.

The administrative procedures for the activation of the NDRF, as currently established in Public Law and Memorandum of Agreement, are specifically designed to ensure that there is no government competition with the maritime industry with regard to shipping services. Unfortunately, due to the specific nature of the prerequisites, these procedures impede responsiveness.

III. EXAMINATION OF THE CONSTRAINTS ON NDRF ACTIVATION

A. INTRODUCTION

The purpose of this chapter is to examine the major constraints which would preclude the timely activation and utilization of the NDRF in a less-than-full mobilization environment. Excessive age, time-consuming repairs, non-availability of spare parts, crew shortages, are just some of the problem areas which could potentially hinder a large scale breakout of ships from the reserve fleet.

As was discussed in the previous chapter, the establishment of a Ready Reserve Force within the NDRF has done much to insure a sealift capability responsive to a fast-breaking contingency situation. However, this in no way diminishes the role or importance of the reserve fleet as a source of surge shipping capacity. In fact, the establishment of a concept such as the RRF is an admission that the reserve fleet, still a heavily relied upon asset, is limited in its response capability. Essentially, the RRF, by eliminating many of the constraints on rapid activation, serves as a stop-gap measure to minimize the effect on this nation's strategic mobility of a slowly responding reserve fleet.

Prior to undertaking a discussion of the various aspects which would serve as obstacles to the breakout of a large number of reserve ships, it will be of advantage to describe the problems experienced during the Korean and Vietnam activations. The delays experienced during these operations provide

a good indication of what can be expected in the future.

B. KOREAN AND VIETNAM ACTIVATION EXPERIENCE

1. Korea: The first activation of the WWII NDRF was in support of military operations in Korea. From mid-March through December 1951, the National Shipping Authority (NSA) authorized the withdrawal of 443 ships from the various reserve sites to facilitate the return of U.S. liner ships from military support roles to their peacetime trade routes. The limited amount of service these reserve ships had experienced during the latter stages of World War II and their brief layup period in the reserve fleet enabled the NSA to place the majority of them on loading berth within five to seven days. (11:2)

Although a slight amount of repair was necessary during the reactivation process, in general the hull, machinery, deck gear, and spare parts on board each reserve ship were adequate for the task at hand. Replacement parts, if not available within the reserve fleet itself, were still available from the original suppliers. (11:2) Considering these factors, the total cost of bringing 443 reserve ships to operating status was only $60 million, or an average of $135,000 per ship in current dollars. (9:7)

The major problem that arose during the initial reactivation process was that with the advent of the Korean conflict, total seagoing billet requirements took a sharp rise from 57,000 in June 1950 to 87,000 in June 1951. (11:2) This increase of 53 percent over the span of a year made seagoing

manpower a particularly acute issue and delayed the sailing of numerous reserve ships. The cyclical employment pattern inherent in the merchant marine combined with the high wages and good job opportunities then existing ashore made it difficult to recruit experienced seamen. As a result, the reactivation process was hampered by shortages of skilled personnel, particularly licensed engineers, radio operators, and able-bodied seamen. (9:7)

During the second quarter of 1952, the number of reserve ships in service decreased rapidly to 183. As the demand for additional shipping subsided, these ships were returned to reserve fleet sites at an average layup cost of $19,000 per ship. (9:7)

In summary, it is clear that the relative youth of the NDRF (average ship age less than ten years) played a vital part in its speedy reactivation and availability during the Korean conflict.

2. Vietnam: Reactivation of ships from the reserve fleet for Vietnam operations was initiated on 16 July 1965 upon request by the Department of Defense; specifically, DOD requested MARAD to activate and place in operation as soon as possible 14 Victory-class ships. By October 1966, 172 reserve ships had been broken out, repaired, refitted, and assigned to 40 general agents for operation; this constituted 93 percent of the total number of General Agency Agreement (GAA) ships in service during military operations in Southeast Asia. (11:2)

The ships laid up in the reserve fleets had been maintained during the period between Korea and Vietnam under a program of contact preservation (i.e. various preservation coatings applied to the interior and exterior surfaces of the ships). This preservation method along with a general neglect during the interim period accounted for most of the problems during initial reactivation phases. The major problem areas included increased activation times, reduced ship reliability, increased activation and repair costs, a shortage of repair yard capability, and crew shortages. (9:8)

The average activation time for the first 14 ships withdrawn from the reserve fleet was 21 days. Due to the DOD request to reduce the time factor involved, shipyard work was accomplished on an around-the-clock basis, numerous shortcuts consistent with safety were taken, and sea trials were eliminated (since most ships came from Atlantic and Gulf fleets, the voyages to the Pacific Coast were used as a shake-down period). However, the average activation time for the next 37 ships withdrawn was considerably greater -- 42 days. This sizable increase was due in part to extended shipyard periods necessitated by the generally degraded condition of the ships and the corresponding greater amount of repair work required to put them in operation. Another contributing factor to increased response time was repair yard capability. Although, for the most part, capability in the United States to repair and reactivate the required reserve ships in an orderly manner was adequate,

there were several instances of repair yard backlogs which delayed ship activations. Table 8 provides activation dates for the first 101 reserve ships withdrawn for Vietnam service. In December 1965, due to mounting costs, DOD requested that further breakout of reserve ships be accomplished on a least-cost basis. This required that shipyard time be further extended to eliminate as much overtime and shift differentials as possible. Thus, as can be seen in Table 8, activation of over half of the authorized reserve ships, which occurred in fiscal year 1966, averaged two months per ship, a period which was considerably longer than initially envisioned. (9:8)

ACTIVATION FLIGHT NO.	NUMBER OF SHIPS	AVERAGE DATE PLACED IN SHIPYARD	AVERAGE DATE ON BERTH	AVERAGE DAYS IN SHIPYARD
1	14	7-17-65	8-7-65	21
2	8	8-17-65	9-27-65	41
3	28	8-28-65	10-10-65	43
4	1	10-19-65	11-21-65	31
5	25	12-15-65	2-6-66	53
6	6	2-7-66	4-15-66	67
7	6	3-12-66	5-15-66	64
8	6	4-12-66	6-15-66	64
9	7	5-12-66	7-15-66	64

TABLE 8

ACTIVATION PERIODS OF 101 NDRF SHIPS

*Source: U.S. Department of Commerce, Ready Reserve Fleet Plan (9:42)

Contrary to what was indicated in the previous paragraph, closely associated with extended shipyard periods were higher activation costs. The total activation cost through April 1966

amounted to $33 million (see Figure 8 for cumulative nine-month activation cost). The average activation cost was approximately $421,000 per ship (for the 79 ships activated by April 1966. Additionally, the average cost for stores, fitting out, GAA fee, etc., was $70,000 per ship for the same time period. (17:49-52) Thus, each ship that was broken out for service cost the government approximately $491,000 through April 1966. Although this sum seems quite acceptable today, in 1966 it was a source of considerable concern to both MARAD and DOD. (18:682) A summary of monthly activation rates and associated costs (July 1965-April 1966) is presented in Figure 9.

Ship reliability also proved to be of concern, especially during the initial three months of operation. Of the 51 ships activated in 1965, approximately 70 percent experienced mechanical problems of one form or another resulting in lost time averaging ten days per ship by 17 March 1966. (9:8) The items that caused most of the breakdowns and corresponding delays are indicated in Table 9. Notwithstanding the high percentage of early breakdowns, over the long run the majority of the reactivated ships performed in an adequate manner. Based upon the operating statistics of 68 ships in service from 17 July 1965 to 1 February 1966, out-of-service time amounted to 4.75 percent as compared to about 3.5 percent under normal (regular berth-line) operations. (9:9)

Aside from delays and out-of-service time due to repairs and breakdowns, there were also numerous delayed sailings due to crew shortages. Essentially, the same problem eixsted in

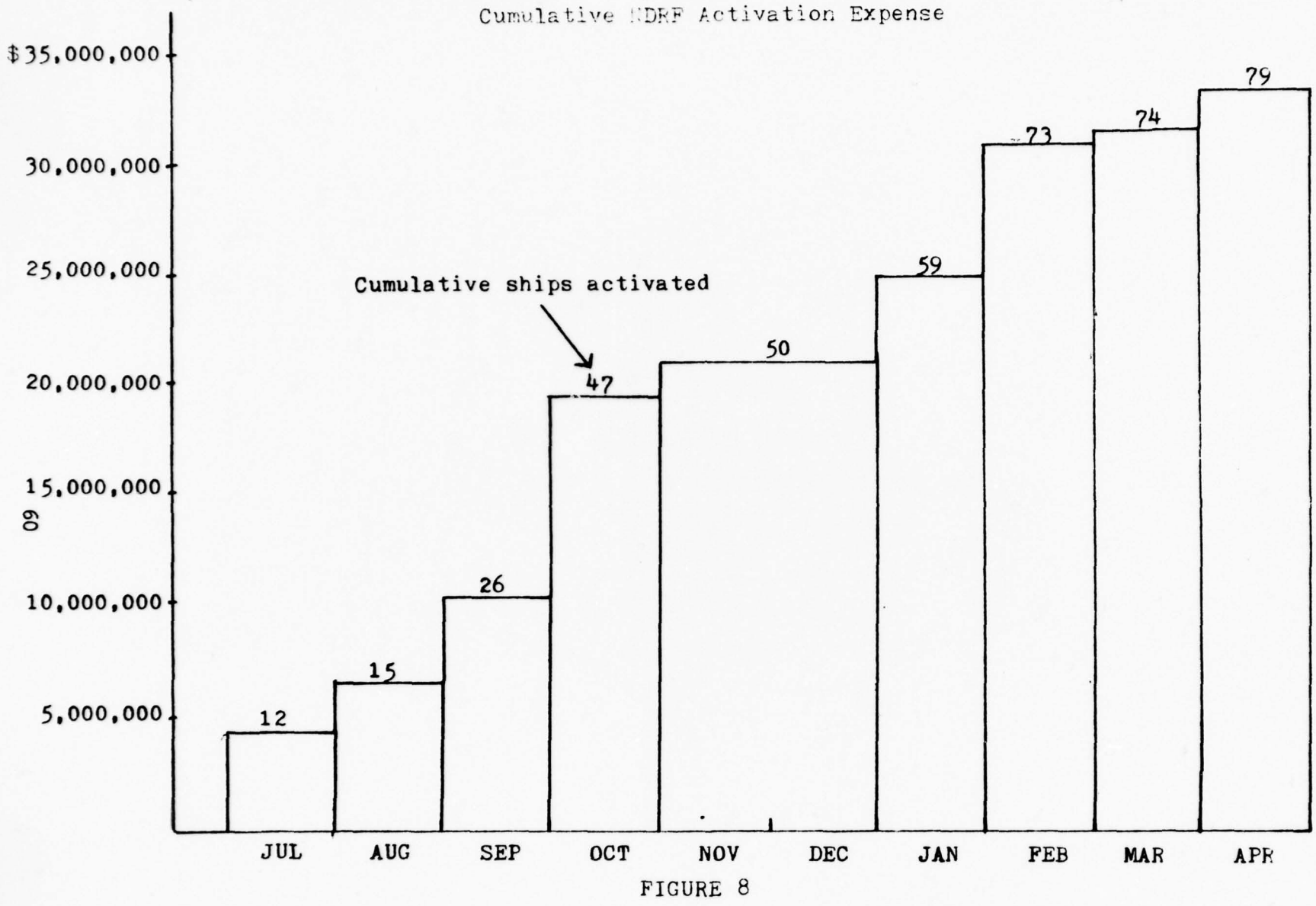


FIGURE 8

*Source: CNO Report, Sealift Requirements Study - Preliminary Report of Phase I, 1967

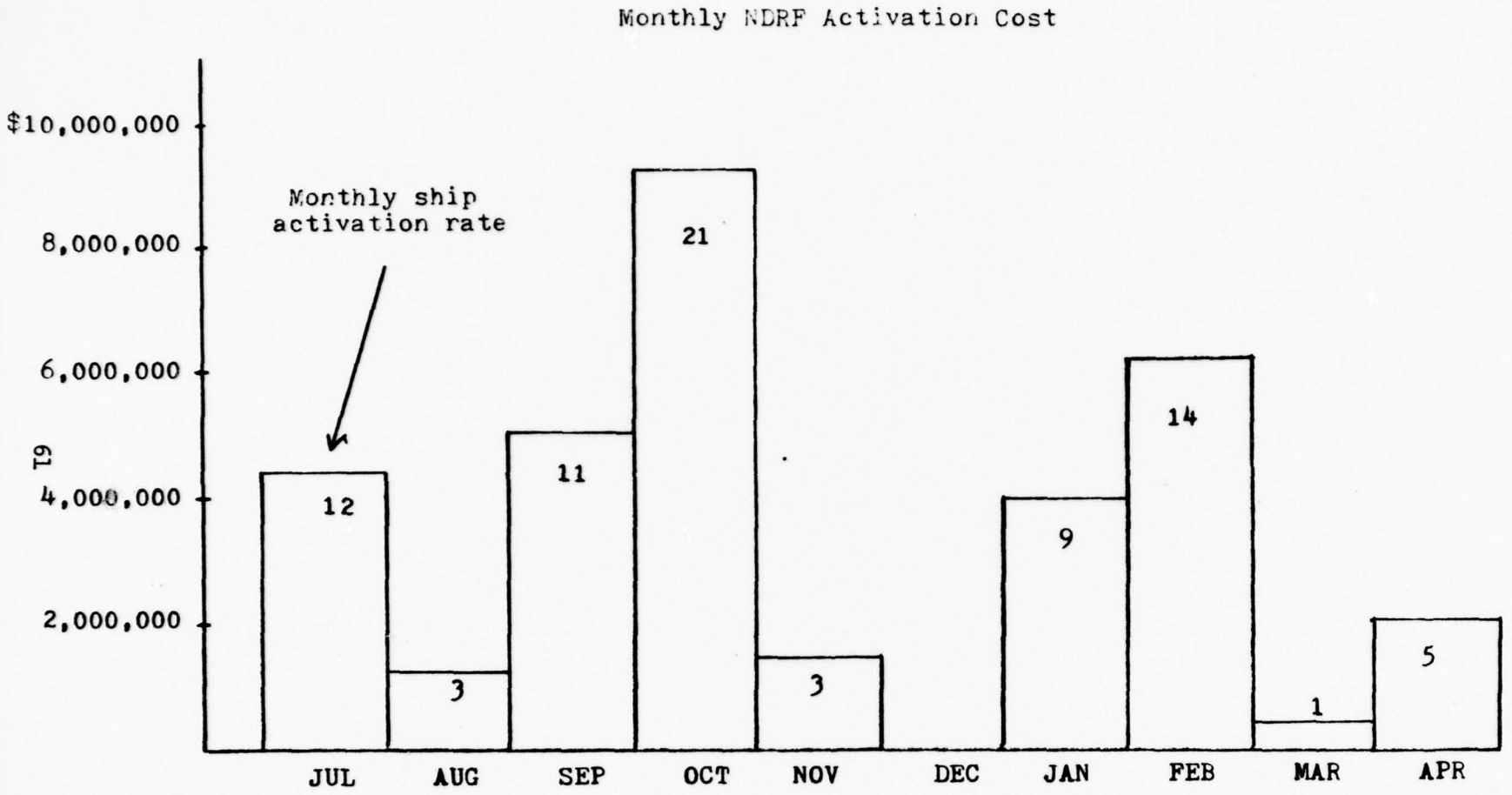


FIGURE 9

*Source: CNO Report, Sealift Requirements Study - Preliminary Report of Phase I, 1967

BREAKDOWN AREAS	SPECIFIC ITEMS CAUSING DELAYS
Boilers	Tubing leaks, bottom blow valve spool, header, boiler water testing line, soot blower, level indicators
Condensers	Tubes leaking
Electrical Systems	Turbo generators, emergency diesel generators, control panels, starting motors, fan motors
Fresh Water Evaporators	Tubing
Pumps	Turbine feed pump, fuel oil pump, feed pump governors, sanitary pumps, main condensate pump motors, main circulatory pumps
Main Engines	Turbines, reduction gears, throttles
Refrigeration	Domestic reefer boxes, main refrigeration system
Piping	Salt water lines
Electronic Systems	Radars, radios, echo sounders
Miscellaneous	Telemotors, topping lifts, winch controls, winch armature, lifeboat winches, anchor windless motors

TABLE 9

MAJOR PROBLEM AREAS CAUSING INITIAL BREAKDOWNS

*Source: U.S. Department of Commerce, Ready Reserve Fleet Plan (9:9)

1965 and early 1966 that existed during the beginning of the Korean War. The large increase in demand for seagoing manpower far exceeded readily available assets. Table 10 illustrates the effect this had on sealift support of Vietnam during the years 1966 through 1968. Both MARAD and MSC sponsored massive recruiting campaigns designed to rapidly build up the seagoing workforce. Unfortunately, due to the time required to train qualified personnel and the lack of skills in critical areas (engineers, deck officers, radiomen), many ships had to sail shorthanded or to delay sailing. (See Table 11) (9:9)

YEAR	SAILINGS	NUMBER OF SAILINGS DELAYED	PERCENT OF SAILINGS DELAYED	DAYS DELAYED
1966	323	160	50	548
1967	563	245	44	833
1968	519	187	36	829
TOTAL	1,405	592	42	2,210

TABLE 10

SHIP SAILINGS DELAYED IN VIETNAM

USE DUE TO CREW SHORTAGES

*Source: CNO Report, Sealift Requirements Study, Third Progress Report, p. 36, December 1967

As can be surmised from the age of the ships and the number of early breakdowns, maintenance and repair costs were significant. Appendix E depicts the number of casualties and

DATE	TOTAL MONTHLY SAILINGS	SHORTHANDED COMPLEMENTS				
		LICENSED OFFICERS		UNLICENSED (SKILLED)		
		DECK	ENG	DECK	ENG	STWD
1966 JAN	8	-	3	-	-	-
FEB	27	5	9	-	1	-
MAR	31	6	27	-	-	-
APR	10	4	10	-	-	1
MAY	25	36	35	2	2	-
JUN	22	9	25	-	-	-
JUL	22	18	35	-	4	1
AUG	28	36	49	11	13	1
SEP	36	32	44	4	14	1
OCT	41	29	33	6	4	-
NOV	41	26	41	5	8	2
DEC	32	25	35	1	2	-
1967 JAN	46	38	62	3	14	1
FEB	30	22	38	2	6	1
MAR	50	9	11	2	7	-
APR	59	34	41	4	3	4
MAY	58	23	37	10	12	1
JUN	43	15	22	3	5	1

TABLE 11

SHORTHANDED COMPLEMENTS
FROM JANUARY 1966 TO JUNE 1967

*Source: CNO Report, Sealift Requirements Study, Third Progress Report, p. 34, December 1967

associated repair costs experienced by the first 47 GAA ships to be reactivated and put in service. From 1965 through 1970, the cost of keeping the reserve ships operating totaled nearly $85 million, or an average of approximately $445 per voyage day.[6] A summary of the number of voyage days, total maintenance and repair costs, and average cost per voyage day per ship for each year during the Vietnam conflict is illustrated in Table 12. As the data illustrate, the ships were most active in 1967 and 1968, with the total number of sailings declining rapidly as military activities slowed. Considering the whole six-year period, the average cost for each NDRF ship can be broken down as follows: (9:9)

Reactivation	$476,937
Maintenance and repair	490,984
Deactivation	45,392
TOTAL	$1,013,313 per ship

In 1970, when the last GAA ship was finally returned to the reserve fleet, a total of 190,909 voyage days of service had been provided. Of the 1972 ships reactivated, only 122 were retained for preservation. The rest were scrapped. (9:8)

In summary, although the NDRF performed satisfactorily during the Vietnam conflict, the material condition and general responsiveness of the fleet was far below the standards that prevailed during the Korean War. This was to be expected if for no other reason than that the ships had aged during the interwar period.

---

[6]Voyage days - the total days spent at sea between ports. Time commences at port departure and ends at port arrival.

YEAR	TOTAL VOYAGE DAYS OPERATION	TOTAL M & R COST	M & R COST PER VOYAGE DAY
1965	1,697	379,664	223
1966	34,135	15,049,402	441
1967	66,064	30,960,248	468
1968	51,503	21,016,082	408
1969	29,914	15,100,154	505
1970	7,596	2,434,381	320
TOTAL	190,909	$84,940,261	$445 **

TABLE 12

GENERAL AGENCY AGREEMENT VESSEL MAINTENANCE AND REPAIR COSTS IN SOUTHEAST ASIA PROGRAM

**One major U.S. operator indicated this as reasonable for ships of that age brought into service under emergency reactivation procedures. MSC also advised that its Victory ships operating during the same period experienced approximately the same average M & R costs per voyage day.

* Source: U.S. Department of Commerce, Ready Reserve Fleet Plan, (9:43)

C. MATERIAL CONDITION OF RESERVE SHIPS

As can be surmised from its history, the consideration which is the most fundamental to activation of the NDRF is the material condition of the ships themselves. Upon this condition depend two closely associated areas, cost and responsiveness, each of which could prove prohibitive to future reserve fleet utilization. Despite the fact that the majority of the ships in the NDRF have reached an unprecedented age, due to their limited active service life and major upgrading during Southeast Asia operations they are considered by many officials to represent significant future service capability. However, how long these ships can be maintained, under the present reserve fleet preservation program, in a state conducive to reactivation is an unknown factor. Excluding the nine ships dedicated to the RRF, there are now 137 ships (130 Victories, 7 Seatrains) whose material condition is a source of keen DOD and Congressional interest. (10:1)

The MARAD preservation program is predicated upon two principles: 1) preservation of those ships considered necessary for retention in the same condition as when last deactivated, and 2) disposal of those ships considered unnecessary. To keep abreast of current fleet conditions and to document preservation efforts, the MARAD regional offices maintain survey and ship condition records for each ship on their retention lists. These files contain among other information:

1) American Bureau of Shipping records and requirements;
2) audio gauge readings of the hull steel thickness; and
3) surveys performed by MARAD personnel. (9:1,13)

Appendix F provides a summary of pertinent data (last drydock period, outstanding work items, etc.) taken from the above records on each of the 130 Victory ships presently in the NDRF.

All ships designated for retention are maintained under a dehumidification/cathodic protection process which is far more effective than the contact preservation method. This latter process, which was used exclusively prior to 1970, consisted of coating vital machinery and exposed metal surfaces with special oil, grease, and other contact materials designed to arrest corrosion.

However, it was discovered during Vietnam reactivation that these coatings slowly hardened and proved very costly and time-consuming to remove. (9:14) Dehumidification preservation, on the other hand, is a method by which certain portions of the ship's interior are tightly sealed to prevent the entry of moisture. Specialized equipment is installed to lower the relative humidity and maintain it within the 35 to 40 percent range. Within this dry atmosphere, corrosion and deterioration of equipment is severely retarded.

Additionally, the underwater portion of each retention ship is protected by a unitized cathodic grid through which an electric current is applied. The electricity passing through the water to the steel hull renders it inert and highly resistant to oxidization. (13:4)

According to cognizant MARAD officials, the present preservation program has been highly effective in maintaining reserve fleet ships in good condition. (19) To substantiate this claim,

MARAD has often referred to various walk-through surveys conducted by joint MSC/MARAD teams over the past few years.[7] In general, these survey findings indicated that the dehumidification process is efficient and suitable to maintain a ship's interior envelope in a satisfactory state of preservation. Additionally, the electro-cathodic protection system appears to be giving excellent results insofar as minimizing underwater hull deterioration. (20:2, 9:14) However, this is not to say that all 137 retention ships in the NDRF are in a high state of repair or preservation for such is definitely not the case. It only means that the preservation program utilized is effective in maintaining the superstructure, hull, and interior of a Victory (or Seatrain) class ship in the same condition as when delivered for layup.

The findings of the 5 April 1976 inspection report on the material condition of the ships of the James River Fleet indicated that although most major interior and exterior portions of the surveyed ships were in satisfactory condition, there were numerous secondary areas open to question. For instance, the report stated that there was "every reason to believe from examination that most if not all of the deck electrical wiring would have to be replaced." (20:2) Also, since present

---

[7]These surveys, the majority of which were conducted from December 1975 through April 1976 for the purpose of selecting 30 Victory ships for the RRF, were cursory in nature and generally did not employ any elaborate destructive/non-destructive test methods; the utilization of which might have revealed defects not apparent to the naked eye.

preservation methods require that major shipboard systems be disconnected, much of this equipment and machinery had not been operated or tested in at least eight years and as such its status was unknown. Additional problem areas that were pointed out concerned galley and messrooms, crew quarters, electronic equipment, lifeboats, cargo handling gear, generators, reefers, flaking paint, and deck deterioration. (20:1-5) The report also noted for future planning purposes that the majority of these ships would cost between $1.8 and 2.0 million and require 60 to 70 days in a repair yard (per ship) for reactivation for emergency use. (20:5)

A similar inspection conducted on 15 April 1976 with the specific purpose of examining the material condition of the ten Seatrain ships moored in the James River fleet revealed that most of these ships had been laid up without repairs (deactivation was accomplished without even cleaning the boiler firesides in some cases). Three of these ships (Georgia, Delaware, and San Juan) were determined to have little potential for further use because of their lesser military cargo capability, age, and interferences on deck.[8] The remaining seven ships were in various states of preservation but were deemed to have high potential. (21:1-2) The Seatrain Florida, for example, was judged to be an extremely good prospect for

---

[8]These vessels for the most part were not fitted with cranes (not self-sustaining), lacked an overhead spardeck, needed repairs, and had main decks cluttered with container supports and open tracks.

reactivation but it was in poor condition due to the deterioration beyond tolerable limits of decks, hull, and topside equipment. (21:9) Additionally, it was estimated that reactivation cost for the seven ships considered to have breakout potential would be between $1.5 and 1.8 million per ship (barring any unanticipated heavy machinery repairs and extensive steel renewals) and would take approximately 65 to 70 days. (21:2)

Although the ships in the NDRF are not sinking at their moorings due to corrosion and deterioration, neither are they being maintained in a state conducive to rapid and economical reactivation. The primary reason for this is MARAD's preservation program. This is evidenced by a noticeable lack of facilities, equipment, and personnel to perform even minor repair work to maintain reserve fleet ships. Essentially, once a ship is deactivated, laid up, and the proper preservation equipment installed, the major tasks of reserve site personnel are those of providing security and caretaker service. Aside from touring the ships periodically to insure that equipment is functioning within limits and applying a new coat of paint every two years, active inspection and preservation is negligible.

Although the ships are supposedly maintained in a manner which will preserve them "as is" for an indefinite period, without scheduled inspections, testing of machinery, electrical circuits, and equipment, and corrective maintenance where needed, deterioration beginning in secondary areas and eventually spreading to primary areas is inevitable. This is especially true considering the age of the Victory ships within the fleet.

Although it was known that as these veterans aged they would require more and more attention to assure continuation of their response capability, such has not been the case. For better or worse, these ships receive the same attention today (or lack of it) that they received ten years ago.

The deterioration in the reserve fleet's material condition has also been hastened by a pronounced lack of budgetary emphasis by MARAD. As indicated briefly in Chapter II (Table 1, page 31), the reserve fleet allocations over the past eight years have been consistently less than one percent of the total MARAD budget. This percentage provides an indication of the priority afforded the reserve fleet in the allocation of resources. With the increasing age of the Victory ships and concomitant increasing maintenance costs on the one hand and the decreasing value of the dollar on the other, holding reserve fleet funding constant has had an adverse effect on the material condition of the NDRF.

Tasked by law with preserving the NDRF under the constraints of an inadequate budget, the regional offices have been forced to make several cutbacks in the area of reserve site personnel, service, and facilities. This had made the accomplishment of normal preservation work an extremely difficult effort. Consequently, the material condition of the reserve ships has been degraded in several areas.

In short, lack of proper funding has fostered a passive preservation program in which reserve fleet ships have not been maintained in a material condition conducive to timely

activation, and unwarranted emphasis has been placed on scrapping ships considered too costly to preserve.

D. REGULATORY CONSIDERATIONS UPON ACTIVATION

An important consideration upon activation of the NDRF will be compliance with the various rules, regulations, and standards which govern U.S. maritime operations. Since deactivation of the fleet in 1970, many federal requirements have changed and new, more stringent statutory regulations have been enacted. However, in keeping with MARAD policy, there has basically been no corresponding upgrading within the reserve fleet. In fact, due to the discontinuance of the periodic inspections and surveys required by the various maritime regulatory agencies, certain essential qualifications have lapsed. Thus, unless waivers are granted in large numbers, the time to activate the NDRF will be lengthened by the time necessary to bring the ships into compliance with current standards.

With respect to the foregoing, the three organizations which would have the most effect upon the activation of the reserve fleet are the U.S. Coast Guard, the American Bureau of Shipping, and the Federal Communications Commission. Other agencies such as the Public Health Service would play important but less significant roles. (9:16) These agencies, their regulations, and their impact upon the NDRF are examined in this section.

The United States Coast Guard (USCG) is the principal maritime law enforcement agency of the Federal Government. As such, its general areas of responsibility, as covered in the Code of

Federal Regulations (CFR) under Titles 33, 46, and 49, basically entail ensuring that U.S. merchant ships can be safely operated in the service and routes indicated and that subject ships comply with all applicable laws, rules, and regulations.

To accomplish its mission, the Coast Guard has established various compulsory inspection and survey requirements (indicated in Table 13). The principal inspection, the inspection for certification, consists of a visual as well as of an operational examination of hull, machinery, lifesaving equipment, fire mains, pollution prevention devices, and sanitation equipment. Once this inspection has been accomplished and all noted discrepancies satisfactorily corrected, a certificate of inspection is issued by the cognizant Officer in Charge of Marine Inspection. This certification by the Coast Guard's Office of Merchant Safety is a mandatory requirement for all large U.S. merchant ships. Additional Coast Guard inspections that are required to be carried out at periodic intervals include drydocking, tailshaft withdrawal, and an operational survey of cargo loading gear. (9:53,22:1)

Concerning the NDRF, compliance with the Coast Guard inspection requirements, although time consuming and costly, would require no major engineering changes. Noteworthy exceptions, however, are the recent oil pollution prevention and marine sanitation regulations (33 CFR 151-159). These regulations impact heavily upon the Victory ships of the reserve fleet since these ships were constructed before increased emphasis was placed on environmental protection standards and they are

TYPE OF INSPECTION	INTERVAL OF INSPECTION	COMMENTS
Boiler/steampiping hydrostatic tests	4 yrs.	
Inspection for certification	2 yrs.	
Reinspection or annual	10 to 14 mos. after certification	General visual check on inspection for certification
Dry docking	2 yrs.	Permits extension of docking intervals based on special circumstances, ie., operation in fresh water, ship lay-up, special coatings, impressed current hull protection, etc.
Tail shaft withdrawal	3 yrs.	Can be extended under special circumstances but not more than one additional year
Cargo gear	4 yrs.	Requires complete cargo gear load test with winches, also proof tests of equipment. USCG requires annual check for condition and suitability.

TABLE 13

U.S. COAST GUARD INSPECTION REQUIREMENTS

*Source: U.S. Department of Commerce, Ready Reserve Fleet Plan (9:53)

not equipped to meet present standards. (9:21)

Although the Coast Guard may still issue a certificate of inspection to a ship that is not in compliance with the pollution control regulations (provided a notice of Merchant Marine inspection requirements is issued and a waiver is requested and granted), the owners of the ship are not relieved of any liability regarding the dumping of oil or sewage. (22:2) Accordingly, even though strict compliance is not essential to NDRF breakout, serious consideration must be given to the cost consequences of these regulations if extended use of reserve ships is contemplated to support a contingency operation.

The federal oil pollution regulations, listed under Title 33 CFR, Sections 151-158, state that all ships constructed prior to 1 July 1974 and operating within United States territorial waters are required to have:

1) Capacity to retain on board all oily waste and bilge slops that may accumulate while operating in the navigable waters or contingeous zones.
2) For fuel discharge containment:
   a) a fixed container or enclosed deck area of at least two-barrels capacity under and around each fuel tank vent, overflow and fill pipe; or
   b) a portable container at least 18 inches deep which has at least a 5-gallon capacity under each fuel tank vent, overflow and fill pipe; or
   c) a flush deck fitting which is serviced by an automatic back pressure shut off nozzle.
3) At least one pump installed to discharge oily bilge slops or ballast through fixed pipe system which shall have at least one standard discharge outlet on each side of the weatherdeck.
4) Each such outlet will have a shore connection or the vessel will have at least one portable adapter that fits the outlets.
5) A means on the weatherdeck near the discharge to stop each pump used to discharge oily waste and a stop valve installed at each outlet.

6) A placard that states: The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and contingeous zone of the United States if such discharge causes a film or sheen upon or discoloration of, the surface of the water, or causes a sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of $5,000. (9:21)

However, these provisions are not applicable to any ship which has a means to process oily bilge water which is acceptable to the Coast Guard. Unfortunately, there is no acceptable unit or process which can accommodate the large quantities anticipated. Even if such a system were available, it would be extremely expensive to install on a Victory ship. (9:22)

To meet the requirements of the oil pollution regulations, the only means of compliance available for Victory ships is the installation of a holding tank and pumping system. This method was investigated by MARAD in 1976 with regard to the inclusion of Victory ships in the RRF. It was determined that the requirements could be most expediently satisfied by converting the Victory's fuel and ballast center inner bottom tank No. 3 for utilization as an oil and bilge slop tank. This solution was considered viable in view of the fact that the No. 3 tank has a 160-ton capacity which is only approximately six percent of a Victory ship's total fuel capacity (2,880 tons) and thus would have a minimum downgrading effect on the ship's maximum cruising radius.

Further, it was indicated that the waste could be pumped via a cross connection with a stop valve between the bilge and ballast pump and the fuel oil transfer pump and then pumped

ashore through the main deck fuel fitting connections. The only new installations required would be the shore connections, deck fittings, and associated controls. (9:22)

The mandatory incorporation of Marine Sanitation Devices (MSD), as specified under Title 33 CRF Section 159, presents another requirement which Victory ships are not equipped to meet. Under existing regulations, mandatory compliance by Victory ships has been waived until 30 January 1980. After that date, however, it will be necessary to install a Type II or Type III MSD to meet sanitation standards. The various approved Marine Sanitation Devices are indicated below:

1) Type 1 - USCG certified overboard discharge to 1,000 fecal coliform per 100 milliliter plus no visible floating solids standard;
2) Type II - USCG overboard discharge certified to 200 fecal coliform per 100 milliliter plus 150 milligram to 1 total suspended solids standard;
3) Type III - USCG certified to no-discharge standard (i.e., this can be a holding tank with means to pump either shoreside or overboard beyond 12-mile limit.) (9:23)

Considering the above, probably the least expensive means of ensuring compliance with MSD standards would be to incorporate a Type III holding tank. Using USCG general criteria of 30 gallons per day per man with capacity for five days, a holding tank of approximately 1,000 cubic feet capacity would be needed to meet the requirement. In view of the fact that only toilet and urinal drains are required to be piped into a holding tank, the installation would be relatively simple. (9:23)

Since the current regulations allow for the operation of Victory ships without MSD's until 1980, if the NDRF is reactiv-

ated prior to this date the ships will be certified without restriction. However, if the NDRF is called upon after 30 January 1980, resolution will require at least the submission of waiver requests.

Concerning the impact of the aforementioned federal regulations and safety standards on the reserve fleet, the Coast Guard has indicated that in a total mobilization environment, where the national defense is a primary concern, all inspection requirements will be waived in order to put the necessary reserve ships in service. However, the waiving of USCG certification under a contingency situation is a more complicated matter. Essentially, the Coast Guard's position is that a limited emergency would not justify disregard of all legal requirements; moreover, it would be prudent for MARAD to take such action as necessary to bring reserve ships up to required standards and to ensure Coast Guard inspection on an annual basis. Although current regulations (46 CFR 90.05-1) specifically relieve all ships from inspection requirements while laid up, compliance with such requirements would prevent any serious delays during the reactivation process. (9:7,22:2-3)

The American Bureau of Shipping (ABS) is a private nonprofit ship classification society established to provide guidance to marine insurance companies as to the quality of the ships they are requested to insure. As such, the ABS has set standards of design, construction, and equipment for merchant ships. (23:788)

The areas examined by the ABS during classification are reserve buoyancy as required by load line regulations, water tight subdivision, communications and other equipment stipulations, minimum standards as to quality, disposition, and dimensions of material used in ship construction, and regulations concerning tonnage measurements. If a merchant ship meets the Bureau's requirements in these areas it is granted classification. (23:778)

ABS regulations stipulate, as a means of ensuring continued compliance with Bureau standards, that classed ships undergo extensive periodic surveys to retain classification. These requirements, indicated in Table 14, are similar to those of the Coast Guard but they are in most cases far more extensive. When non-compliance with the survey requirements or due dates (Table 14) is determined immediate action is taken by the ABS to revoke classification. (9:53)

The importance of ship classification, aside from attesting to a ship's material condition and seaworthiness, is indicated by the four services it performs:

1) It indicates on behalf of the owner that "due diligence" was observed in the eventuality of an accident;
2) it informs a prospective shipper that, by sending his merchandise aboard, he is not assuming a disproportionate amount of risk;
3) it assists the insurance underwriter in ascertaining the nature of the risk involved; and
4) it enables the owner to obtain insurance at normal prevailing rates. (9:18)

Thus, classification acts in the common interests of the owner, the insurance underwriter, the shipper, and the public at large.

TYPE OF INSPECTION	INTERVAL OF INSPECTION	COMMENTS
Special periodic survey	4 yrs.	
Boiler/steampiping hydrostatic test	4 yrs.	Part of special periodic survey
Reinspection or annual	1 yr.	General visual check of hull and machinery
Dry docking	2 yrs.	Permits extension of dry docking intervals based on special circumstances, ie., operation in fresh water, ship in lay-up, special coatings, impressed current hull protection, etc.
Tail shaft withdrawal	3 yrs.	Can be extended under special circumstances, but not more than one additional year
Load line certificate	4 yrs.	Delegated by Coast Guard to ABS; check for correct load marks and also require annual survey for endorsement
Boiler studs and boltings	8 yrs.	

TABLE 14

AMERICAN BUREAU OF SHIPPING INSPECTION REQUIREMENTS

*Source: U.S. Department of Commerce, Ready Reserve Fleet Plan (9:53)

Concerning the NDRF, MARAD policy is not to maintain reserve ships (with the exception of the RRF) in "in class" status while laid up. Consequently, if such status is desired the ships will be delayed upon activation by the amount of time necessary to meet ABS standards.

The Federal Communications Commission (FCC) is the third principal agency whose rules and regulations will have a pronounced effect upon the activation of the NDRF. When laid up after Vietnam service, reserve ships were in full compliance with the then current U.S. flag merchant ship radio communication requirements established by the FCC. However, since then changes have been made in several of the Commission's regulations with respect to mandatory communications equipment for U.S. merchant ships, and the radio installations on board the ships in the reserve fleet have not been changed to meet these new requirements. (24:1) The requirements are contained in subparts R, S, U, and X of the Federal Communications Commission's Rules and Regulations (47 CFR 83:441 and 47 CFR 83.701-725). Essentially, these are as follows:

1) All vessels must have a current FCC-approved auto alarm system aboard;
2) all vessels must have a current FCC-approved and accepted reserve, main and high-frequency transmitter aboard;
3) all vessels must have one emergency position indicating radio beacon (EPIRB) installed aboard;
4) all vessels must be equipped with an approved (USCG and FCC) VHF/FM radio telephone system covering all

U.S. and international frequencies as well as guard for Channels 13 and 16 (Bridge to Bridge Safety Comm.); and

5) all AM radio telephone installations must be replaced with an FCC-type accepted SSB radio telephone system (effective 1 January 1977). (25:1)

Current planning by MARAD concerning NDRF contingency utilization calls for reserve ships to be put in service with present onboard radio communications systems intact. Although this will meet the minimum operational requirements for ships sailing on international voyages, it is recognized by MARAD that presently installed communications systems may not meet the technical standards or operational characteristics required by the aforementioned FCC rules and regulations. (24:1) Concerning this aspect, the FCC has indicated that MARAD may expect sympathetic consideration of requests for temporary waivers to allow ships to be put in service pending installation of equipment that complies with FCC requirements.

However, the FCC has also indicated that many of its regulations are simply the promulgation of statutory, treaty, or international agreements with respect to the safety of life at sea which the FCC does not have the authority (under ordinary circumstances) to arbitrarily waive (e.g., the mandatory requirement to have a reliable communications system in operable condition at sailing, etc.). The requirements are contained in Parts II and II, of Title III, of the Communications Act (47 USC 351); the International Telecommunications Union (ITU) Regulations; and the International Convention for Safety of

Life at Sea (SOLAS) agreements. (26:1-2)

The FCC has advised MARAD that it would be in its own best interest to conduct a periodic review of the radio installations on board all reserve fleet ships to determine compliance with the legal requirements which could not be easily waived upon emergency activation. The Commission further indicated that it is highly desirable that all radio equipment meet these requirements even during periods when ships are in a reserve status. (26:2)

E. PUBLIC VESSEL COMPLIANCE WITH REGULATORY REQUIREMENTS

The ships of the NDRF, as public vessels, are exempt from most of the regulatory requirements discussed in the previous section. However, it has been the policy of MARAD and MSC during past reserve fleet activations to meet to the fullest possible extent the requirements of cognizant regulatory agencies. It is presumed that MARAD and MSC, as a means of ensuring ship safety, will continue this policy.

F. SUPPLY SUPPORT

Another area of major concern regarding the activation of the NDRF is the provision of spare parts. Since many replacement equipments and components for Victory-class ships have not been available commercially for years, MARAD's principal source of supply is its limited in-house inventory. If a required piece of machinery, part, etc., is not available in stock then it has to be specially manufactured in order to complete repairs. This is an expensive and time-consuming

operation. However, availability of a particular part is only half of the concern; knowledge of its availability, i.e., its accessibility, is also important. The present decentralized structure and management of MARAD's reserve fleet inventory system is not conducive to accessibility. Therefore, it is highly probable that spare parts shortages (through non-availability or inaccessibility) will seriously delay the deployment of reserve fleet units upon activation.

As alluded to in the previous paragraph, each reserve fleet (James River, Suisun Bay, Beaumont) maintains its own separate inventory of spare parts to support its assigned ships. Each inventory, administered by regional personnel, is composed of two elements:

1) A general warehouse stock of major equipment and machinery components which includes such items as steam turbines, generators, booms, cargo winches, and the like. These items are stored in barges and warehouses under dehumidification protection.
2) A basic shipboard allowance of minor items necessary for at-sea repairs. This inventory is stored aboard reserve ships. (13:10-11)

Concerning the administration, maintenance, and general status of the spare parts inventories at each reserve site, a 1976 General Accounting Office (GAO) report indicated that while their inspection of warehouses and storage barges was extremely positive (all listed equipment on hand and in good condition), corresponding checks of the spare parts allowance

on randomly-selected ships were not so positive. In the latter case, discrepancies included unlabeled, loose stock stored haphazardly throughout the ship, lack of current physical inventory counts, and in some instances inadequate records pertaining to the actual spares required. In addition, the GAO report further indicated that the amount of inventory on hand to support a massive activation of reserve ships was critical in some areas. (13:11)

Subsequent action by MARAD corrected most of the deficiencies noted in the GAO report. Additionally, in an effort to increase its support capability, MARAD has established a special holding category within the reserve fleet composed of 44 recently-downgraded Victory-class Troop ships (AP5's) to be cannibalized for spare parts in the event of activation. (10:2) These ships are currently in the James River and Suisun Bay fleets. However, inventory still remains a critical issue.

Although availability has been addressed by MARAD, accessibility still poses a potential problem. Three separate inventories, three separate inventory lists, three separate inventory accounting systems, all add to the increased likelihood of administrative failures in the event of massive fleet activation. Although centralization of the three inventories is impractical, a centralized automatic data processing system would alleviate most accessibility problems by allowing access to the inventory lists of the other fleets. Faced with limited resources, centralization of inventory data is the best way to ensure the most effective and efficient use of available parts.

G. REPAIR FACILITY AND DRYDOCK CONSTRAINTS

The nation's ship repair industry is comprised of numerous organizations of varying sizes and capabilities. The smaller of these organizations, usually referred to as "topside" yards, do not have drydocks, employ a limited number of people, sometimes less than 100, and specialize in work that can be accomplished without extensive ship facilities. (27:1230) Appendix G is a list of major topside repair facilities, 44 of which are located on the East Coast. No attempt has been made to tabulate specific machinery and equipment capabilities due to variations in the type of work individual firms accomplish. (28:39)

The larger organizations have drydocks and can repair or rebuild any part of a ship. In the larger organizations, employment numbers in the thousands and repair may be combined with shipbuilding capabilities. (27:1230) Of the industry's 250 firms that repair ships, 65 are capable of drydocking ships 300 feet or longer. For ships of this size, the repair industry has a total of 128 drydocking facilities (73 floating drydocks, 50 graving drydocks, and 5 marine railways). (28:36) These 65 major yards account for approximately 80 percent of the total dollar value of the repair and conversion work within the industry. (9:33,28:36)

Presently, MARAD holds master repair contracts[9] with 77 repair facilities. Geographically, these facilities are

---

[9]Master repair contract - an existing contractual instrument which contains negotiated contract clauses to be used in contracting for future repair services.

distributed as follows: 38 on the East Coast, 18 on the Gulf Coast, 20 on the West Coast, and 1 on the Great Lakes. (28:36) Appendix H provides a summary of the drydocking facilities and financial limitations for 74 of the 77 repair yards holding master repair contracts.

Concerning the ability of the ship repair industry to respond to the activation needs of the NDRF, it is important to note that of the 65 major repair yards alluded to in the previous paragraph only 44 are capable of drydocking a Victory-size ship. Correspondingly, the total number of drydocks available is reduced from 128 to 84. (28:98) This is significant in view of the fact that all NDRF Victory ships will require a minimum three to five-day drydock period prior to being put in service. A summary of repair yard capability by coast is indicated in Table 15. Due to the extreme distance from each reserve site, Great Lakes facilities would not be considered practical during a contingency situation. Thus, as can be seen in Table 15, the maximum number of repair yards with drydock facilities that could be expected to be available is further reduced to 39 (79 associated drydocks). Appendix I tabulates information as of 1977 for 30 of these yards on a coastal basis.

Aside from the limited drydock resources available, another important aspect to recognize is that in a non-mobilization situation the prevailing attitude would be one of "business as usual." NDRF ships would rate no special priority over commercial business repairs other than that which could be

COAST	NO. OF REPAIR YARDS	NO. OF DRYDOCKS FOR VICTORY SHIPS
East	21	42
Gulf	8	11
West	10	23
Great Lakes	5	8

TABLE 15

Number of Repair Yards Capable of Drydocking Victory-Size Ships

*Source: U.S. Department of Commerce, Report on Survey of U.S. Shipbuilding and Repair Facilities, (28:98)

obtained unofficially by the government. In this environment, necessary ship repairs would have to be procured via normal contract-bid procedures and MARAD would have to compete with commercial interests for available space. Thus, in a contingency requiring substantial activation of the reserve fleet, a shortage of drydock space may develop into a serious bottleneck.

H. SEAGOING MANPOWER CONSTRAINTS

An area of considerable concern to DOD sealift planners is the ability of the maritime industry to respond to the increased demand for trained seagoing manpower in the event of a large-scale breakout of NDRF ships. As indicated in Section B of this chapter, during the Korean and Vietnam conflicts as more reserve ships were activated, shortages of licensed deck/engineering personnel and certificated radio operators proved more and more acute (see Table 11, page 64). Thus, it would appear reasonable to expect similar difficulties in the future. However, MARAD has stated that no such difficulties are envisioned since for every afloat position two qualified personnel are available, and, in a contingency all available manpower would be utilized to meet commitments. (19) It can be readily seen that there are two divergent views on this subject.

In order to reach an independent conclusion as to what can be expected in the area of manpower availability, a basic assumption has been made that the maritime manpower pool is related to seagoing opportunities. As can be seen below, seagoing opportunities were far superior in the past to those

predicted in the foreseeable future.

1) World War II (1940) - approximately 52,000 seagoing positions.
2) Korea (1950) - approximately 57,000 positions (employment decreased from 189,000 in 1946 to 57,000 in 1950 - over 700,000 seamen were issued USCG documents during WWII).
3) Vietnam (1965) - Approximately 54,000 positions (by 1967, shipbound positions rose to 65,584).
4) 1977 - approximately 26,836 positions.
5) 1981 - between 22,000 and 29,000 seagoing positions. (2:18)

Assuming the downward trend in seagoing positions continues, the active manpower base available to support NDRF activation and from which trained personnel would be withdrawn in an emergency will shrink correspondingly.

The history of maritime employment opportunities has been one of major expansion during pericds of international conflict and contraction in peacetime. The cyclical nature of the fortunes of the merchant marine have been expressed in numbers of ships in the fleet and the associated job opportunities for seamen. Manpower adjustments to meet fluctuations are difficult and tax the resources of private companies, maritime unions, the Federal Government, and the seamen. As can be seen in Table 16, in 1966 there were over 1,000 ships of 1,000 gross tons or over in the privately-operated U.S. flag ocean-going fleet. As of 1 July 1977, the active ocean fleet totalled 577

YEAR	TOTAL SHIPS IN MERCHANT MARINE (1,000 tons and over)	TOTAL SEAGOING BILLETS	TOTAL MANNING LEVEL
1964	919	54,312	103,000*
1965	949	54,853	101,000*
1966	1,093	60,245	95,208
1967	1,087	65,278	95,910
1968	1,033	62,285	117,923
1969	1,013	53,976	107,819
1970	819	47,034	87,463
1971	764	39,500	80,000
1972	633	32,333	77,123
1973	622	31,762	77,000
1974	594	28,697	74,000*
1977	577	26,831	71,000

TABLE 16

SIZE OF THE MERCHANT FLEET, 1964 - 1977

**Source: National Academy of Sciences, The Seagoing Workforce, Implications of Technological Change (29:53)

*Estimated Figures

ships. Corresponding to this reduction in ships, by almost 50 percent, was a similar reduction in available jobs and a decline in the size of the maritime workforce. (29:26,8:63)

The merchant marine is still experiencing a reduction in the number of ships in the fleet and the number of jobs available for the workforce. Adding to this decline in employment opportunities are reduced manning scales fostered by the introduction of new technology, particularly automation. (29:63)

This situation poses a dilemma because the need to attract new, technically competent people into the merchant marine conflicts with the lack of employment opportunities caused by a reduced number of jobs. The current workforce has a right to jobs currently available, a right which is enforced by union seniority regulations. In turn, within the current workforce, those mariners with insufficient seniority are foreclosed from obtaining enough employment and either leave the industry, retire, or remain and receive a reduced income. The result is an aging and imbalanced workforce with a potential for mass retirement. As an example, almost half of today's deck and engine officers are over 50 years old, a fact which indicates their entry into the merchant marine as young men during World War II. (30:2) As these older mariners begin to retire, a shortage of experienced manpower in skilled areas will result. It is this skill shortage that will pose a major challenge to the future expansion of the maritime industry. (29:35)

This challenge prompted MARAD in 1969 to initiate the first of a continuing series of studies aimed at forecasting the licensed manpower supply/demand situation which will exist in the 1980's. To appreciate the uncertainty associated with these forecasts, it should be noted that this first study concluded that continuation of the then-existing union and federally-sponsored deck and engine officer programs would perpetuate a large trained manpower surplus which would prove detrimental to the maritime industry as a whole. (30:3-5)

The second study, published in 1972, forecast a significantly lower "oversupply" than the first study. The third study, completed in 1974, forecast a continued decrease in the "oversupply" of qualified deck and engine officers cumulating in a shortage no later than mid-1977. The current study in the series, Deck and Engine Officers in the U.S. Merchant Marine, Supply and Demand, 1976-1985, after re-evaluating the previous study's assumptions and applying sensitivity analyses to fleet forecasts, concluded that a shortage in trained manpower is indeed likely by the year 1981. (30:3-5)

In order to appreciate the potential impact of these forecast shortages on the crewing of ships withdrawn for the reserve fleet, it is necessary to quantify the increase in manpower which will be demanded upon activation. Depending on the nature of, the expected duration of, and the amount of logistics support necessitated by a contingency, anywhere from 400 to over 5,500 mariners will be required to man and put in service the RRF (9 ships) or the bulk of the NDRF (130 Victory ships), respectively. As can be seen in Table 17, assuming a crew of 44, there will be a requirement for 1,040 deck/engine officers and 130 radio operators to man the 130 Victory ships currently in the fleet. Stated simply, the licensed/certificated manpower pool lacks the capacity to accommodate a surge in demand of this magnitude.

I. LEGAL CONSIDERATIONS

Thus far, this chapter has identified various material condition, supply, and manpower areas which could have a

SKILL CATEGORY	MANNING LEVEL	FULL ACTIVATION REQUIREMENT (130 ships)
Licensed deck	4	520
Radio	1	130
Unlicensed deck		
Skilled	10	1,300
Unskilled	3	390
Licensed engine	4	520
Unlicensed engine		
Skilled	10	1,300
Unskilled	3	390
Cooks, stewards	9	1,170
TOTAL	44	5,720

TABLE 17

MANNING LEVEL BY SKILL CATEGORY FOR A VICTORY SHIP

*Source: The Rand Corporation Report RM-3422-ISA, Federal Maritime Policy and Military Shipping Requirements, by L.A. Rapping, p. 12, April 1963

significant effect upon the activation of the NDRF. An additional area of concern which has only recently presented itself deals with the passage of the National Emergencies Act (Public Law 94-412). The express purpose of this legislation was to terminate the existing state of national emergency. Unfortunately, it also terminated the authority to activate the NDRF. (2:22)

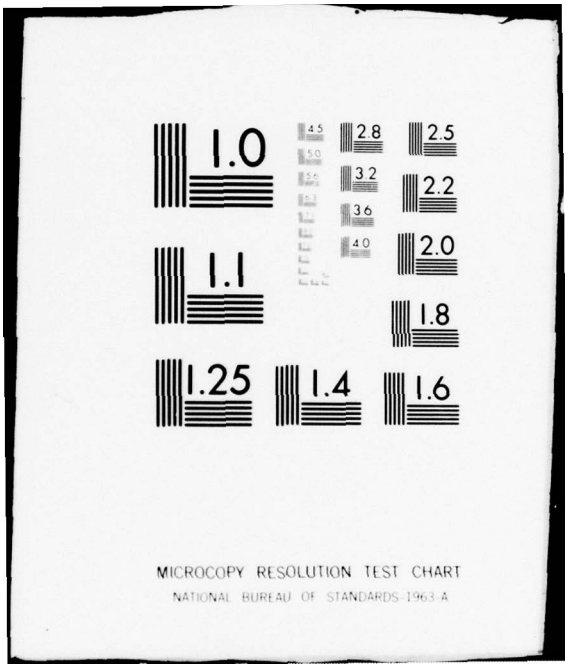
As indicated in Chapter II, (page 19), the NDRF was established under Section 11 of the Merchant Ship Sales Act of 1946 which reads in part:

AD-A062 199 NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF F/G 13/10
AN ANALYSIS OF THE CONSTRAINTS ON THE ACTIVATION OF THE NATIONA--ETC(U)
SEP 78 W B EVERS

UNCLASSIFIED NL

2 OF 2
AD A062199

END
DATE FILMED
3-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

> 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, 1936, as amended .... (31:1)

Of particular interest is the fact that this act provides for the utilization of NDRF assets only during periods when commercial ship requisitioning is imminent. According to Section 902 of the Merchant Marine Act of 1936, such periods are limited to:

> Whenever the President shall proclaim that the security of the national defense makes it advisable or during any national emergency declared by Proclamation of the President ... (30:1)

Thus, with the termination of the existing national emergency went part of the authority to withdraw ships from the reserve fleet.

The alternatives available to MARAD concerning the above situation are:

1) When a contingency arises requiring NDRF activation, petition the President to proclaim a state of national emergency or declare the security of the national defense is in jeopardy;
2) petition Congress to amend Section 11 of the Merchant Ship Sales Act of 1946 to separate authority to activate the NDRF from authority to requisition; or
3) obtain an agreement between the Navy and MARAD to allow interagency ship transfers per Section 717 of the current DOD Appropriations Act.

It is considered that a Presidential declaration of a new state of national emergency as required by the first alternative would invite severe adverse publicity as would a proclamation concerning the security of the national defense. As a consequence, a contingency situation would have to reach the point of almost full mobilization before such a declaration in either area would be politically feasible.

Alternative two, changing the legislation to separate the authority to withdraw ships from the reserve fleet from the authority necessary to requisition commercial ships, is theoretically the best approach to the situation. However, considering legislative delays, it is probably not the most expedient.

Concerning alternative three, Section 717 of the current DOD Appropriations Act authorizes the transfer of ships under the jurisdiction of the Department of Commerce (DOC) to any other federal department, without reimbursement, upon request of the department and approval of DOC. Similar provisions have been included in DOD appropriations bills since 1953 and are presently codified under 40 USC 483a. (2:22) It is expected that these provisions will continue to be included in future DOD appropriations bills. Thus, it appears that under the provisions of the appropriations bills sufficient authority exists for the activation of NDRF ships, provided they are placed in Navy custody for operation by MSC. However, it is questionable that MARAD would consent to the transfer of reserve ships to the Navy unless an agreement was executed in advance. (2:23) To date, no such agreement has been signed

and the issue with regard to the authority to activate the reserve fleet is still in question.

J. SUMMARY

Activation of the NDRF in response to past DOD requests has exhibited substantial, but not insurmountable, problems. Examination of these areas with respect to reserve fleet reliability and availability reveals that crowded shipyards, shortages in qualified personnel, and inadequate spare parts supply will have a significant impact on future activations. Additionally, the material condition of the laid up ships will become a more dominant factor as time passes.

In short, the constraints identified in this chapter imply serious delays in the withdrawal and activation of reserve shipping in a contingency situation. These delays are analyzed in Chapter Four.

IV. ANALYSIS OF NDRF FUTURE ACTIVATION CAPABILITY

A. INTRODUCTION

In the previous chapter various problem areas were identified which would seriously retard the activation of the NDRF. The purpose in this chapter is to analyze those areas with respect to the delays which are the most likely to be experienced in responding to a future contingency.

In general, the emphasis placed on breakout time fluctuates in response to the unique circumstances of each incident that required employment of the NDRF. The degree of fluctuation is proportional to the urgency of the situation. If demand is immediate, activation time becomes an overriding consideration and all shortcuts consistent with safety (limited sea trials, maximum use of overtime and concurrent operations, etc.) are taken. When breakout time is not a major consideration, an orderly activation over a period of several months is possible. Thus, depending on the situation involved, DOD time requirements for NDRF breakout will vary. In order to estimate a future activation rate and determine if the NDRF will be responsive to DOD needs, a scenario has been developed to provide a vehicle in which the various constraints on NDRF effectiveness can be analyzed.

The scenario presented in the next section, although hypothetical, is considered to be representative of the type of contingency situation which might evolve in this country in the 1980's. It is necessary to select this fictitious method of

presentation in order to be able to discuss military sealift requirements in an unclassified format.

B. SCENARIO

The general scenario hypothesized involves a fast-breaking contingency situation in which the United States is tasked with supporting deployed U.S. forces while maintaining its commercial trade. Within this environment, it is assumed that the withdrawal of a large portion of the merchant marine from its trade routes to meet the military requirement for increased lift capacity would reap unacceptable economic penalties. Thus, the requirement for sealift to support this military operation falls for the most part on this country's reserve shipping capacity. The specific situation hypothesized is described in the following paragraphs.

On 5 June 1982, the last of the U.S. forces based in South Korea are withdrawn. On 9 October of that same year, the North Koreans launch a full-scale invasion of the South. In the wake of this action, the President issues orders for the redeployment of U.S. forces to stem the tide of this unprovoked offensive.

The U.S. forces utilized consist of a Modified Army Heavy Armored Corps of 100,000 men with two-plus divisions and some non-divisional tactical combat units. The main force units are broken down as follows: a corps headquarters (with the attendant battalions and companies of field artillery, air defense artillery, etc.); an armored division; a mechanized infantry division; an air cavalry brigade; an armored regiment and 15 tactical air squadrons. (32:4)

All military forces and highly time-sensitive material are airlifted to the scene of action. Troop movements commence on 10 October and are completed by 30 October. The remainder of the support equipment and necessary supply/resupply material must be moved by sea.

The basic dry cargo sealift requirement to support a force of corps size to sustain combat for 60 days is as follows:

1)	Army	
	Unit equipment	712,460 measurement tons[10]
	Resupply	204,291 measurement tons
2)	Air Force	
	Resupply	87,552 measurement tons
3)	Total	1,004,303 measurement tons

As indicated, unit equipment comprises about 71 percent of the total sealift requirement. These cargo items include: the M-60 tank, helicopters (OH-58, AH-1, UH-1, and CH-47); trucks (8-ton and 5-ton types); landing craft (LCM-6 and LCM-8); the M-50 self-propelled 155 mm artillery piece; and the M-551 armored reconnaissance vehicle. (32:3)

Considering both the sealift requirement and the urgency of the situation, the decision was made at MSC Headquarters to utilize the SRP to augment MSC and RRF shipping assets. Subsequently, a callup of SRP-committed shipping was initiated on 11 October. In response to this action, an immediate ground

---

[10]Measurement ton (M/T): A unit of cubic measurement equal to 40 cubic feet.

swell of opposition by participating shippers was experienced. Many challenged the necessity of the callup in the courts contending that all reserve shipping (meaning the NDRF) should be completely exhausted prior to SRP involvement. Others rendered unwilling compliance and stated it would require more time than expected to notify the ships and have them proceed to ports of embarcation. Due to the severe opposition, pending court decisions, and the lack of time-responsive action by unwilling shippers, the SRP was declared non-responsive to the callup on 13 October by MSC officials.

Thus, military sealift assets available for use during the initial deployment of equipment and for subsequent resupply operations are as follows (in priority):

1) MSC controlled fleet - (It is assumed that the 1982 MSC controlled fleet will be roughly comparable in size to today's fleet.) This fleet consists of 3 roll-on/roll-offs, 3 C-4 heavylift ships, 14 regular C-4s, 4 modified C-4 hulls and 3 other breakbulk ships (see Appendix A). Of these ships, seven are available for immediate loading (ROS)[11] with the remaining 20 (FOS)[12] available in 21 days. The ships at sea are directed to discharge their cargo at the nearest port of opportunity

---

[11]Reduced operating status (ROS) - Underutilized MSC shipping maintained under SEP funding for readiness purposes.

[12]Full operating status (FOS) - Fully utilized MSC shipping maintained under industrial funding for peacetime sealift purposes.

and proceed to their ports of embarcation by the quickest available routes. This fleet represents a lift capacity of 443,523 measurement tons.

2) Ready Reserve Force - (It is assumed that by 1982 the RRF will have reached its currently projected strength of 25 ships.) This force is composed of the following ship mix: 1 VC-2, 4 C-3s, 11 C-4s, and 9 Seatrains. These ships are put on berth ready to accept cargo ten days after notification. This fleet represents a total lift capacity of 433,467 measurement tons.

3) NDRF Victory ships - (It is assumed that the size of this fleet (129 ships) will remain constant through 1982.) The time frame in which these ships are made available is examined below. This fleet represents a total lift capacity of 1,460,925 measurement tons.

Considering just the volume capacity needed (1,004,303 M/T) and that which can be made available within three weeks (876,990 M/T), it is apparent that a number of reserve Victory ships have to be reactivated to supplement the sealift capability of the MSC controlled fleet. Because the Victory-type ship is not ideally suited for unit equipment cargoes (limited below-deck stowage height, hatch size, boom capacity, etc.), these ships are used in the resupply role. All unit equipment is moved by RRF and MSC controlled fleet assets (C-4s, Ro/Ros, Seatrains). Thus, assuming a stowage factor of 80 percent, approximately 33 Victory ships are needed to transport designated resupply cargo.

Sealift operations commence on 12 October and initial supply is scheduled to be complete by 25 November. In order to insure adequate sealift support of deployed U.S. forces, the following time schedule was utilized by MSC:

7 MSC (ROS) ships available to load cargo on 12 October;

5 MSC (FOS) ships - the first turnaround segment - available on 15 October;

10 MSC (FOS) ships - the second turnaround segment - available on 20 October;

25 RRF ships available on 24 October;

10 MSC (FOS) ships - the last turnaround segment - available on 25 October;

33 NDRF Victory ships available on 10 November.

With the exception of the 33 Victory ships, the above sealift operations went as scheduled. The Victory ships which were to constitute the resupply segment of the operation were not available due to numerous unforeseen difficulties experienced during their reactivation.

The two cases that follow, termed optimistic and pessimistic, were predicated on two combinations of conceivable conditions which would affect the availability of the NDRF in the scenario described above.

C. OPTIMISTIC CASE

This case portrays the most favorable circumstances that can reasonably be expected during future activation efforts. It assumes the following general conditions:

1) Immediate availability of drydocks and repair facilities in the vicinity of each reserve site;
2) adequate shipyard manpower skills to handle the increased repair activity;
3) material condition of reserve fleet such as to require only minimum hull and topside repairs; and
4) sufficient maritime manpower in the licensed certificated skill areas (deck, engine, radio) to meet the increased demand.

Considering the hypothetical scenario presented in the previous section, it is assumed that a minimum of four days would be lost to the administrative decision process. Assuming maximum utilization of concurrent decision steps (see Figure 7, page 52), it would be 14 October before any decision could be made to employ NDRF Victories to supplement contingency shipping and before the MARAD regional directors would receive instructions to start breaking out reserve ships. At that time, repair facilities would be canvassed, drydock reservations would be made, fleet superintendents would be notified, and general agents would be solicited (see Figure 10). The activation estimates in this and the following case are based on the 14 October date as being considered time zero.

To be responsive to the time requirement established by DOD (ships on berth within 30 days), activation will have to proceed on a "crash" basis. As such, drydock and repair facilities will be procured by negotiated instead of competitive means. Although this action is more costly, it has the potential to cut several days off the activation process. It is

NDRF Activation Flow Chart

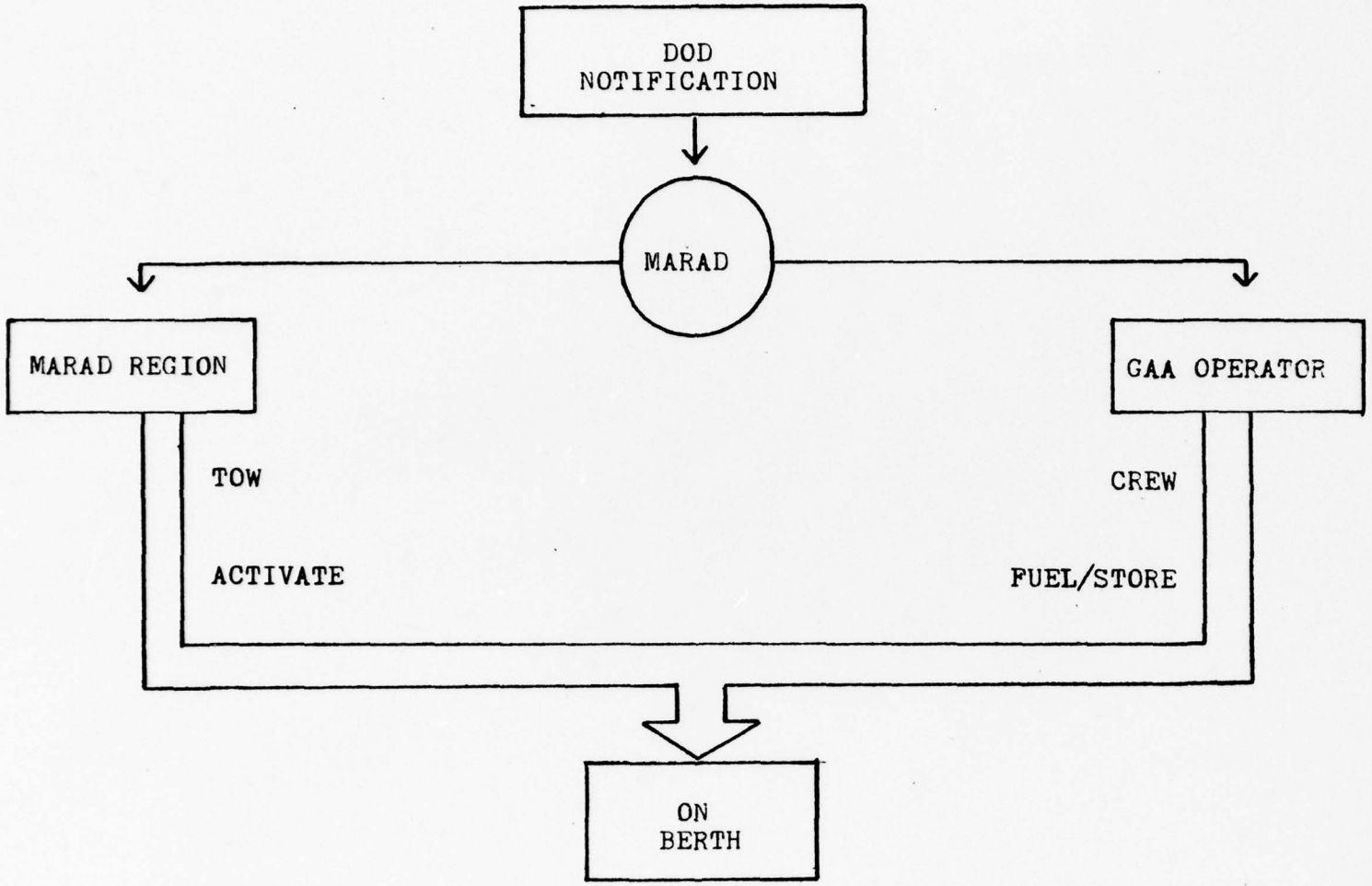


FIGURE 10

*Source: MARAD slide presentation, The National Defense Reserve Fleet

estimated that drydock and repair services could be contracted for in one day.

The repair industry situation considered in this case is one offering minimum constraint to NDRF activation. It is estimated that between 30 and 50 percent of drydock space and 80 percent of repair yard space (topside yards) could be made available for immediate VC-2/3 utilization. Since there is usually a two-year backlog in new ship construction, shipyard facilities are not considered available for NDRF use. Additionally, it is estimated that 40 percent of the manpower resources at each yard could be devoted to the activation effort. This situation is summarized in Table 18, which takes into account commercial demand for repair and conversion.

It is assumed that ships being broken out will be towed to nearby drydocks and then towed to topside yards in the same general vicinity. It is estimated that it will require two days for breakout and towing operations and five days at the drydock facility itself, assuming no unforeseen hull repairs.

In the optimistic case, it is postulated that the material condition of the reserve fleet in 1982 will be such as to require an average of 35,000 man-hours per ship for repair and refit. This figure is predicted by assuming minimum deterioration in secondary areas (electrical wiring, electronic equipment, boilers, etc.), minimum deck replating, and minimum setbacks due to scarcity of spare parts. It is estimated, making maximum use of overtime labor, that each Victory will require an average of 30 days to complete topside repairs. This is

COAST	REPAIR YARDS	NUMBER DRYDOCKS	% AVAILABLE	NUMBER AVAILABLE	TOPSIDE YARDS	% AVAILABLE	NUMBER AVAILABLE
EAST	21	42	30	12	44	80	35
GULF	8	11	40	4	19	80	15
WEST	10	23	50	11	24	80	19
TOTAL	31	76	-	27	101	-	69

TABLE 18

Repair Facilities Available Under Optimistic Activation Conditions

*Source: U.S. Department of Commerce, Report on Survey of U.S. Shipbuilding and Repair Facilities (28,98)

predicated on the assumption that in 1982 there will exist an adequate pool of skilled labor to support around-the-clock shifts.

The repair yard estimate also includes time allotted to ensure compliance with all regulatory requirements. Waivers would be considered only in those cases where inordinate costs or delays would be encountered (i.e., oil pollution/marine sanitation regulations, FCC regulations concerning specific radio operating characteristics). It is anticipated, that due to the urgency of the situation, all regulatory agencies (USCG, ABS, FCC) will be sympathetic to waiver requests where safety of life at sea is not involved.

In order to maximize use of concurrent activation steps, outfitting (furnishing stores, providing habitability items, installing and inventoring all navigation, office, berthing equipment, etc.) will take place at the same time as repair activities. It is anticipated that minimum difficulty will be experienced in obtaining these items.

Upon completion of topside repairs and refitting, sea trials will be performed enroute to designated ports of embarcation and will be of minimum duration (two days).

The Gantt chart in Figure 11 illustrates the time-phased activation schedule under the above optimistic assumptions. As can be seen, it will require a minimum of 39 days after notification to break out and put in service the first round of Victory ships. Thus, the earliest that DOD could expect supplemental reserve shipping would be 23 November 1982.

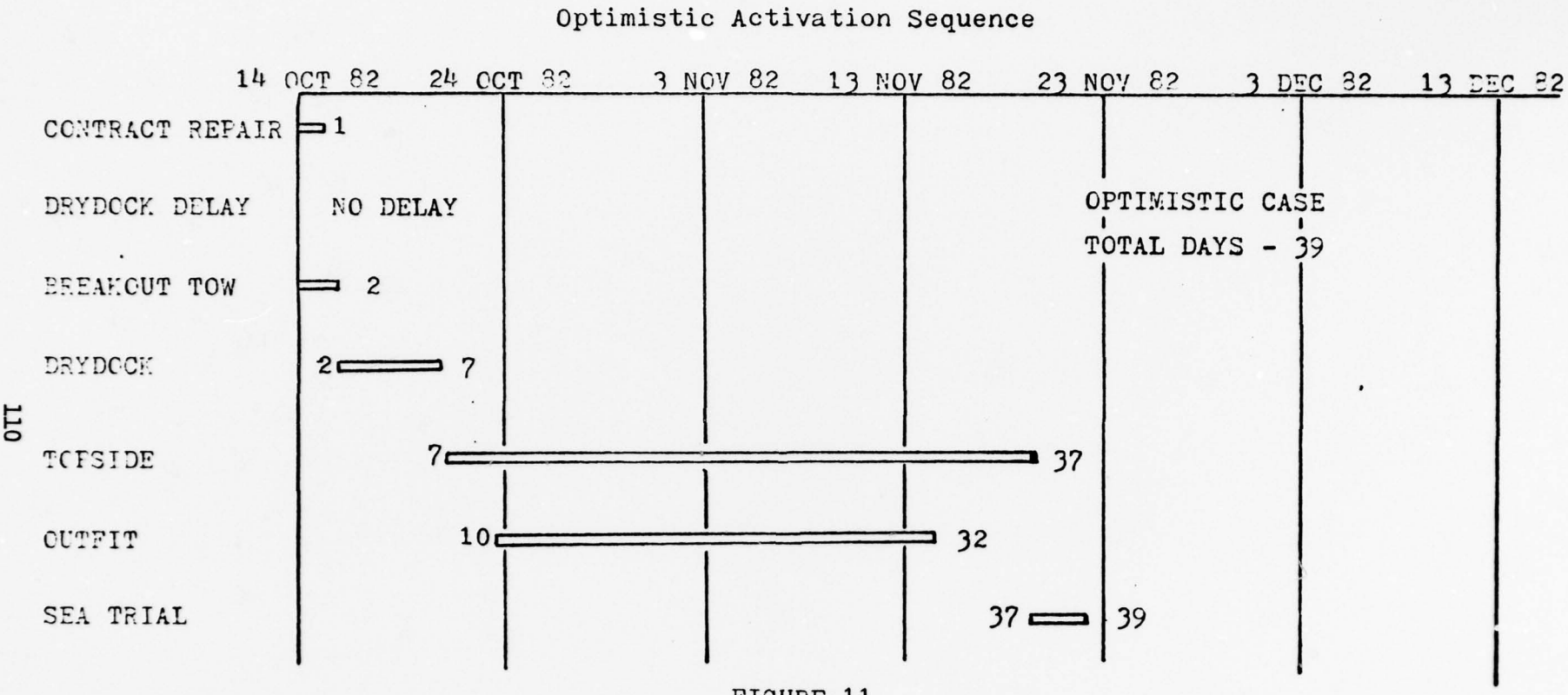


FIGURE 11

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Program Considerations

Considering the previous estimates as the best case with regard to reserve fleet time responsiveness, Table 19 projects the breakout schedule by coast for the remainder of the fleet (assuming an escalation in the contingency and more shipping required). Utilizing a sustained activation rate of 27 ships every 15 days, it would require 114 days working around the clock, 7 days a week, with minimum delays to deploy the entire fleet.

The activation times described thus far have not included delays due to crew shortages. Naturally, difficulty in this area could increase the above estimates. However, as indicated earlier, in the optimistic case manning is not perceived to be a problem.

D. PESSIMISTIC CASE

In the pessimistic case, activation times are slower than in the previous case but they are in keeping with potential shipyard and ship repair constraints. In the pessimistic case, it is assumed that the following conditions prevail:

1) Delays in drydock availability occur due to commercial backlogs;
2) shipyard skilled labor pools are inadequate to accommodate surges in repair activity;
3) material condition of the reserve fleet is such as to warrant extensive hull and topside repairs; and
4) manpower shortages exist in the licensed deck, engine, and radio skill areas.

14 OCT '82	ATLANTIC	GULF	PACIFIC	TOTAL	CUMULATIVE
23 Nov '82	12	4	11	27	27
8 Dec '82	12	5	12	29	56
23 Dec '82	12	4	12	28	84
7 Jan '83	9	4	12	26	110
22 Jan '83	-	4	11	15	125
6 Feb '83	-	4	-	4	129
TOTAL	45	25	59	129	-

TABLE 19

Activation of 129 Victory Ships Under Optimistic Conditions

*Source: GAO Report, The National Defense Reserve Fleet - Can It Respond to Future Contingencies? (13:30)

As in the optimistic case, activation period estimates start at the time each regional director receives notification of the requirement (14 October). The administrative decision steps taken prior to this point are assumed (as in the optimistic case) to require a minimum of four days to complete.

The repair industry situation anticipated under pessimistic assumptions is one of intensive commercial utilization. Thus, assuming no bumping of ships already scheduled, it is estimated that a minimum of seven days' delay in obtaining drydock space will be encountered. This is the time necessary to integrate Victory ships into the regular commercial schedule and to complete work already in progress. After this initial delay, it is anticipated that drydock services will gradually become available up to the level experienced in the optimistic case. In general, a "business as usual" attitude would prevail throughout the industry and activation efforts would receive essentially no special consideration in terms of manpower allocations or drydock space.

Under these circumstances, activation of the NDRF would be seriously constrained. One means of minimizing the drydock bottleneck which would ensue would be to reverse-schedule drydock and topside repairs. Considering that drydock facilities would be unavailable for at least seven days, commencement of topside maintenance for the first group of Victories broken out of layup would be an expeditious course of action. Presumably, when the second group of Victories was broken out drydock facilities would be available.

It is anticipated, considering the time factors involved and the industry situation, that repair and drydock services would again be procured on a negotiated vice competitive bid basis. It is assumed that competitive bid awards would be considered when cost and not time was the major factor. It is estimated that drydocking once attained would require eight days to complete. In the pessimistic case three additional days are arbitrarily added to accomplish the more extensive hull maintenance and repairs (sand blasting, repainting, repairing damaged plates) that are expected. (Without actually breaking out ships a reliable estimate of drydocking time requirements cannot be obtained.)

Under pessimistic assumptions, the material condition of the reserve fleet in 1982 is considered to be such as to require a minimum of 65 days (an average of 45,000 man-hours per ship) in order to effect topside repairs. This estimate takes into account extensive deck rewiring, replacement of damaged, eroded deck plates, and machinery overhauls.

Other items that would contribute to a lengthy repair period would be maximum delays due to the necessity of manufacturing critical spare parts not in inventory and a shortage of labor in such skill areas as welders, electricians, machinists, and pipefitters. It is postulated that repair yards can accommodate a gradual buildup of demand that requires doubling the normal repair yard labor force. Such a buildup would permit an orderly assimilation of unskilled laborers. Each skilled worker would be assigned a newly-hired helper or in some instances, a skilled,

experienced employee would guide the work of several newly-hired, inexperienced workers. In other words, skill shortages could be compensated for, but only gradually. Obviously this buildup would be of little benefit to the first group of ships activated.

As in the optimistic case, certification, loadline, and other regulatory inspections would occur concurrently with dry-dock and topside maintenance. However, due to the degraded material condition of the fleet in the pessimistic situation, it is anticipated that compliance with the basic requirements will be time consuming and subject to numerous delays. Shortage of inspection personnel, reluctance to issue waivers on the part of the agencies, and reinspection in many critical areas, all would contribute to extending the activation process. It is expected that if compliance becomes too time consuming, many of the requirements will have to be conscientiously ignored.

As indicated in the Gantt chart in Figure 12, activation of the initial group of Victories under the combination of adverse conditions described in the previous paragraphs will require approximately 82 days. Thus if the MARAD regions are notified on 14 October as to the number of ships required, the first ship will not be available until 4 January. This is assuming, of course, that sea trials are passed with no major difficulty. Using this date as a base, Table 20 indicates the expected time frame for deployment of the remainder of the fleet should the contingency situation worsen.

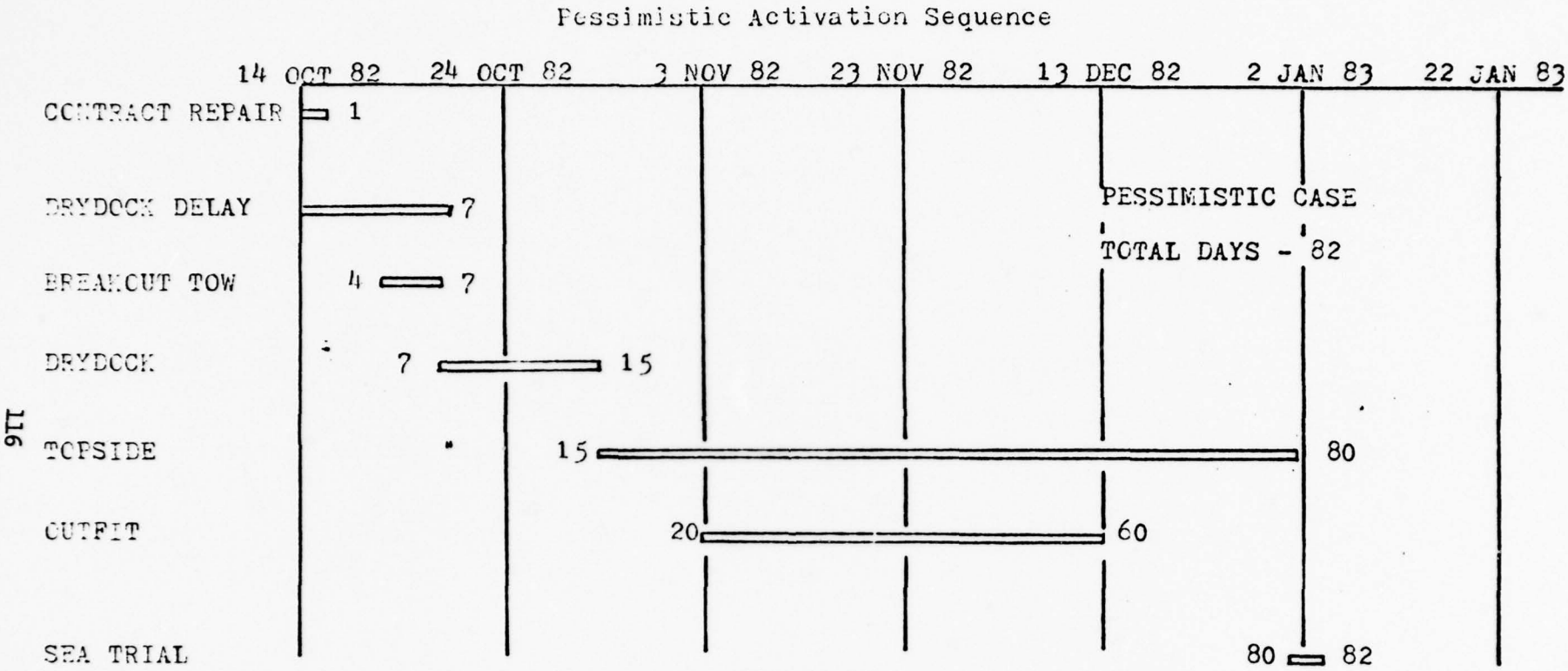


FIGURE 12

*Source: MSC Working Paper Memorandum, Sealift Appraisal and Proper Considerations

14 OCT '82	ATLANTIC	GULF	PACIFIC	TOTAL	CUMULATIVE
4 Jan '83	7	4	5	16	16
4 Feb '83	7	4	5	16	32
4 Mar '83	9	5	7	21	53
4 Apr '83	9	5	7	21	74
4 May '83	10	5	9	24	98
4 Jun '83	3	2	9	14	112
4 Jul '83	-	-	9	9	122
4 Aug '83	-	-	8	8	129
TOTAL	45	25	59	129	-

TABLE 20

Activation of 129 Victory Ships Under Pessimistic Conditions

*Source: GAO Report, The National Defense Reserve Fleet - Can It Respond to Future Contingencies? (13:30)

The above activation estimates are based entirely upon the time required to break out ships from layup and do not allow for delays due to crew shortages in such areas as licensed deck, engine, and radio. Under the foregoing assumptions, it is anticipated that the first 30 Victory ships activated will not experience crewing difficulties due primarily to the long lead time involved. Approximately three months would exist in which to identify shortages, recruit skills from the labor market, accelerate training programs, and reallocate manpower resources prior to the first group of ships becoming available. However, subsequent activations would be subject to delays and short-handed sailings until the industry's training and licensing program could accommodate the increased demand.

E. CONCLUSION

The two cases outlined in the preceding sections are considered representative of both ends of the spectrum with regard to future reserve fleet responsiveness in a contingency situation. In comparing the activation estimates it is concluded that the NDRF's ability to provide supplemental reserve shipping within the time frame specified in the scenario is non-existent. Even under the best of circumstances, the earliest that reserve ships can be available is 23 November. This is assuming that no constraints other than the material condition of the ships will prevail. Such clearly may not be the case. In analyzing the scenario developed in this chapter, it is surmised that reserve ships will be ready for service sometime

between 23 November 1982 and 4 January 1983 assuming that break-out notification is received by 14 October. Since the scenario mandates that resupply operations commence no later than 10 November, the NDRF cannot be considered responsive to the contingency situation postulated. This analysis demonstrates that during a contingency situation, commercial shipping will have to be withdrawn temporarily for military use until adequate reserve shipping becomes available.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

In this thesis, numerous problem areas which could constrain the response capability of the NDRF have been examined. The most serious of these is the present material condition of the 130 Victory ships maintained in the fleet. With the exception of the nine ships assigned to the Ready Reserve Force, the ships of the NDRF are not maintained in a condition conducive to either rapid or economical reactivation. Lack of proper equipment, facilities, and personnel; lack of adequate funding; and a preservation program directed towards maintaining the "status quo" are all contributing factors to the poor material condition of the reserve fleet. Due to this poor material condition, it is estimated that an average of 40,000 man-hours per ship will be required to fully service a reserve ship and make it ready for sea. The corresponding maintenance period will be the dominant factor in determining the time frame in which these ships can be made available to DOD in an emergency.

Considering the present material condition of the NDRF ships upon activation, compliance with the various rules, regulations, and standards which govern U.S. maritime operations would also be a constraining factor. Although waivers could be obtained, in a non-emergency situation the Coast Guard and FCC have stated reluctance to waive legal requirements, especially where safety of life at sea is involved. Additionally, compliance would be in the best interest of MARAD since willful non-compliance may

have an adverse effect on crewing the ships. Thus, upon activation, additional time may have to be allotted for the inspection and certification of ships.

The majority of the ships in the NDRF will have to undergo a drydock period prior to being put in service. As the analysis has indicated, the availability of drydocks is a critical issue if a substantial number of reserve ships are to be activated. Depending upon the intensity of the commercial activity within the repair industry, drydocking could become a serious bottleneck to activation efforts.

Even if reserve ships can be activated in a reasonable time frame, the ability to crew such ships poses a potential problem. Manning difficulties will depend to a great extent on the number of active positions and the number of inactive mariners seeking seagoing positions. It is anticipated that the seamen who became surplus to the needs of the merchant marine at the end of the Vietnam War will no longer be in the maritime labor force in the 1980's.

Additionally, most of the mariners who entered the merchant marine during World War II will have long since retired. Accordingly, if the reserve fleet is activated, crews will necessarily have to be recruited from the various maritime academies, from those retired, from those on vacation, as well as from those expected to be in the inactive labor force.

In general, it is expected that in the foreseeable future the maritime industry will possess a surge labor capacity sufficient to man the ships in the RRF. However, due to fore-

casted shortages of trained personnel to meet commercial requirements in the early 1980's, there is considerable uncertainty with regard to the ability of the industry to crew ships in addition to the RRF in a contingency situation.

In view of the constraints identified above and the associated delays, it is concluded that the capability of the NDRF to provide reserve shipping within the first 30 days of a contingency callup in the 1980's is inadequate. Thus, if a situation arose requiring sealift support beyond the limited capacity of MSC and RRF assets, DOD would have to divert commercial shipping to military service until the NDRF became available.

B. RECOMMENDATIONS

The disruption of this country's maritime trade in the above fashion is acceptable only when national security is threatened. The recommendations that follow are directed towards reestablishing the NDRF in its position as a buffer between surge DOD sealift requirements and the necessity of utilizing commercial shipping.

It is recommended that the NDRF funding level be increased to allow reserve fleet superintendents to pursue a more aggressive preservation program to include regular inspections, operation of equipment, and necessary repair maintenance. In this manner, the actual material condition of reserve ships can be ascertained on a continuing basis. This would facilitate accurate estimates as to activation time and required repair maintenance.

It is recommended that critical replacement parts not in inventory and potential sources of supply be identified so as to be readily available upon activation. Additionally, it is recommended that the three separate reserve fleet inventories be combined under one computerized central control system.

It is recommended that a long-range plan for phase out and replacement of NDRF Victory ships be initiated. One proposal that is worth further investigation is that of replacing the aging Victories with government-subsidized newly-constructed breakbulk ships. These ships once built could be employed in various tramp operations throughout the world with the understanding that they would be made immediately available upon request by DOD. The benefits of this "reserve fleet at sea concept" is that it would promote maritime employment, it would insure the availability of a fully-manned and ready ship within 10 to 20 days of callup, and it would insure that the valuable (from a military standpoint) breakbulk ships would not disappear from the U.S. flag inventory.

In conclusion, it is recommended that further research with respect to activation of the NDRF be conducted in the area of qualified manpower availability. Some type of manpower reactivation plan needs to be devised which would encompass the identification of licensed mariners from the inactive labor force.

APPENDIX A

MSC CONTROLLED FLEET

Excerpted from Ref. 2

NUCLEUS	TYPE	YR. BUILT	SPEED	M/T
METEOR	RO/RO	67	20.0	24,279
COMET	RO/RO	58	18.0	17,096
MIRFAK	C-1	57	13.0	2,651
BLAND	C-3	51	18.5	13,222
TOWLE	VC-2	45	16.5	10,446
BROSTROM	C-4 (H/L)	43	17.0	16,985
CHARTERED SHIPS				
CALLAGHAN	RO/RO	67	25.0	50,044
AMER RELIANCE	C-4	65	21.0	15,800
AMER RANGER	C-4	65	21.0	15,450
AMER RACER	C-4	64	21.0	15,800
AMER CHAMPION	C-4	63	21.0	15,400
AMER CHIEFTAIN	C-4	63	21.0	15,400
AMER COURIER	C-4	63	21.0	15,400
AMER CORSAIR	C-4	63	21.0	15,400
PION CONTENDER	C-4	63	21.0	15,400
PION COMMANDER	C-4	63	21.0	15,400
PION CRUSADER	C-4	63	21.0	15,400
PION CONTRACTOR	C-4	63	21.0	15,400
PION MOON	C-4	62	21.0	15,400
AMER CHARGER	C-4	62	21.0	15,400
AMER CHALLENGER	C-4	62	21.0	15,400
TRANSCOLORADO	C-4 (H/L)	45	17.0	16,552
TRANSCOLUMBIA	C-4 (H/L)	45	17.0	16,552
GREEN SPRING	EX C-4 (MOD)	45	17.0	18,874
GREEN WAVE	EX C-4 (MOD)	45	17.0	18,874
GREEN LAKE	EX C-4 (MOD)	44	17.0	18,874
GREEN PORT	EX C-4 (MOD)	44	17.0	18,874
				443,523

APPENDIX B

U.S. FLAG GENERAL CARGO FLEET

Excerpted from Ref. 2.

	65	66	67	68	69	70	71	72	73	74
B/B	517	525	544	515	483	415	336	246	200	160
Container	21	29	31	72	107	105	113	106	104	113
LASH	-	-	-	-	-	1	6	7	10	13
SeaBee	-	-	-	-	-	-	-	2	3	3
RO/RO	1	1	1	2	3	5	8	9	10	12
TOTAL	539	555	576	589	593	526	463	370	327	310

	75	76	77	78	79	80	81	82	83	84	85
B/B	158	153	151	151	151	151	151	151	146	141	140
Con-tainer	113	108	105	105	105	105	105	108	111	113	117
LASH	20	20	20	22	22	23	24	26	30	30	30
SeaBee	3	3	3	3	3	3	3	3	3	3	3
RO/RO	13	14	15	15	16	17	17	18	18	18	18
TOTAL	307	298	294	296	297	299	300	306	308	305	308

APPENDIX C

SRP TIME-PHASED COMMITMENT

Excerpted from Ref. 2.

Ship Type	Number of Ships Committed to SRP	Committed Ships by Commitment Period X+10	X+30	X+60
Breakbulk	67	21	44	67
Container				
SS	8	2	5	8
NSS	39	12	23	39
Container/RO-RO	--	--	--	--
LASH	5	2	5	5
Seabee	--	--	--	--
Total	119	37	77	119

APPENDIX D

NDRF STATUS AS OF JUNE 30, 1978

Excerpted from Ref. 10.

Design	CDC	MIL AUX	CM	SPECIAL** PROGRAM CANDIDATES	SCRAP CANDIDATES	Total	JR	BE	SB
C1-A	-	-	-	-	1	1	-	1	-
C1-M-AV1	-	-	-	-	1	1	-	-	1
C2-S-B1	-	1	-	-	10	11	6	-	5
C2-F Cargo	-	-	-	-	1	1	1	-	-
C2-S-AJ1,AJ3	-	-	-	-	5	5	4	-	1
C2-S-E1	-	-	-	-	1	1	1	-	-
C2-T Cargo	-	-	-	-	1	1	1	-	-
C3-S-33a	5	-	-	-	-	5	5	-	-
C4-S-1a	-	1	-	-	-	1	-	-	1
C4-S-B5	-	1	-	-	-	1	1	-	-
EC2-S-C1	-	-	-	1	1	2	1	-	1
E3-M-A1	-	-	-	1	-	1	1	-	-
P2-S2-R2	-	7	-	-	-	7	2	-	5
P2-S1-DN3	-	1	-	-	-	1	-	-	1
P2-SE2-R1	-	8	-	-	-	8	5	-	3
P6-S-DS1	-	-	1	-	-	1	1	-	-
R2-S-BV1	-	-	-	-	1	1	-	-	1
T1-M-BT1	-	-	-	-	1	1	-	1	-
T1-M-24A	-	2	-	-	-	2	-	-	2
T2-A	-	-	-	4	-	4	-	2	2
T2-SE-A1	-	6	-	2	-	8	3	4	1
T2-SE-A2	-	1	-	1	-	2	-	1	1
T3-S-A1	-	-	-	1	-	1	-	1	-
T3-S2-A1	-	-	-	3	-	3	3	-	-
V4-M-A1	-	2	-	-	-	2	-	2	-
VC2-S-AP2	112	2	-	1	-	115	39	20	56
VC2-S-AP3	18	2	-	-	-	20	10	6	4
VC2-S-AP5	-	-	-	44	-	44	30	-	14
Z-EC2-S-C5	-	-	-	1	-	1	1	-	-
Auxiliaries-Navy	-	2	-	1	-	3	2	-	1
Ocean Tugs-Navy	-	20	-	-	-	20	6	9	5
LSD	-	-	-	8	-	8	4	-	4
LST	-	11	-	-	1	12	4	-	8
Tanker-Navy Design	-	-	-	2	-	2	-	-	2
Container Carrier	-	-	9	-	-	9	7	1	1
Totals by Design*	135	67	10	70	24	306	138	48	120

APPENDIX E

INITIAL BREAKDOWN COST OF FIRST 47 VICTORY SHIPS ACTIVATED FOR VIETNAM SERVICE

Excerpted from Ref. 18.

VESSEL	COST
Alamo Victory	None
Amarillo Victory	$ 9,700
American Planter	None
Anniston Victory	5,200
Barre Victory	29,000
Baton Rouge Victory	None
Battle Creek Victory	6,909
Belgium Victory	31,505
Berea Victory	20,699
Berkeley Victory	500
Bowdoin Victory	None
Brazil Victory	None
Brigham Victory	32,000
Britain Victory	53,400
Bucknell Victory	None
Carroll Victory	26,500
Citadel Victory	27,375
Creighton Victory	None
Cuba Victory	6,110
Denison Victory	16,000
Exermont	35,000
Exhibitor	7,900
Exmouth	Performed by crew
Exton	3,000
Fenn Victory	None
Gainesville Victory	None
Great Falls Victory	None
Grove City Victory	None
Hannibal Victory	None

VESSEL	COST
Hope Victory	22,600
Hunter Victory	None
Laredo Victory	Performed by crew
Linfield Victory	Performed by crew
Loma Victory	7,000
Loyola Victory	None
Maiden Victory	20,404
Meridian Victory	16,700
Muhlenberg Victory	None
Navajo Victory	5,355
Pine Bluff Victory	None
Red Oak Victory	None
Rice Victory	25,550
San Mateo Victory	51,400
Southwestern Victory	None
Swarthmore Victory	17,100
Willamette Victory	7,000
Xavier Victory	40,000
47 vessels at a cost of	$523,907

APPENDIX F

CONDITION STATUS OF 130 VICTORY SHIPS IN NDRF

Excerpted from Ref. 9.

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
EASTERN REGION				
Albion Victory	5/70	12/70	8/70	None noted
Anchorage Victory	5/70	5/70	N/A	Hull dmg
Bessemer Victory	6/70	6/69	9/70	Hull dmg Bearing dmg
Brigham Victory	11/70	2/71	11/73	None noted
Britain Victory	5/70	8/68	8/69	None noted
Burbank Victory	9/69	9/68	8/70	None noted
Clarksville Victory	1/69	1/68	12/70	Elec.cable dmg
Cornell Victory	5/69	9/68	5/74	Hull dmg
CCNY Victory	3/69	3/68	1/70	None noted
Denison Victory	1/71	4/69	1/74	None noted
Drury Victory	4/70	1/70	10/69	None noted
Durango Victory	8/69	2/70	1/70	Anchor chain dmg - Bower anchor lost
Green Bay Victory	4/70	6/70	2/70	HP & LP Pin on Gear dmg
Halaula Victory	1/70	10/70	2/70	#2 Gen.Exam
Harvard Victory	4/70	8/70	1/70	None noted
Hobart Victory	11/69	11/68	N/A	None noted

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
EASTERN REGION				
Kenyon Victory	5/70	10/69	N/A	None noted
Lafayette Victory	10/70	6/69	11/70	None noted
Laredo Victory	9/70	6/69	9/69	None noted
Lynn Victory	6/70	9/70	N/A	None noted
Manderson Victory	6/70	10/70	9/70	None noted
Newcastle Victory	5/70	5/70	2/70	None noted
Oberlin Victory	9/69	9/68	N/A	None noted
Oshkosh Victory	10/69	12/69	9/70	None noted
Rice Victory	9/70	12/70	9/70	None noted
Rosewell Victory	2/68	2/67	4/70	None noted
Rutgers Victory	4/70	5/70	1/70	None noted
Santa Clara Victory	5/70	3/71	4/70	Flat keel dmg
Selma Victory	10/69	10/68	9/70	Flat keel dmg
Southwestern Victory	11/69	7/70	10/69	Flat keel dmg
Tulane Victory	4/70	2/70	N/A	None noted
Vanderbilt Victory	11/69	10/70	9/70	Hull dmg
Wayne Victory	5/70	6/70	11/70	None noted
Wesleyan Victory	3/69	12/69	1/70	None noted
American Victory	9/69	8/69	9/70	None noted
Beatrice Victory	11/69	12/69	10/70	None noted
Carroll Victory	6/69	10/68	6/69	None noted
Catawba Victory	2/70	6/70	10/73	None noted

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
EASTERN REGION				
Duke Victory	6/69	6/68	3/70	None noted
Elko Victory	5/70	2/71	2/70	None noted
Greeley Victory	5/73	5/72	7/70	None noted
Gretna Victory	11/70	1/71	10/70	None noted
Joplin Victory	6/69	6/68	3/70	None noted
Lawrence Victory	12/69	4/70	9/70	None noted
Loma Victory	1/71	1/70	4/71	None noted
Sharon Victory	6/70	5/70	11/70	None noted
GULF REGION				
Allegheny Victory	4/70	1/69	5/70	None noted
Amarillo Victory	11/69	11/68	10/69	UT Hull
Anniston Victory	9/69	9/68	10/69	Hull dmg
Beaver Victory	4/69	4/68	4/70	Hull dmg
Belgium Victory	4/70	3/68	N/A	Boiler repair
Canton Victory	5/70	9/69	4/70	Boiler
Cedar Rapids Victory	2/53	8/52	N/A	No ABS report but survey indicates bottom damage, laid up since 1952.
Citadel Victory	11/69	2/69	10/69	Bull Gear Shaft OB Generator
Cuba Victory	11/69	2/69	8/69	Hull & Main Deck Plates renewal

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
GULF REGION				
Drake Victory	7/70	7/69	8/70	Relays & Circuit Breakers
Enid Victory	2/70	9/69	2/70	FK plts 16 & 17 renewal
Grinnell Victory	1/70	9/68	1/70	Rotor #1 Gen.
High Point Victory	6/70	9/68	8/70	Hull dmg
Linfield	N/A	N/A	N/A	N/A
Meridian Victory	11/69	8/68	7/73	None noted
Pine Bluff Victory	10/69	10/68	9/69	H.P. Turbine Rotor Repairs
San Mateo Victory	10/69	10/68	10/69	Hull dmg
Tucson Victory	2/70	11/68	4/70	Mn Red.Gears (exam)
Whittier Victory	5/70	4/69	2/70	Hull dmg
Asbury Victory	9/70	6/69	10/70	Vessel's bottom to be examined in next drydock
Battle Creek Victory	4/70	4/69	9/69	None noted
Gainesville Victory	7/70	7/69	N/A	None noted
Hattiesburg Victory	5/70	5/67	2/70	None noted
Minot Victory	1/70	1/69	1/70	None noted
Princeton Victory	12/70	7/69	N/A	None noted
WESTERN REGION				
Adelphi Victory	8/69	8/69	8/70	None noted

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
WESTERN REGION				
Alfred Victory	8/69	2/69	N/A	None noted
Barnard Victory	8/69	2/69	N/A	None noted
Barre Victory	5/69	5/68	N/A	Lifeboat dmg Lifeboat davits dmg
Berea Victory	12/69	5/68	N/A	None noted
Berkley Victory	10/69	10/68	9/69	None noted
Boulder Victory	4/54	4/53	N/A	None noted
Bowdoin Victory	2/69	2/68	2/70	None noted
Brazil Victory	5/69	5/68	8/69	None noted
Carleton Victory	10/53	9/53	N/A	None noted
Central Victory	6/69	6/68	7/70	None noted
Clarksville Victory	8/70	N/A	N/A	Shell dmg
Clearwater Victory	10/69	4/68	8/70	Shell dmg
Creighton Victory	1/70	10/68	8/73	None noted
De Peuw Victory	10/69	10/68	N/A	None noted
Earlham Victory	5/70	5/69	9/70	None noted
Fenn Victory	12/69	12/68	1/70	None noted
Frontenac Victory	10/69	10/68	10/70	None noted
Great Falls Victory	5/70	5/69	1/70	None noted
Grove City Victory	7/69	7/68	8/69	Bilge keel dmg
Hope Victory	10/69	10/68	9/69	None noted

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
WESTERN REGION				
Lahaina Victory	3/70	11/68	2/70	None noted
Lakewood Victory	4/69	4/68	1/70	None noted
Malden Victory	10/67	11/68	10/69	None noted
Masillon Victory	4/69	4/68	4/70	Propeller blade dmg
Mayfield Victory	11/69	4/69	10/70	None noted
Mercer Victory	7/70	7/69	7/70	None noted
Meredith Victory	8/70	8/69	10/70	None noted
Morgantown Victory	9/69	6/69	9/69	None noted
Muhlenberg Victory	4/70	7/68	2/70	#2 Gen repair
Nashua Victory	7/70	7/69	5/70	Rudder repair
Navajo Victory	7/70	7/69	7/73	Shell dmg
North Platte Victory	7/69	7/68	6/70	None noted
Ocala Victory	6/70	6/69	4/71	None noted
Occidental Victory	6/70	9/69	N/A	None noted
Pacific Victory	7/70	8/68	6/70	None noted
Pan American Victory	10/70	3/69	10/73	None noted
Provo Victory	10/53	6/53	N/A	Shell dmg
Purdue Victory	7/70	7/69	7/70	Mn thrust bearing repair
Queens Victory	1/70	12/69	2/71	None noted
Rider Victory	5/70	5/69	5/70	Shell dmg
St. Augustine Victory	11/69	12/67	9/70	None noted

VESSEL NAME	ANNUAL SURVEY DUE	LAST DRYDOCK	CARGO GEAR QUAD SURVEY	A.B.S. OUTSTANDING WORK
WESTERN REGION				
Sioux Falls Victory	6/70	9/69	5/70	Mn reduction gear repair
Swarthmore Victory	10/69	10/68	10/69	None noted
Valdosta Victory	9/52	6/52	N/A	Shell dmg
Woodstock Victory	8/52	5/52	N/A	None noted
Xavier Victory	3/69	3/68	10/69	None noted
Bucknell Victory	8/69	8/68	10/69	None noted
Council Bluffs Victory	8/69	8/68	8/69	None noted
Elmira Victory	10/69	8/68	11/70	None noted
Hamilton Victory	3/70	5/69	N/A	Vessel's bottom to be examined in next drydock
Hannibal Victory	5/69	5/68	2/70	None noted
Hunter Victory	8/69	8/68	8/69	None noted
Lane Victory	10/70	11/69	9/70	None noted
Las Vegas Victory	8/70	8/69	7/70	None noted
Lindenwood Victory	8/69	11/68	8/70	None noted
Loyola Victory	12/69	6/69	2/70	None noted
Red Oak Victory	5/69	7/68	2/70	None noted
Winthrop Victory	10/70	10/69	10/70	None noted

APPENDIX G

MAJOR TOPSIDE REPAIR FACILITIES

Excerpted from Ref. 28.

EAST COAST

Ardell Marine Corporation
Brooklyn, N.Y.

American Ship Repairs Co., Inc.
Brooklyn, N.Y.

Arnessen Electric Company, Inc.
Brooklyn, N.Y.

Atlantic Marine, Inc.
Fort George Island, Fla.

Atlantic Repair Co., Inc.
Brooklyn, N.Y.

Auto Marine Sales Corp.
Ft. Lauderdale, Fla.

Banks Ship Rigging Corp.
Brooklyn, N.Y.

Berkley Shipbuilding & Drydock Corp., Norfolk, Va.

Braswell Shipyards, Inc.
Mt. Pleasant, S.C.

Caddell Drydock & Repair Co.
Staten Island, N.Y.

Cardinal Engine & Boiler Works, Inc., Brooklyn, N.Y.

Carolina Marine & Drydock Co.
Wilmington, N.C.

Consolidated Service, Inc.
Charleston, S.C.

Diesel Injection Sales & Service, Norfolk, Va.

Electric Motor & Contracting Co.
Norfolk, Va.

General Ship Repair & Engine Works, Inc., E. Boston, Mass.

General Ship Repair Corp.
Baltimore, Md.

Horne Brothers, Inc.
Newport News, Va.

Hudson Engineering Company
Hoboken, N.J.

Industrial Welding & Machine, Inc., Portland, Me.

J-Y Industrial Corp.
Brooklyn, N.Y.

Kurt's Marine Diesel, Inc.
Ft. Lauderdale, Fla.

Marine Contractors Co., Inc.
East Boston, Mass.

Marine Electric Corp.
Brooklyn, N.Y.

Merrill-Stevens DD Company
Miami, Fla.

Metro Machine Corp.
Norfolk, Va.

A. Moe & Co., Inc.
Philadelphia, Pa.

Moon Engineering Co., Inc.
Norfolk, Va.

EAST COAST	GULF COAST
Newport Shipyard, Inc. Newport, R.I.	American Marine Corp. New Orleans, La.
Nordic Diesel & Machine Co., Inc., Brooklyn, N.Y.	Bludworth Shipyard, Inc. Houston, Tex.
Norlantic Diesel, Inc. Fairhaven, Mass.	Boland Marine and Mfg. Co. New Orleans, La.
Promet Corp. East Providence, R.I.	Buck Kreihs Co., Inc. New Orleans, La.
Reynolds Shipyard Corp. Staten Island, N.Y.	Coastal Iron Works, Inc. Corpus Christi, Tex.
Rollinson Electric Contractors, Inc., Savannah, Ga.	Coastal Marine Service of Texas, Inc., Port Arthur, Tex.
Sandblasters, Inc. Charleston, S.C.	Dixie Machine Welding & Metal Works, New Orleans, La.
Seahol Contracting Co. Charleston, S.C.	Farmer's Marine Copper Works, Inc., Galveston, Tex.
South Portland Shipyard & Marine Railway Corp. South Portland, Me.	J.A. Gerrets, Inc. New Orleans, La.
Stephen Ransom, Inc. Port Newark, N.J.	Hahn & Clay Houston, Tex.
Surless Ship Repair Corp. Brooklyn, N.Y.	Harrisburg Machine Co., Inc. Houston, Tex.
Thames Shipyard & Repair Co. New London, Conn.	Hendry Corp. Tampa, Fla.
Tickle Engineering Works, Inc. Brooklyn, N.Y.	Lone Star Marine Salvage Co. Houston, Tex.
Williams Brothers Division of Gowen, Inc. Portland, Me.	Marine Repairs, Inc. Houston, Tex.
Williams & Manchester Shipyard Newport, R.I.	McDonough Iron Works Galveston, Tex.
Wilmington Iron Works, Inc. Wilmington, N.C.	Runyan Machine & Boiler Works, Inc., Pensacola, Fla.

GULF COAST

Saucer Marine Service, Inc.
New Orleans, La.

Sherman Shipyard
Panama City, Fla.

Slocum Iron Works, Inc.
Mobile, Ala.

WEST COAST

Cavanaugh Machine Works
Wilmington, Calif.

Coastal Marine Eng. Co.
San Francisco, Calif.

Colbert, Inc.
Stockton, Calif.

Dockside Machine & Ship Repair
Wilmington, Calif.

Duwamish Shipyard, Inc.
Seattle, Wash.

Electro-Mechanical Co.
Portland, Ore.

Ets-Hokin & Galvan Electric Co.
San Diego, Calif.

Franklin Machine Works, Inc.
San Francisco, Calif.

Fulton Shipyard
Antioch, Calif.

General Eng. & Machine Works
San Francisco, Calif.

Kettenburg Marine
San Diego, Calif.

Marine Iron Works, Shipyard
Div., Tacoma, Wash.

Marine Power & Equipment Co.
Seattle, Wash.

Pacific Drydock & Repair Co.
Oakland, Calif.

Pacific Marine & Supply Co.
Honolulu, Hawaii

Plant Bros. Corp.
San Francisco, Calif.

Rowe Machine Works, Inc.
Seattle, Wash.

Service Engineering Co.
San Francisco, Calif.

Southwest Marine, Inc.
Chula Vista, Calif.

Tacoma Boatbuilding Co., Inc.
Tacoma, Wash.

Triple "A" South
San Diego, Calif.

West Winds, Inc.
San Francisco, Calif.

Wilmington Iron Works
Wilmington, Calif.

Wilmington Welding & Boiler
Works, Wilmington, Calif.

GREAT LAKES

Advance Boiler & Tank Co.
Milwaukee, Wis.

G.W. Industries, Inc.
Cleveland, Ohio

Hans Hansen Welding Co., Inc.
Toledo, Ohio

Lower Lake Dock Co.
Sandusky, Ohio

GREAT LAKES

Niagara Industries, Inc.
Erie, Pa.

Nicholson & Hall Corp.
Buffalo, N.Y.

Nicholson Terminal & Dock Co.
River Rouge, Mich.

Oldman Boiler Works, Inc.
Buffalo, N.Y.

Perry Shipbuilding Corp.
Erie, Pa.

Pittsburgh & Conneaut Dock Co.
Conneaut, Ohio

Sen-Wel Industries, Inc.
Buffalo, N.Y.

Soo Drydock Company
Sault Ste. Marie, Mich.

William Farrel, Inc.
Toledo, Ohio

Ste. Marie Yard & Marine, Inc.
Sault Ste. Marie, Mich.

APPENDIX H

SHIPYARDS HOLDING MASTER REPAIR CONTRACTS

Excerpted from Ref. 9.

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Eastern Region:		
New England Area -		
BETHLEHEM STEEL CORP., E. Boston, Mass.	Yes	Unlimited
GENERAL DYNAMICS CORP. ELECTRIC BOAT DIV., Quincy, Mass.	Yes	Unlimited
PROMET CORP., E. Providence, R.I.	-	$3,765,000
BATH IRON WORKS Bath, Maine	-	1,000,000
GENERAL SHIP & ENGINE WORKS, INC., E. Boston, Mass.	-	515,000
MARINE CONTRACTORS CO., INC., E. Boston, Mass.	-	430,000
INDUSTRIAL WELDING & MACHINE CO., Portland, Maine	-	275,000
SOUTH PORTLAND SHIPYARD & MARINE RAILWAYS CORP., S. Portland, Maine	-	44,000
New York Area -		
BETHLEHEM STEEL CORP., Hoboken, N.J.	Yes	Unlimited
BREWER DRYDOCK CO., Staten Island, N.Y.	Yes	Unlimited
BUSHEY, IRA S. & SONS, Brooklyn, N.Y.	Yes	Unlimited

Name & Location of Contractor	Drydock Facilities	Financial Limitation
New York Area -		
TODD SHIPYARDS CORP., Brooklyn, N.Y.	Yes	Unlimited
RODERMOND INDUSTRIES, INC. Jersey City, N.J.	-	Unlimited
TICKLE ENGINEERING WORKS, INC., Brooklyn, N.Y.	-	$ 730,000
STEPHEN RANSON, INC., Port Newark, N.Y.	-	600,000
HUDSON ENGINEERING CO., Hoboken, N.J.	-	298,000
ATLANTIC REPAIR CORP., Brooklyn, N.Y.	-	185,000
REYNOLDS SHIPYARD CO., Staten Island, N.Y.	-	165,000
ARDELL ENGINEERING CORP., Brooklyn, N.Y.	-	115,000
NORDIC DIESEL & MACHINE CO., INC., Brooklyn, N.Y.	-	85,000
CHARLTON MARINE, INC., Jersey City, N.J.	-	65,000
Baltimore/Philadelphia Area -		
BETHLEHEM STEEL CORP., Baltimore, Md.	Yes	Unlimited
MARYLAND SHIPBUILDING & DRYDOCK CO., Baltimore, Md.	Yes	Unlimited
SUN SHIPBUILDING & DRYDOCK CO., Chester, Pa.	Yes	Unlimited
A. MOE & CO., INC. Philadelphia, Pa.	-	239,000

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Norfolk and South Atlantic Area -		
NEWPORT NEWS SHIPBUILDING & DRYDOCK CO., Newport News, Va.	Yes	Unlimited
NORFOLK SHIPBUILDING & DRYDOCK CO., Norfolk, Va.	Yes	Unlimited
JACKSONVILLE SHIPYARDS, Jacksonville, Fla.	Yes	Unlimited
SAVANNAH MACHINE & SHIPYARD CO., Savannah, Georgia	Yes	Unlimited
HORNE BROS., INC., Newport News, Va.	-	Unlimited
BRASWELL SHIPYARDS, INC., Mt. Pleasant, S.C.	-	$ 755,000
COLONNA'S SHIPYARD, INC., Norfolk, Va.	-	415,000
MOON ENGINEERING CO., INC., Norfolk, Va.	-	300,000
BEST REPAIR COMPANY, Norfolk, Va.	-	200,000
DETYEN'S SHIPYARDS, INC. Mt. Pleasant, S.C.	Yes	175,000
METRO MACHINERY CORP., Norfolk, Va.	-	70,000
Great Lakes Region -		
BAY SHIPBUILDING CORPORATION, Sturgeon Bay, Wisconsin	-	1,000,000
Central Region:		
Florida -		
TAMPA SHIP REPAIR & DRYDOCK CO., INC., (DIVISION OF AMERICAN SHIPBUILDING CO.), Tampa, Fla.	Yes	Unlimited

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Central Region:		
Alabama -		
ALABAMA DRYDOCK & SHIPBUILDING CO., Mobile, Ala.	Yes	Unlimited
BENDER WELDING & MACHINE CO., INC., Mobile, Ala.	-	Unlimited
SLOCUM IRON WORKS, INC., Mobile, Ala.	-	$ 90,000
Mississippi -		
THE INGALLS SHIPBUILDING CORP., Pascagoula, Miss.	-	Unlimited
Louisiana -		
TODD SHIPYARDS CORP. (NEW ORLEANS DIVISION), New Orleans, La.	Yes	Unlimited
AVONDALE SHIPYARDS, INC. New Orleans, La.	Yes	Unlimited
BOLAND MARINE & MFG. CO., INC., New Orleans, La.	-	Unlimited
BUCK KREIHS CO., INC. New Orleans, La.	-	Unlimited
DIXIE MACHINE WELDING & METAL WORKS, INC., New Orleans, La.	-	Unlimited
Texas -		
BETHLEHEM STEEL CORP., Beaumont, Tex.	Yes	Unlimited
TODD SHIPYARDS CORP., (GALVESTON DIVISION), Galveston, Tex.	Yes	Unlimited
TODD SHIPYARDS CORP., (HOUSTON DIVISION), Houston, Tex.	Yes	Unlimited

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Central Region:		
Texas -		
FARMER'S MARINE COPPER WORKS, INC., Galveston, Tex.	-	$ 835,000
McDONOUGH IRON WORKS, Galveston, Tex.	-	705,000
COASTAL MARINE SERVICE OF TEXAS, INC., Port Arthur, Tex.	-	640,000
LONE STAR MARINE SALVAGE CO., Houston, Tex.	-	255,000
HARRISBURG MACHINE CO., INC. Houston, Tex.	-	170,000
Western Region:		
San Pedro/San Diego Area -		
BETHLEHEM STEEL CORP. TERMINAL ISLAND San Pedro, Calif.	Yes	Unlimited
TODD SHIPYARDS CORP. LOS ANGELES DIVISION, San Pedro, California	Yes	Unlimited
NATIONAL STEEL AND SHIPBUILDING CO., San Diego, Calif.	-	Unlimited
ETS-HOKIN CORP., Wilmington, Calif.	-	Unlimited
CAMPBELL INDUSTRIES San Diego, Calif.	-	5,390,000
San Francisco Bay Area -		
BETHLEHEM STEEL CORP., San Francisco, Calif.	Yes	Unlimited
TODD SHIPYARDS CORP. SAN FRANCISCO DIVISION, Alameda, Calif.	Yes	Unlimited

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Western Region:		
San Francisco Bay Area -		
WILLAMETTE IRON & STEEL CO.	Yes	Unlimited
TRIPLE "A" MACHINE SHOP, INC., San Francisco, Calif.	-	Unlimited
WEST WINDS, INC., San Francisco, Calif.	-	$ 780,000
SERVICE ENGINEERING CO., San Francisco, Calif.	-	95,000
Columbia River Area -		
DILLINGHAM MARINE & MFG. CO., Portland, Ore.	Yes (use of Port of Portland Drydock Facility)	Unlimited
NORTHWEST MARINE IRON WORKS, Portland, Ore.	Yes (use of Port of Portland Drydock Facility)	Unlimited
WILLAMETTE IRON & STEEL CO., Portland, Ore.	Yes (use of Port of Portland Drydock Facility)	Unlimited
Puget Sound Area -		
LOCKHEED SHIPBUILDING AND CONSTRUCTION CO., Seattle, Wash.	Yes	Unlimited
TODD SHIPYARDS CORP. SEATTLE DIVISION, Seattle, Wash.	Yes	Unlimited
LAKE UNION DRYDOCK CO., Seattle, Wash.	-	Unlimited

Name & Location of Contractor	Drydock Facilities	Financial Limitation
Western Region:		
State of Hawaii -		
DILLINGHAM SHIPYARD (a DIVISION OF DILLINGHAM CORP.) Honolulu, Hawaii	-	Unlimited
PACIFIC MARINE & SUPPLY CO., LTD., Honolulu, Hawaii	-	$ 710,000

APPENDIX I

SHIP REPAIR CAPABILITY

Excerpted from Ref. 28.

Ship Repair Yard	No. of Drydocks	Employment	
		Current (1977)	Mobilization
EAST COAST			
Bethlehem Steel Baltimore, Md.	4*	1,940	9,900
Bethlehem Steel Boston, Mass.	2	500	800
Bethlehem Steel Hoboken, N.J.	5	650	7,300
Brewer D.D. Co. Staten Island, N.Y.	2	200	1,700
Ira S. Bushey Brooklyn, N.Y.	1*	200	720
Coastal D.D. & Repair Brooklyn, N.Y.	2*	450	2,000
Detyens Shipyard Mt. Pleasant, S.C.	1*	400	700
Jacksonville Shipyards Jacksonville, Fla.	4*	2,385	2,835
Maryland S.B. & D.C. Co.	3	1,600	12,000
Newport News SB & DD Co. Newport News, Va.	6	26,000	41,000
Norfolk SB & DD Corp. Norfolk, Va.	1*	2,060	3,600
Savannah Mach. & DD Co. Savannah, Georgia	1	400	800
Sun SB & DD Co. Chester, Penna.	2	4,480	35,000
Todd Shipyards Brooklyn, N.Y.	4	410	4,000

Ship Repair Yard	No. of Drydocks	Employment	
		Current (1977)	Mobilization
GULF COAST			
Alabama DD & SB Co. Mobile, Ala.	2	3,430	29,000
Bethlehem Steel Beaumont, Tex.	1	1,240	5,100
Tampa Ship Repair Tampa, Fla.	1	640	1,100
Todd Shipyards Galveston, Tex.	1	817	4,000
Todd Shipyards Houston, Tex.	1	300	2,175
Todd Shipyards New Orleans, La.	2	370	2,500
Avondale Shipyards, Inc. New Orleans, La.	1*	6,900	N/A
WEST COAST			
Bethlehem Steel San Francisco, Calif.	2	1,000	3,310
Bethlehem Steel Term. Island, Calif.	2	680	7,500
Lockheed SB & Const. Co. Seattle, Wash.	2*	2,875	6,600
National Steel & SB Co. San Diego, Calif.	2*	6,050	10,000
Port of Portland Portland, Oregon	3	N/A	N/A
Todd Shipyards Alameda, Calif.	2	1,030	4,000
Todd Shipyards San Pedro, Calif.	2	1,640	8,000
Todd Shipyards Seattle, Wash.	3	1,200	7,200

Ship Repair Yard	No. of Drydocks	Employment	
		Current (1977)	Mobilization
WEST COAST			
Willamette Iron & Steel Richmond, Calif.	5	350	2,170

* Yard has additional drydock(s) not large enough to accommodate a Victory ship. Employment data, however, are for the entire yard as no separation could be made.

REFERENCES

1. Whitehurst, C.H., Jr., The Defense Transportation System: Competitor or Complement to the Private Sector?, American Enterprise Institute for Public Policy Research, 1976.

2. Military Sealift Command Working Program Memorandum Serial 75M6, Sealift Appraisal and Program Considerations, 1 November 1977.

3. Whitehurst, D.H., Jr., "The National Defense Reserve Fleet: Past, Present, and Future," United States Naval Institute Proceedings, v. 103, p. 27-34, February 1977.

4. Jantscher, G.R., Bread Upon the Water: Federal Aids to the Maritime Industry, The Brookings Institution, 1975.

5. U.S. Navy, Fiscal Year 1979 Military Future and Budget of the United States Navy, by J. L. Holloway, III, March 1978.

6. Military Sealift Command, Military Sealift Command, February 1978.

7. U.S. Congress, House, Committee on Merchant Marine and Fisheries, Subcommittee on Merchant Marine, Maritime Authorizations - FY 1978, Hearings, 95th Cong., 1st sess., Washington, D.C.: GPO, 1977.

8. U.S. Department of Commerce, MARAD '77, Maritime Administration, May 1978.

9. U.S. Department of Commerce, Ready Reserve Fleet Plan, Maritime Administration, December 1977.

10. U.S. Department of Commerce, Ships in the National Defense Reserve Fleet - By Design, Maritime Administration, June 1978.

11. Bryon, R.A. and Sparks, C.J., "The National Defense Reserve Fleet: An Essential Element of National Defense," Naval Engineers Journal, p. 1-5, June 1977.

12. Memorandum of Agreement Between the Department of the Navy and the Department of Commerce, dtd 2 November 1976.

13. General Accounting Office, Report B-118779, The National Defense Reserve Fleet - Can It Respond to Future Contingencies?, 6 October 1976.

14. Brown, J., Data Analyst MSC, Washington, D.C., Personal Interview, 21 June 1978.

15. Clark, G., Ass't Reserve Ship Division Director MARAD, Washington, D.C., Personal Interview, 22 June 1978.

16. Merchant Marine Act 1936, The Shipping Act of 1916, and Related Acts, U.S. Govt. Print. Office, 1975.

17. Office Chief of Naval Operations, Sealift Requirements Study - Preliminary Report of Phase I, 1967.

18. U.S. Congress, House, Committee on Merchant Marine and Fisheries, Subcommittee on Merchant Marine, Vietnam Shipping Policy Review, Part 3, Hearings, 89th Cong. 2nd sess., Washington, D.C., GPO, 1966.

19. Bryon, R., Chief Division of Reserve Fleet MARAD, Washington, D.C., Personal Interview, 22 June 1978.

20. Military Sealift Command, Inspection Report on Visit to James River Fleet, 12 May 1976.

21. Military Sealift Command, Report on Condition of Seatrain Ships in NDRF James River Fleet, 26 April 1976.

22. Memorandum of Understanding Between Assistant Administrator for Operations, Maritime Administration and Chief, Office of Merchant Marine Safety, U.S. Coast Guard, dtd 29 April 1977.

23. Encyclopedia Americana, 39th ed., v. 19, p. 788, Americana Corporation, 1970.

24. Maritime Administration Unclassified Letter to the Honorable Richard E. Wiley, Chairman, Federal Communications Commission, Washington, D.C., Subject: Licensing of Radio on Board Vessels of the National Defense Reserve Fleet, 29 September 1975.

25. ITT Mackay Marine Unclassified Letter EAE 813-75 to Mr. Robert A. Bryon, Division of Ship Management, MARAD, Subject: Compliance with FCC, SOLAS, ITU Regulations of NDRF, 14 October 1975.

26. Federal Communications Commission Unclassified Letter Serial 7210-14 to Mr. John Nachtsheim, Executive Director, National Shipping Authority, MARAD, Subject: FCC Waiver of Regulations in Case of NDRF, 29 October 1975.

27. U.S. Congress, House, Committee on Armed Services, Sea Power Subcommittee, Current Status of Shipyards - 1974, Part 3, Hearings, 93rd Cong., 2nd sess., Washington, D.C., GPO, 1974.

28. U.S. Department of Commerce, Report on Survey of U.S. Shipbuilding and Repair Facilities, Maritime Administration, December 1977.

29. National Academy of Sciences, The Seagoing Workforce, Implications of Technological Change, Maritime Transportation Research Board, September 1974.

30. U.S. Department of Commerce, Deck and Engine Officers in the U.S. Merchant Marine, Supply and Demand, 1976-1985, Maritime Administration, March 1977.

31. Military Sealift Command Unclassified Memorandum to RADM S.H. Moore, Commander Military Sealift Command, Subject: Termination of Authority to Withdraw Ships From the NDRF, 3 December 1976.

32. Military Sealift Command, Report of Military Sealift Command Analysis of Candidate Ships for the National Defense Reserve Fleet Ready Reserve Force, 2 September 1976.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Documentation Center Cameron Station Alexandria, Virginia 22314	2
2.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
3.	Department Chairman, Code 54 Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
4.	Commander Jerry Douglas Horton, USN, Code 54Ht Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	LT William B. Evers, USN 5412 Dalrymple Street Virginia Beach, Virginia 23462	1
6.	Asst. Professor Robert W. Sagehorn, Code 54Sn Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1