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An analysis of candidate ship classes as potential Naval Reserve trainers.

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AN ANALYSIS OF CANDIDATE SHIP CLASSES AS POTENTIAL NAVAL RESERVE TRAINERS

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THESIS

AN ANALYSIS OF CANDIDATE SHIP CLASSES
AS POTENTIAL NAVAL RESERVE TRAINERS

by

Michael Hoert

March 1980

Thesis Advisor: K. Euske

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Operating and upkeep costs for each alternative were analyzed to provide other information relevant to training ship assignments. Costs included were direct costs regularly incurred, exclusive of extraordinary items.

Two conclusions were drawn from the findings. First, the mission of the training ship program could be accomplished with fewer ships than now assigned. Second, the cost advantage of LST-1179 Class tank landing ships is offset by its lesser ability to train critical ratings for the fleet.

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An Analysis of Candidate Ship Classes as Potential Naval Reserve Trainers

by

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Lieutenant, United States Navy
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requirements for the degree of

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March 1980

ABSTRACT

Four ship classes were analyzed as candidates for Naval Reserve training assignments. They are FF-1040 and FF-1052 Class frigates, DD-931 Class destroyers, and LST-1179 Class tank landing ships. Reserve crew billets proposed for each alternative were compared to FY 1980 Naval Reserve manpower availability in seventeen seaport localities to identify training ship assignment options. For each option, the possibility of a second reserve training crew was investigated.

Operating and upkeep costs for each alternative were analyzed to provide other information relevant to training ship assignments. Costs included were direct costs regularly incurred, exclusive of extraordinary items.

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I. INTRODUCTION

Since 1973 the U.S. Armed Forces have been manned according to the total force concept [Binkin, 1974]. The total force has been described by the President's Defense Manpower Commission as the combination of active duty and reserve military personnel, government employees, and industrial contractors [Defense Manpower Commission, 1976]. There are two reasons why this defense design was adopted. The first reason is that the total force concept defines the manpower resource base such that the U.S. can maintain a peacetime military force capable of a rapid increase in size. The second reason is that the use of a total force concept reduces the monetary and social costs to the citizens which would be necessary if the U.S. were to maintain an armed force sufficient to simultaneously meet all of its military commitments around the world [Binkin, 1974].

The reserves comprise about one-third of the three million men and women serving in the military portion of the total force [Hessman, 1978]. The mission and purpose of the nation's military reserve is defined under Title 10, Section 262 of the U.S. Code as follows:

> The purpose of each reserve component is to provide trained units and qualified persons available for active duty in the armed forces, in time of war or National emergency and at such other times as the National security requires. To fill the needs of the armed forces whenever, during and after the period needed to procure and train additional units and qualified persons to achieve the planned mobilization, more units and persons are needed than are in the regular components.

There are seven reserve military components [Binkin 1974]. These are the Army National Guard, Army Reserve, Naval Reserve, Marine Corps Reserve, Air Force Reserve, Air National Guard, and Coast Guard Reserve. These seven reserve components serve as a standby adjunct to one of the five military services. The Navy's standby reserve component is the Naval Reserve. The focus of this paper is on the quality and quantity of training equipment available to the Naval Reserve and specifically the surface ship portion of the Naval Reserve.

The surface Naval Reserve has been provided with training ships on a regular basis since the end of the Second World War. These training ships initially came from the large inventory of surplus vessels held by the Navy after demobilization in 1946 [Evans, 1979]. Since that time, training ships transferred to the Naval Reserve have been those with outmoded technology being phased out of the fleet as a result of ship construction or modernization programs [Evans, 1979]. Current Navy policy is that less capable ships will continue to be transferred into the Naval Reserve provided they have reasonable remaining service life [Chief of Naval Operations (a), 1978].

Of the fifty ships operating as Naval Reserve trainers in 1979, nearly one-half were World War II vintage destroyers [Dept. of Defense FY80 Appropriations, House Hearings]. Due to their operational unreliability and obsolescent design, the Program Objectives Memorandum (POM) for the 1980

Department of Defense budget included retirement without replacement of nearly all of these old destroyers [U.S. Dept of Defense (b), 1979]. However, unfavorable response from Congress to the proposed reduction in the surface ship portion of the Naval Reserve caused the Navy to reprogram the 1980 budget and keep most of the old training ships in service [Tuck, 1979]. Although the reprogramming action prevented their retirement in 1980, the old Naval Reserve training destroyers are five years past their useful life expectancy and must eventually be placed out of service [Dept. of Defense FY80 Appropriations, House Hearings]. When these ships are finally retired it will be necessary to decide what replacement ships, if any, will serve as Naval Reserve training platforms.

If it is decided that replacement ships can be made available for Naval Reserve training assignments, the ships involved and their homeport locations will have to be determined. These last two decisions are the basis for the analysis presented in this paper.

In addition to strong Congressional support for the Naval Reserve, at least three other conditions should be considered prior to analyzing the use of surface ships as Naval Reserve training vessels. These are the candidate ships available, the availability of manpower, and the cost of operating ships.

The first factor, the availability of training hardware, considers the Navy's surface force which includes all ships

except for aircraft carriers and submarines. The surface force is expected to increase in numbers of ships through 1985, as shown in Table 1. The projected figures shown in Table 1 primarily result from expected construction and delivery schedules for the FFG-7 Perry Class guided missle fast frigates. Should overseas deployment, regular overhaul cycles and ship retirement schedules remain unchanged, the fleet will have a greater number of surface ships by the mid-1980's [Redfern, 1979].

The second factor is the availability of active duty and reserve manpower. Active duty personnel shortages are expected in twenty-four enlisted ratings for at least the next five years [Koehler (b), 1979]. Each enlisted rating is analogous to a civilian trade in that a set of technical skills relating to specific equipment is required for initial entry into the specialty area and the level of required technical knowledge increases as individuals advance in pay status. Of the twenty-four ratings expected to remain undermanned, as many as thirteen are applicable to surface ships whose older technology could make them candidates for duty as training ships [Chief of Naval Operations (e), 1979].

Table 2 is provided to compare projected 1980 active duty manpower shortages in these thirteen rating areas with the availability of Naval Reservists near major seaports. This particular portion of the total Naval Reserve population is significant because the 100 mile travel authorization limit to and from the training site essentially limits the regular

TABLE 1

SURFACE FORCE PROJECTED GROWTH (FY 1980 THROUGH FY 1985)

Atlantic Fleet Strength (Less NRF* Destroyers)

Ship Type	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
Destroyers	24	24	24	25	25	25
Guided Missile Destroyers	21	23	23	24	25	25
Fast Frigates	29	29	29	29	29	29
Guided Missile Fast Frigates	6	12	18	22	26	30
Total	80	88	94	100	105	109

Pacific Fleet Strength (Less NRF* Destroyers)

Ship Type	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
Destroyers	19	19	19	19	19	19
Guided Missile Destroyers	16	16	16	16	18	18
Fast Frigates	30	30	30	30	30	30
Guided Missile Fast Frigates	6	18	12	15	18	19
Total	71	83	77	80	85	86

Notes: No escort ship retirements (non-NRF) are programmed through FY 1985. The number of LSTs in service is expected to remain constant at 20 ships through FY 1985.

*Naval Reserve Force

Data Source: (Redfern, 1979)

TABLE 2

COMPARISON OF NAVY-WIDE ACTIVE DUTY
PERSONNEL SHORTAGES WITH NAVAL RESERVE PERSONNEL
AVAILABILITY IN COASTAL PORT VICINITIES
(FOR FY 1980)

(Active duty personnel shortages or surpluses are shown in the left-hand side of each paygrade column. Availability of Naval Reserve personnel is shown on the right)

	E-4	E-5	E-6	E-7	E-8	E-9
BT	+254/135	-517/117	-304/92	-35/39	-6/7	-60/5
EN	-456/256	-256/165	-116/171	-25/101	-15/38	-16/12
ET	+384/150	-347/119	-348/220	-64/72	-43/13	-33/8
EW	+ 88/32	- 29/ 15	-104/ 14	-15/ 5	- 4/ 1	-3/0
FTG	-104/81	-98/ 41	-194/ 32	-18/24	-	-
FTM	-159/13	+170/16	-446/ 29	-18/15	-	-
GMG	+ 63/112	- 78/100	- 73/47	-30/27	-	-
GMT	-134/ 18	- 98/ 14	-108/ 9	- 7/ 9	- 7/ 1	+2/0
HT	-741/310	-637/207	-435/214	-48/151	-24/29	-19/6
OS	-731/124	-216/118	-523/70	-27/53	-20/ 5	-12/6
RM	- 63/362	-280/256	-200/43	-59/66	-41/ 6	-27/3
STG	-205/67	-172/39	-170/33	-15/26	-14/ 9	- 4/2
TM	-431/24	- 76/43	-58/35	-16/24	- 8/ 6	-16/2

Legend

BT - Boiler Technician
EN - Engineman
ET - Electronics Technician
EW - Electronics Warfare Technician
FTG- Fire Control Technician(Guns)
FTM- Fire Control Technician(Missiles)
GMG- Gunner's Mate(Guns)
GMT- Gunner's Mate (Technical)
HT - Hull Technician
OS - Operations Specialist
RM - Radioman
STG- Sonar Technician (Surface)
TM - Torpedoman's Mate

Data Source: (Koehler (b), 1979 and Naval Reserve Personnel Center, 1979)

use of a training ship to this group [Bureau of Naval Personnel, 1979]. The figures in Table 2 show that for some ratings and paygrades, the coastal seaport portion of the Naval Reserve population could supply manpower to fill many or all of the projected active duty billet vacancies, However, although these individuals are available, their geographic dispersion may affect decisions regarding the types of training ships to choose and their homeport locations.

The third factor is the cost of owning and operating ships whose primary mission is to train Naval Reserve personnel for wartime contingencies. Because of the high cost of transporting Naval Reservists overseas to meet their ships for two week annual training periods, Naval Reserve training ships have not deployed on a regular basis since 1974 [Evans, 1979]. However, since nearly all other ships in the fleet routinely deploy to project a U.S. presence overseas, the operation of local Naval Reserve training ships could be regarded as a drain on the budget resources otherwise available to the peacetime deploying force. Therefore, with this in mind, the analysis will investigate the feasibility of operating a smaller less-costly number of Naval Reserve training ships, each training a greater number of reserve personnel.

In choosing the ship classes analyzed in this study, three criteria were used. The first two are part of the Navy's policy for transfers to the Naval Reserve. These are reasonable remaining service life and less operational

capability compared to more recent designs [Chief of Naval Operations (a), 1978]. The third criterion is that each class chosen contain a sufficient number of ships to allow its consideration as a major source of Naval Reserve training hardware. Four classes of ships met these criteria and were analyzed as potential Naval Reserve training platforms. These four are DD-931 Forest Sherman Class Destroyers, FF-1040 Garcia Class Fast Frigates, FF-1052 Knox Class Fast Frigates, and LST-1179 Newport Class Tank Landing Ships.

II. METHOD OF ANALYSIS

A. DISCUSSION

The analysis is divided into two sections: reserve manpower availability and training ship annual cost. The analysis is divided because of the possibility that more than one training ship's reserve mobilization crew manpower requirements could be filled with the personnel available in a specific locality. In case this should occur, the cost of ship ownership could be used to choose between alternatives.

In order to more fully understand the method of analysis, current Naval Reserve training ship background information is included. The background information aids understanding because the information provides a basis for the shipboard manning design proposed for each of the four training ship alternatives. The shipboard manning design in turn defines the cost of manpower which is a factor in the analysis of the cost of operating and maintaining a training ship.

B. MANPOWER ANALYSIS

The Navy's reserve training destroyers are currently manned with a composite crew consisting of about two-thirds active duty (nucleus crew) personnel and one-third Naval Reservists (reserve mobilization crew) [Evans, 1979]. The

nucleus crew is deliverately undermanned in order to accommodate the reserve mobilization crew for one training weekend at sea each month and for a two week underway period each year. Although undermanned, the nucleus crew is capable of operating the ship at sea in a limited combat capacity without support from the reserve mobilization crew [U.S. Dept of Defense (a), 1979]. In the event of a reserve mobilization, both crews serve together on a full-time basis enabling the training ship to assume a regular combat role in the fleet.

The method for determining the nucleus/reserve mobilization crew manning structure for each class of training ship included in the analysis is based on the requirements specified for standard conditions of manning readiness in the OPNAV Instruction 5320 series as follows:

> A condition of manning readiness is a description of a unit preparedness relative to the general degree of readiness in effect. As applied to manning, each condition of readiness prescribes a combination of operational, maintenance, administrative, and support capabilities which require simultaneous or zero delay response requiring a designated portion of unit personnel to be alert and actively performing assigned duties.

There are five conditions of manning readiness [Chief of Naval Operations (b) through (e)]. The requirements of each one are listed in Table 3. Beginning with a full shipboard manning allowance at condition I, the manning conditions of readiness shown in Table 3 identify the relationship between reductions in shipboard manpower and expected combat capability.

TABLE 3

MANNING CONDITIONS OF READINESS

Condition	Requirements
I	All personnel are alert and all ship systems are manned and operating. No maintenance other than urgent repairs or that normally performed on watch is expected. Crew endurance at condition I is expected to be 24 hours.
II	Required ship systems are continuously manned and operating. At least 4 to 6 hours rest will be provided each man per day. Performance of crew support functions and urgent preventive maintenance is expected. Crew endurance at condition II is expected to be 10 days.
III	Ship systems are manned and operating as necessary. Accomplishment of normal underway maintenance, support, and administrative functions is expected. Each man is to receive the opportunity for 8 hours rest per day. Crew endurance at condition III is expected to be 60 days.
IV	Ship systems are manned only to the extent necessary for a safe and effective ship control, propulsion, and security watch. Accomplishment of underway maintenance, administrative, and support functions is expected. Maximum advantage is to be taken of training opportunities. Crew endurance at condition IV is not manpower constrained.
V	Watchstations are assigned as required to provide adequate security. An adequate number of personnel are on board to meet potential import emergencies. Accomplishment of maintenance, support, and administrative functions is expected. Maximum advantage is to be taken of training opportunities. Providing these requirements are met, the crew is to be provided maximum opportunity for rest, leave, and liberty.

Source: (Chief of Naval Operations (b) through (e))

In order to provide a basis for comparison between the proposed training ship alternatives, nucleus crew manning assignments were primarily based on condition III watch-station requirements. The reserve mobilization crew was designed to have sufficient personnel depth and range such that the nucleus/reserve mobilization crew combination will permit the training ship to meet all of the requirements of manning condition I.

Once the nucleus and reserve mobilization crew manpower assignments for each training ship alternative were made, each training ship alternative was then compared with the surface Naval Reserve population in the vicinity of the major seaports to determine which ships, if any, were compatible with the reserve manpower available in each locality. The geographic area included in each seaport locality analyzed is bounded by the 100 mile travel limit authorized for a Naval Reservists to and from the reservist's training site [Bureau of Naval Personnel, 1978].

If the mobilization crew billets in any proposed training ship could be filled using the local Naval Reserve population, the remainder of that locality's population would then be reviewed to determine the availability of additional personnel in the critical ratings listed in Table 2. There are two reasons for doing this. The first is to explore the possibility of utilizing the ships to provide training for additional reservists having technical skills needed in the fleet. The second reason is to provide the decision-maker with additional information for the determination of

homeport locations in the event not enough ships are available for transfer to the Naval Reserve.

C. COST ANALYSIS

Upon completion of the manpower portion of the analysis, the annual cost to the Navy of operating each training ship alternative was compared. There are two reasons for doing a training ship cost analysis. The first is to provide additional information to aid in deciding which ships should be assigned to the Naval Reserve. The second is to provide another means to evaluate each alternative when a more than one class of ship could be assigned to any of the seaport locations being considered. The training ship cost analysis includes the following items of ordinary operating cost:

a. Nucleus Crew Personnel Costs
b. Shipboard Upkeep and Maintenance Costs
c. Intermediate Maintenance Availability (IMA) Costs
d. Propulsion Fuel Costs
e. Regular Overhaul Costs
f. Base Utility Service Costs

The six cost items were included in the analysis because they are costs regularly incurred throughout each training ship alternative's life cycle.

D. SUMMARY

This chapter describes a method of analysis which was used to compare four alternative classes of ships to determine their application as Naval Reserve training ships.

The analysis describedwas used to compare each training ship alternative based on Naval Reserve manpower availability in selected seaport localities and annual operating costs. The purpose of the manpower analysis was to determine which ships among the four alternatives are feasible training ship assignment options. The purpose of cost analysis is to provide additional information which could affect a training ship assignment decision. In the next chapter, the availability of Naval Reserve manpower is compared with the reserve mobilization crew manning requirements of each training ship alternative. In localities where training ship assignments are feasible, the extent to which a second reserve crew is available is also determined.

III. RESERVE TRAINING SHIP MANPOWER ANALYSIS

The reserve training ship manpower analysis is divided into four sections. The first section includes nucleus and reserve crew manning proposals for each training ship alternative on the basis of the conditional manpower requirements specified in the Ship's Manpower Document (SMD). Reasons for any exceptions to SMD manning requirements are included for each crew proposal. The second section presents the ship class and homeport assignment combinations found feasible when reserve crew requirements were compared to the seaport Naval Reserve population. Included in the section are additional ship class and homeport assignment combinations that were feasible when reserve crew manning requirements were lowered. The third section contains a manning proposal for an additional reserve training crew and the results obtained when these manning proposals were compared to the remaining Naval Reserve population in localities where ship assignments were found feasible. The fourth section discusses the potential degradation in training ship maintenance and underway endurance due to reduced active duty manning.

A. TRAINING SHIP MANNING PROPOSALS

The nucleus and reserve mobilization crew manpower proposals made for each training ship alternative are shown in Tables 4 through 7. For each training ship alternative, the proposed nucleus crew varies slightly from

TABLE 4

THE DD-931 FOREST SHERMAN CLASS DESTROYER
PROPOSED ACTIVE/RESERVE MANNING STRUCTURE

Rating	Nucleus Crew	Reserve Crew
QM	1 E-6, 1 E-4, 1 E-3	1 E-5, 1 E-4
BM	1 E-7, 3 E-4, 3 E-3	2 E-5, 1 E-6, 3 E-3
SM	1 E-6, 1 E-4, 2 E-3	1 E-5, 1 E-4
STG	1 E-6, 2 E-5, 3 E-3	1 E-7, 3 E-4, 2 E-3
STG*	1 E-6, 3 E-5, 3 E-4, 3 E-3	1 E-7, 1 E-6, 1 E-5, 1 E-4, 1 E-3
TM	1 E-5	1 E-3
GMT*	1 E-6, 1 E-4	3 E-5, 2 E-4
GMG	1 E-7, 5 E-5, 3 E-4, 2 E-3	1 E-6, 1 E-5, 5 E-4, 1 E-3
GMG*	1 E-7, 3 E-4, 3 E-4, 1 E-3	1 E-6, 1 E-5, 1 E-4, 2 E-3
FTG	2 E-6, 3 E-5, 4 E-4, 1 E-3	1 E-7, 2 E-5, 4 E-4, 3 E-3
FTM	Not Applicable to DD-931	
ET	1 E-6, 1 E-4, 1 E-4, 1 E-3	1 E-5, 2 E-4, 1 E-3
OS	1 E-7, 1 E-6, 1 E-5, 2 E-4, 3 E-3	2 E-6, 4 E-4, 5 E-3
EW	1 E-7, 1 E-5, 1 E-4	1 E-5, 1 E-4, 2 E-3
RM	1 E-7, 1 E-6, 2 E-5, 3 E-4, 2 E-3	1 E-6, 2 E-4, 1 E-3
YN	1 E-6, 1 E-3	1 E-3
PN	1 E-7, 1 E-3	1 E-4
DK	1 E-6	1 E-3
MS	2 E-6, 2 E-5, 2 E-4, 3 E-3	1 E-7, 1 E-5, 3 E-4, 1 E-3
SH	1 E-5, 2 E-4, 1 E-3	0
SK	1 E-7, 1 E-4, 1 E-3	1 E-6, 1 E-4, 1 E-3
BT	1 E-7, 2 E-6, 5 E-5, 11 E-4, 12 E-3	1 E-8, 1 E-6, 2 E-5, 7 E-4, 3 E-3
MM	1 E-9, 1 E-7, 2 E-6, 6 E-5, 10 E-4, 6 E-3	1 E-7, 1 E-6, 4 E-5, 4 E-4
MR	1 E-5	0
EN	1 E-6, 1 E-4	0
IC	1 E-6, 1 E-5, 1 E-4	1 E-4, 2 E-3
HT	1 E-6, 1 E-5, 2 E-4, 1 E-3	1 E-7, 1 E-6, 1 E-4, 1 E-3
EM	1 E-6, 1 E-5, 2 E-4, 1 E-3	1 E-7, 1 E-5, 2 E-4
FN	16 non-designated personnel	4 non-designated personnel
HM	1 E-7	1 E-3
SN	32 non-designated personnel	6 non-designated personnel
SN*	35 non-designated personnel	6 non-designated personnel

*Applicable to ships of this class which received ASW (Anti-Submarine Warfare) conversions

Total Assigned - 209 Active Duty Enlisted (*217 in ASW ships) - 117 Reserve personnel

Data Source: (Chief of Naval Operations (d), 1977)

TABLE 5

THE FF-1040 GARCIA CLASS
FAST FRIGATE
PROPOSED ACTIVE/RESERVE MANNING STRUCTURE

Rating	Nucleus Crew	Reserve Crew
QM	1 E-6, 1 E-4, 1 E-3	1 E-5, 1 E-4
BM	1 E-7, 1 E-5, 3 E-4, 2 E-3	1 E-6, 2 E-5, 3 E-4, 3 E-3
SM	1 E-6, 1 E-4, 2 E-3	1 E-5, 1 E-4
STG	1 E-7, 2 E-6, 4 E-5, 1 E-4, 2 E-3	1 E-6, 3 E-4, 2 E-3
TM	1 E-5	1 E-4
GMT	1 E-6, 1 E-4	3 E-5, 2 E-4
GMG	1 E-6, 1 E-5, 2 E-4	1 E-5, 2 E-3
FTG	1 E-6, 1 E-5, 3 E-4, 4 E-3	1 E-7, 2 E-6, 1 E-5
FTM	Not Applicable to FF-1040	
ET	1 E-7, 1 E-5, 2 E-4, 2 E-3	1 E-6, 1 E-5, 1 E-4, 2 E-3
OS	1 E-7, 1 E-6, 2 E-5, 2 E-4, 3 E-3	2 E-6, 2 E-5, 4 E-4
EW	1 E-7, 1 E-5, 2 E-4	1 E-5, 1 E-4, 2 E-3
RM	1 E-7, 1 E-6, 1 E-5, 2 E 4, 2 E-3	1 E-6, 1 E-5, 3 E-4, 1 E-3
YN	1 E-6, 1 E-4	0
PN	1 E-7	1 E-4, 1 E-3
DK	1 E-6	1 E-3
MS	2 E-6, 1 E-5, 2 E-4, 2 E-3	1 E-8, 1 E-6
SH	1 E-5, 2 E-4, 1 E-3	0
SK	1 E-7, 1 E-4, 1 E-3	1 E-6, 1 E-5
BT	1 E-9, 1 E-6, 5 E-5, 6 E-4, 6 E-3	2 E-6, 2 E-5, 3 E-3
MM	1 E-8, 1 E-7, 2 E-6, 4 E-5, 6 E-4, 3 E-3	1 E-6, 1 E-5, 2 E-4, 1 E-3
MR	1 E-5	0
EN	1 E-6, 1 E-4	1 E-5
IC	1 E-6, 1 E-5, 1 E-4	1 E-4, 1 E-3
HT	1 E-6, 1 E-5, 3 E-4, 1 E-3	1 E-7, 2 E-6, 1 E-5
EM	1 E-6, 1 E-5, 2 E-4, 1 E-3	1 E-7, 1 E-4, 2 E-3
FN	12 non-designated personnel	4 non-designated personnel
HM	1 E-7	1 E-3
SN	32 non-designated personnel	6 non-designated personnel

Total Assigned - 181 Active Duty Enlisted - 96 Reserve Crew Personnel

Data Source: (Chief of Naval Operations (b), 1977)

TABLE 6

THE FF-1052 KNOX CLASS
FAST FRIGATE
PROPOSED ACTIVE/RESERVE MANNING STRUCTURE

Rating	Nucleus Crew	Reserve Crew
QM	1 E-6, 1 E-4, 1 E-3	1 E-5, 1 E-4
BM	1 E-7, 3 E-4, 3 E-3	1 E-6, 2 E-5, 2 E-4, 4 E-3
SM	1 E-6, 1 E-4, 2 E-3	1 E-5, 1 E-4
STC	1 E-8, 2 E-6, 2 E-5, 2 E-4, 3 E-3	1 E-6, 2 E-5, 3 E-4, 2 E-3
TM	1 E-5	1 E-4
GMT	1 E-6, 1 E-4	2 E-5, 1 E-4
GMG	1 E-6, 1 E-5, 1 E-4, 2 E-3	1 E-5, 1 E-4, 2 E-3
FTG	1 E-7, 1 E-5, 1 E-4, 1 E-3	1 E-6, 1 E-5, 2 E-4
FTM	1 E-6, 1 E-4	1 E-5, 1 E-4, 2 E-3
ET	1 E-7, 1 E-5, 3 E-4	1 E-6, 2 E-5, 1 E-4
OS	1 E-7, 1 E-6, 2 E-5, 2 E-4, 2 E-3	2 E-6, 1 E-5, 4 E-4, 7 E-3
EW	1 E-7, 1 E-5, 1 E-4	1 E-5, 1 E-4, 2 E-3
RM	1 E-6, 2 E-5, 3 E-4, 2 E-3	1 E-7, 1 E-6, 2 E-4
YN	1 E-6, 1 E-4	0
PN	1 E-7	1 E-4
DK	1 E-6	1 E-3
MS	2 E-6, 1 E-5, 2 E-4, 2 E-3	1 E-7
SH	1 E-5, 2 E-4, 1 E-3	0
SK	1 E-7, 1 E-4, 1 E-3	1 E-6, 1 E-5
BT	1 E-9, 2 E-6, 4 E-5, 6 E-4, 7 E-3	1 E-5, 1 E-6, 2 E-3
MM	1 E-7, 2 E-6, 3 E-5, 5 E-4, 6 E-3	1 E-8, 3 E-4, 2 E-3
MR	1 E-5	0
EN	1 E-6, 1 E-4	0
IC	1 E-6, 2 E-4	1 E-5, 2 E-3
HT	1 E-6, 2 E-5, 1 E-4, 1 E-3	1 E-7, 1 E-6, 1 E-5, 2 E-4
EM	1 E-6, 1 E-5, 2 E-4, 1 E-3	1 E-7, 1 E-4, 1 E-3
FN	12 non-designated personnel	3 non-designated personnel
HM	1 E-7	1 E-3
SN	29 non-designated personnel	5 non-designated personnel

Total Assigned - 175 Active Duty Enlisted, 98 Reserve Crew Enlisted Personnel

Data Source: (Chief of Naval Operations (c), 1977)

TABLE 7

THE LST-1179 NEWPORT CLASS
AMPHIBIOUS TANK LANDING SHIP
PROPOSED ACTIVE/RESERVE MANNING STRUCTURE

Rating	Nucleus Crew	Reserve Crew
QM	1 E-6, 1 E-5, 1 E-4	2 E-4
BM	1 E-7, 1 E-5, 4 E-4	1 E-7, 1 E-5, 3 E-4
SM	1 E-6, 2 E-4, 1 E-3	1 E-5, 1 E-4, 1 E-3
STG	Not Applicable to LST-1179 Class	
TM	Not Applicable to LST-1179 Class	
GMT	Not Applicable to LST-1179 Class	
GMG	1 E-6, 2 E-5, 1 E-4, 3 E-3	1 E-7, 1 E-5, 1 E-4, 6 E-3
FTG	1 E-6, 1 E-5, 2 E-4, 3 E-3	1 E-7, 1 E-5, 2 E-3
FTM	Not Applicable to LST-1179 Class	
ET	1 E-6, 1 E-5, 1 E-4	1 E-5, 1 E-4
OS	1 E-7, 2 E-5, 2 E-4, 2 E-3	1 E-6, 1 E-5, 2 E-4, 2 E-3
EW	Not Applicable to LST-1179 Class	
RM	1 E-7, 1 E-6, 1 E-5, 2 E-4, 3 E-3	1 E-6, 1 E-5, 3 E-4
YN	1 E-6, 1 E-3	1 E-3
PN	1 E-6	1 E-4
DK	1 E-6	1 E-3
MS	2 E-6, 1 E-5, 2 E-4, 2 E-3	1 E-7, 2 E-3
SH	1 E-5, 2 E-4, 1 E-3	0
SK	1 E-7, 1 E-4, 1 E-3	1 E-5, 1 E-3
BT	1 E-6, 1 E-4, 1 E-3	1 E-4
MM	Not Applicable to LST-1179 Class	
MR	1 E-5	0
EN	1 E-9, 2 E-6, 4 E-5, 5 E-4, 6 E-3	1 E-7, 2 E-6, 2 E-5, 4 E-4, 4 E-3
IC	1 E-6, 2 E-4	1 E-5
HT	1 E-6, 1 E-5, 3 E-4	1 E-7, 1 E-6, 1 E-5, 2 E-3
EM	1 E-7, 4 E-4, 2 E-3	1 E-6, 2 E-5, 1 E-3
FN	16 non-designated personnel	5 non-designated personnel
HM	1 E-7	1 E-4, 1 E-3
SN	42 non-designated personnel	8 non-designated personnel
Total Assigned - 159 Active Duty Enlisted - 83 Reserve Crew Personnel		

Data Source: (Chief of Naval Operations (c), 1976)

condition III watchstation requirements specified in the SMD. The reasons for exceptions to these nucleus crew manning assignments is shown for each proposal in Table 8. In most cases, billet substitutions were made to provide divisional leaders, experienced maintenance technicians or support services for the nucleus crew. In all cases, the combination of nucleus and reserve mobilization crews meets all requirements specified in the SMD for condition I.

B. TRAINING SHIP CLASS AND HOMEPORT ASSIGNMENTS

1. The Naval Reserve Seaport Population

Data describing the Naval Reserve population in the vicinity of sixteen continental U.S. ports and Hawaii is included in Appendix A. Other seaport localities were not included for two reasons. Either the Naval Reserve population in these localities was too small, or, in the case of the Great Lakes, treaty provisions with Canada eliminated them as potential training ship homeports. The data shown in Appendix A is an onboard personnel count as of December, 1979 in a total of fifty-five separate Naval Reserve training centers. Data regarding the extent to which the Naval Reserve population shifts over time was not available. For this reason, the population shown in Appendix A was assumed constant in the analysis.

2. Training Ship Manpower Requirements and Reserve Manpower Availability

The data shown in Table 9 is a summary presentation of the results obtained when the reserve crew manpower

TABLE 8

EXCEPTIONS TO CONDITION III MANNING REQUIREMENTS FOR EACH TRAINING SHIP ALTERNATIVE

Reason for Exception*	Ship Class DD-931	FF-1040	FF-1052	LST-1179
A.	QM,BM,SM, GMG,EW,RM, IC,EM,HT	QM,BM,IC, GMG,FTG,STG, EM,SM,HT	QM,BM,EW, IC,EM,FTG, SM,HT	QM,BM,SM, RM,HT,EN, BT,GMG
B.	SH,MS,HM, SK	SH,MS,HM SK	SH,MS,HM, SK	SH,MS,HM, SK
C.	ET,TM	ET,TM	ET,GMG,TM	ET
D.	BT,MM	BT,MM	BT,MM	-
E.	SM,OS,RM	OS,RM,SM, GMT	SM,RM,GMT, OS,FTM,HT	OS

*Reason for Exception

A. One E-6 or E-7 billet has been shifted from the reserve crew to the nucleus crew in place of a more junior man in the same rating. The substitution was made to provide divisional leading petty officers and work center supervisors for the nucleus crew.

B. No Condition III watchstations are listed in the SMD for these ratings. Nucleus crew assignments in these ratings are based on crew support requirements.

C. No Condition III watchstations are listed in the SMD for these ratings. Nucleus crew assignments in these ratings are based on equipment maintenance requirements.

D. Because Condition III and Condition I manning requirements are nearly identical, nucleus crew petty officer manning has been reduced to accommodate reserve crew personnel. However, Condition III watchstations can be filled by substituting non-designated firemen (FN,FA,FR) in place of junior petty officers.

E. Because Condition III and Condition watchstation requirements are nearly identical, nucleus crew manning has been reduced to two underway watch sections to make billets available in the reserve crew.

TABLE 9

PERCENTAGE OF RESERVE CREW MANPOWER REQUIREMENTS FOR EACH SHIP CLASS MET BY THE AVAILABLE NAVAL RESERVE POPULATION AT SELECTED SITES

	Ship Class and Proposed Reserve Crew Size			
	DD-931 117 Personnel	FF-1040 96 Personnel	FF-1052 98 Personnel	LST-1179 83 Personnel
Locality	Percentage of Naval Reserve Personnel Available to Fill Reserve Crew Billets in One Ship of Each Class			
Hawaii	50%	59%	56%	71%
Seattle*	88%	91%	87%	92%
Portland, Ore.	90%	91%	88%	100%
San Francisco*	95%	98%	94%	100%
Los Angeles*	98%	100%	92%	100%
San Diego*	91%	91%	92%	100%
Galveston, Tx.	92%	89%	85%	96%
Mobile, Ala.	90%	87%	86%	100%
Tampa, Fla.*	83%	83%	78%	89%
Mayport, Fla.*	77%	80%	71%	78%
Charleston, S.C.*	64%	68%	71%	70%
Norfolk, VA*	85%	86%	85%	93%
Baltimore, Md., Wash., D. C.	95%	91%	88%	99%
Philadelphia	98%	98%	100%	100%
New York, N.Y.*	100%	97%	98%	100%
Boston *	90%	88%	84%	90%

Notes

Localities marked with a single asterisk are homeports for other Reserve training ships (minesweepers and auxiliaries) that have not reached retirement age. To account for the Reserve personnel in these ships, the population in the applicable localities was reduced by each assigned training ship's reserve manning allowance prior to entry in the analysis.

Baltimore and Washington, D.C. were combined due to their proximity and the fact that the Potomac River's depth is insufficient for all alternatives other than the LST-1179 class.

requirements of each type of training ship were compared to the current availability of Naval Reservists in each locality. The comparison of the four training ship alternatives to the availability of Naval Reserve personnel was done in order to identify the degree to which the reserve population met 100 percent of the mobilization crew manpower requirements in each of the four training ship classes. The data in Table 9 illustrates this comparison in terms of the percentage of Naval Reservists available to fill mobilization billets aboard a ship of each class. For example, of the 96 reservists needed to fully augment the nucleus crew proposed for one FF-1040 class fast frigate, 83 percent were available in the Tampa, Florida locality.

The data in Table 9 indicates that seven of the localities have a Naval Reserve population large enough to fill all of the reserve mobilization crew manpower requirements in any one of the training ship alternatives considered. Of these seven localities, only three had a Naval Reserve population sufficient to augment more than one training ship. These localities were Los Angeles, Philadelphia, and New York City.

By maintaining the same size nucleus crew and slightly reducing the reserve mobilization crew manning requirements for each training ship, the number of ship assignment options increased. Table 10 shows the extent to which a five or ten percent reduction in reserve mobilization crew manning requirements resulted in more training ship and homeport

TABLE 10

ALTERNATIVE NAVAL RESERVE TRAINING SHIP HOME PORT
ASSIGNMENTS UNDER VARIOUS RESERVE CREW MANNING LEVEL REQUIREMENTS

Locality	Reserve Crew Manning Level		
	100%	95%	90%
	Possible Ship Assignments		
Hawaii	None	None	None
Seattle/Tacoma	None	None	1 LST-1179 Class, or 1 FF-1040 Class
Portland, Ore.	1 LST-1179 Class	1 LST-1179 Class	1 LST-1179 Class, or 1 DD-931 Class, or 1 FF-1040 Class
San Francisco	1 LST-1179 Class	1 LST-1179 Class, and 1 FF-1040 Class	1 LST-1179 Class, and 1 FF-1040 Class, or 1 LST-1179 Class, and 1 DD-931 Class
Los Angeles	1 LST-1179 Class, or 1 FF-1040 Class	1 LST-1179 Class, and 1 FF-1040 Class or 1 LST-1179 Class and 1 DD-931 Class	1 LST-1179 Class, and 1 FF-1040 Class, or 1 LST-1179 Class, and 1 FF-1052 Class, or 2 LST-1179 Class
San Diego	1 LST-1179 Class	1 LST-1179 Class	Any one ship chosen from the four available alternatives
Galveston	None	1 LST-1179 Class	1 LST-1179 Class, or 1 DD-931 Class
Mobile	1 LST-1179 Class	1 LST-1179 Class	1 LST-1179 Class, or 1 DD-931 Class
Tampa	None	None	None
Jacksonville	None	None	None
Charleston	None	None	None
Norfolk	None	None	1 LST-1179 Class
Wash., D. C.	None	None	None
Baltimore	None	None	1 LST-1179 Class
Baltimore and Wash., D.C.	None	1 LST-1179 Class, or 1 DD-931 Class	1 LST-1179 Class, or 1 DD-931 Class, or 1 FF-1040 Class
Philadelphia	1 LST-1179 Class, or 1 FF-1052 Class	1 LST-1179 Class, and any one of the other alternatives	Same options as indicated for 95% Reserve manning requirement
New York	1 DD-931 Class, or 3 LST-1179 Class	1 LST 1179 Class and any one of the other three alternatives, or 3 LST-1179 Class	Any combination of 2 LST-1179 class and any two ships chosen from the other three alternatives
Boston*	None*	None	1 LST-1179 Class, or 1 DD-931 Class

*Note: 1 DD-931 Class Reserve training ship is presently located in the Boston locality at Newport, Rhode Island

assignment options. However, it was also found that accepting a reduction in the manning of the training ship's reserve crew could affect its ability to serve as a combat unit upon mobilization. In some cases the reduction in size of the training ship's mobilization crew could only be made possible by accepting disproportionate reductions in one or two enlisted ratings such as operations specialist or fire control technician.

C. ADDITIONAL RESERVE CREWS

The availability of a second reserve crew for each of the training ship alternatives was considered to provide at sea training for reservists in critical rating areas whose mobilization assignments were elsewhere in the fleet. However, since each of the training ship alternatives have different equipment, the number of ratings applicable to form a second crew varried with the choice of training ships. For example of the thirteen undermanned ratings shown in Table 2 eight apply to the LST-1179 class ship and thirteen apply to the FF-1052 class frigate.

In areas where multiple ship assignment options were found, the availability of a second reserve crew became dependent on the extent to which the reserve population was depleted by the billet requirements of each training ships mobilization crew.

To facilitate the comparison of training ship alternatives, two conditions were imposed on the structure of the second reserve crew prior to determining its availability within the local Naval Reserve population. These conditions were:

a. The training ship location options chosen would be those shown in Table 13 using a 90% manning level requirement for the first reserve crew.

b. The second reserve crew would be composed of ten Naval Reservists in each rating shown in Table 2 which applied to the training ship.

The first condition was imposed because reducing the manning level requirements for the first reserve crew allowed a greater number of training ship assignments in most localities. The second condition was imposed because ten Naval Reservists in each applicable rating shown in Table 2 provided a second reserve crew nearly the size of the first. This situation diminishes the possibility of messing and berthing problems due to overcrowding.

Table 11 shows the results obtained by screening the available Naval Reserve population for a second reserve training crew. As the data indicates, there were no instances in which the availability of reservists was sufficient to completely man a second crew.

D. POTENTIAL PROBLEM AREAS

The nucleus crew manning proposals made for each of the training ship alternatives were designed to fulfill the

TABLE 11

AVAILABILITY OF NAVAL RESERVISTS TO FORM AN ADDITIONAL TRAINING CREW

(Ship Assignment Options Are Based On A 90% Manning Level Requirement in the Training Ship's Own Reserve Mobilization Crew)

Locality	Ship Assignment Option Using A 90% Reserve Mobilization Crew Manning Level	Number of Reserve Personnel Sought For a Second Crew	Percentage of Reserve Personnel Available For A Second Crew
Portland, Ore.	1. 1 LST-1179 Class	80	83%
	2. 1 DD-931 Class	110	57%
	3. 1 FF-1040 Class	120	61%
Seattle/ Tacoma, Wash.	1. 1 LST-1179 Class	80	79%
	2. 1 FF-1040 Class	120	69%
San Francisco	1. 1 LST-1179 Class &	80	66%
	1 DD-931 Class	110	65%
	2. 1 LST-1179 Class &	80	84%
	1 FF-1040 Class	120	68%
Los Angeles	1. 1 LST-1179 Class &	80	78%
	1 FF-1040 Class	120	68%
	2. 1 LST-1179 Class &	80	76%
	1 FF-1052 Class	130	70%
	3. 2 LST-1179 Class	80 each	83% each
San Diego	1. 1 LST-1179 Class	80	89%
	2. 1 FF-1040 Class	120	76%
	3. 1 FF-1052 Class	130	66%
	4. 1 DD-931 Class	110	67%
Galveston, Tx.	1. 1 LST-1179	80	74%
	2. 1 DD-931	110	47%
Mobile, Ala.	1. 1 LST-1179 Class	80	80%
	2. 1 DD-931 Class	110	49%
Norfolk, Va.	1. 1 LST-1179 Class	80	88%
Baltimore, Md. Wash., D. C.	1. 1 LST-1179 Class	80	98%
	2. 1 FF-1040 Class	120	82%
	3. 1 DD-931 Class	110	85%
Philadlephia	1. 1 LST-1179 Class &	80	93%
	1 FF-1040 Class	120	72%
	2. 1 LST-1179 Class &	80	93%
	1 FF-1052 Class	130	68%
	3. 1 LST-1179 Class &	80	89%
	1 DD-931 Class	110	75%
New York	1. 2 LST-1179 Class &	80 each	85% each
	2 FF-1040 Class	120 each	70% each
	2. 2 LST-1179 Class &	80 each	80% each
	2 FF-1052 Class	130 each	62% each
	3. 2 LST-1179 Class &	80 each	79% each
	2 DD-931 Class	110 each	75% each
Boston	1. 1 LST-1179 Class	80	78%
	2. 1 DD-931 Class	110	66%

Data Source: (Naval Reserve Personnel Center, 1979)

watchstation, administrative, and crew support requirements shown in Table 3 for manning condition of readiness III. However, a review of each Ship's Manpower Document indicates the possibility that two other manning conditions of readiness III requirements might be only partially met due to the reduction in the supply of full-time active duty manpower: shipboard maintenance and endurance at sea.

1. Shipboard Maintenance

The first of these requirements is the accomplishment of routine shipboard maintenance. Maintenance man-hour requirements are specified in the SMD for each ship in the fleet [Chief of Naval Operations (e), 1977]. These requirements are based on the time needed for equipment maintenance and repair, cleaning,and ship preservation [Chief of Naval Operations (e), 1977]. The nucleus crew manning proposals shown in Tables 4 through 7 reduce the number of active duty crew member assignments in the SMD by about one-third. Accordingly, the number of maintenance man-hours available are also reduced.

For example, in the FF-1052 class frigate, an average of 24.3 maintenance man-hours are assigned weekly to an E-5 in the Boiler Technician (BT) rating [Chief of Naval Operations (e), 1977]. A reduction in the number of BT's in paygrade E-5 will either increase the maintenance workload for other BT's assigned or cause a backlog of deferred maintenance. Table 12 shows the degree to which routine shipwide maintenance in the FF-1052 class frigate could be

TABLE 12

SUMMARY OF THE POTENTIAL REDUCTION OF ROUTINE MAINTENANCE IN THE FF-1032 KNOX CLASS FAST FRIGATE AS A RESULT OF REDUCED ACTIVE DUTY MANNING

Ship's Department	Included Enlisted Ratings	Routine Shipboard Maintenance(By Dept.)	Average Weekly Maintenance Loss (Percentage)
Executive	PN, YN, HM	26.5 Manhours	15%
Operations	SM, QM, ET, OS, EW, RM	466.	35%
Weapons	BM, GMG, FTG, FTM, GMT, STG, TM	1070.	40%
Engineering	MM, EN, MR, BT, EM, IC, HT, FN	1712.	25%
Supply	SK, MS, SH, DK	44.5	15%
Non-Designated Seamen(E-1,E-2,E-3)	SN, SA, SR	545.	20%
TOTAL MANHOURS (SHIPWIDE)		3864	30%

Data Source: (Chief of Naval Operations (e), 1977)

backlogged on a weekly basis as a result of a one-third reduction in the number of personnel in the active duty crew. The FF-1052 class frigate is the only training ship for which a maintenance backlog was analyzed. However, because of the general specifications by which all Navy ships are constructed, a similar kind of maintenance backlog could be expected in the other three training ship alternatives.

2. Endurance at Sea

Sixty days endurance at sea is the second manning condition of readiness III requirement which may only be partially satisfied by the nucleus crew proposed for each training ship alternative. There are two reasons why a reduction in underway endurance in condition III might be expected. The first is the possibility of higher equipment failure rates due to backlogged routine maintenance. The second reason is the lack of back-up personnel in the nucleus crew to keep watchstations manned in the event of crewmember absence or injury. Data was not available to aid in estimating each training ship's endurance at sea without reserve crew support. However, on the basis of current operating schedules, underway periods for reserve training ships do not normally exceed fourteen days [Evans, 1979].

E. SUMMARY

The nucleus and reserve crew manning assignments were developed from the SMD for each training ship alternative.

The reserve mobilization crew manpower requirements for each training ship were compared to the Naval Reserve population in seventeen seaport localities to determine the following:

a. The availability of training ship and homeport assignment options based on a 100% reserve vrew manning level requirement.

b. The availability of training ship and homeport assignment options at reserve crew manning levels of 95 percent and 90 percent.

A second reserve crew is proposed for each training ship alternative based on critical rating needs in the active fleet. The manning requirements proposed for the second reserve vrew were compared to the Naval Reserve population in localities where training ship assignments were found feasible.

IV. TRAINING SHIP COST ANALYSIS

In this chapter the four training ship alternatives are compared based on annual cost. Cost analysis is included to provide additional information which could be relevant to a decision concerning which ships, if any, should transfer to the Naval Reserve.

A. DISCUSSION

All funds specifically budgeted for Naval Reserve training ships in fiscal year 1980 (FY 80) were in the Military Personnel, Navy (MPN) and Operation and Maintenance, Reserve (O&M, R) appropriations [Dept. of Defense FY80 Appropriations, House Hearings]. Within these two appropriations, annual training ship expences charged directly to the ship are grouped into five separate cost areas as follows [Dept. of Defense FY80 Appropriations, House Hearings]:

a. Nucleus Crew Personnel Costs
b. Operating Target (OPTAR) Costs
c. Intermediate Maintenance Availability (IMA) Costs
d. Propulsion Fuel Costs
e. Shipyard Regular Overhaul Costs

While not specifically charged to Naval Reserve training ships in the FY 80 budget, a portion of O&M funding allocated for base facility operations can be traced to the cost of keeping each ship in service. This sixth category includes such costs as pierside utilities, sewage and garbage

disposal, pier maintenance, and other costs associated with maintaining a water-front ship berthing facility.

The sum of the six cost areas represents the significant expenses incurred in operating a Naval Reserve training ship exclusive of extraordinary items such as hull or equipment damage [Dept. of Defense FY80 Appropriations, House Hearings]. The analysis compares training ship alternatives on the basis of fiscal year 1980 price rates in each of the six cost categories discussed above. For each category a description of the cost inputs is given as well as comparative data for each training ship alternative.

B. COST CATEGORIES

1. Nucleus Crew Personnel Costs

The enlisted billet cost model used to collect the cost data for each alternatives training ship's nucleus crew was constructed in 1980 at the Navy Personnel Research and Development (NPRDC), San Diego [Koehler, 1980]. The NPRDC enlisted billet cost model produces average total costs for personnel in all ratings at every paygrade. The NPRDC model groups twenty-seven personnel cost inputs into three separate categories. The first category is direct personnel cost which includes base pay, allowances, proficiency and hazardous duty pay, and active duty medical care. The second category includes the costs of training and retirement. The third category includes personnel overhead costs such as dependent education and medical care, recreational facilities, and social security [Koehler, 1979]. Using the

TABLE 13

FISCAL YEAR 1980 NUCLEUS CREW ANNUAL BILLET COSTS

Rating	DD-931 Class Billet Cost		FF-1040 Class Billet Cost	FF-1052 Class Billet Cost	LST-1179 Class Billet Cost
QM	$ 50,608		$ 50,608	$ 50,608	$ 54,072
BM	106,282		110,993	106,282	100,887
SM	67,725		67,725	67,725	69,643
STG	151,564	242,493*	296,481	265,712	-
TM	21,476		21,476	21,476	-
GMT	-	40,674*	40,674	40,674	-
GMG	202,495	149,780*	74,580	87,865	121,150
FTG	323,328		293,014	129,129	224,825
FTM	-		-	67,212	-
ET	80,631		123,498	109,699	63,711
OS	186,903		206,860	190,067	159,327
EW	63,359		80,598	63,359	-
RM	180,169		142,339	152,556	159,204
YN	34,091		35,094	35,094	34,091
PN	38,344		23,990	23,990	20,782
DK	20,729		20,729	20,729	20,729
MS	155,485		136,359	136,359	136,359
SH	60,735		60,735	60,735	60,735
SK	52,812		52,810	52,810	52,810
BT	464,327		302,476	320,654	49,776
MM	475,069		314,926	288,848	-
MR	17,276		17,276	17,276	17,276
EN	38,989		39,989	39,989	313,681
IC	59,539		59,539	56,512	56,512
HT	90,345		107,054	92,940	92,834
EM	89,941		89,941	89,941	123,665
HM	23,687		23,687	23,687	23,687
FN	205,344		154,008	154,008	154,008
SN	408,832	447,160*	408,832	370,504	536,592
Total Coat	$3,670,076	$3,787,292*	$2,907,185	$3,135,430	$2,646,356

*Billet Costs for the DD-931 Class Destroyer marked with an asterisk apply to ships within the class which have undergone ASW (Anti-Submarine Warfare) conversions. Billet costs indicated by a dash are not applicable to the ship class.

Data Source: (Koehler (a), 1980)

data produced by the NPRDC enlisted billet cost model, the nucleus crew personnel costs for each of the training ships were determined. These costs are presented in Table 13.

2. Shipboard Upkeep and Maintenance Costs

All Naval Surface Force ships receive annual funding from their Type Commanders in the form of an operating target (OPTAR). Apportioned on a quarterly basis, these funds are provided to replenish each ship's repair parts stock and obtain consumable items such as paint, cleansers, and lubricating oils. The amount of OPTAR funding granted to a particular ship is dependent on the size of the Type Commander's annual operating budget and the anticipated funding needs of the class [Butt, 1979]. The OPTAR amounts shown below in Table 14 are those which were planned for the Atlantic Fleet Surface Force at the start of fiscal year 1980.

TABLE 14

ANNUAL OPERATING TARGET
(Fiscal Year 1980)

	DD-931 Class	FF-1040 Class	FF-1052 Class	LST-1179 Class
REPAIR PARTS	$320,000	$260,000	$280,000	$180,000
CONSUMABLES	175,000	135,000	151,000	124,000
TOTAL OPTAR	495,000	395,000	431,000	314,000

Data Source: [Butt, 1979]

3. Intermediate Maintenance Availability (IMA) Costs

Intermediate level maintenance in surface ships is accomplished by destroyer tenders, repair ships, and shore-based ship intermediate maintenance activities. Availabilities with intermediate maintenance activities are regularly scheduled for all surface ships. Availabilities average two and one-half to four weeks in length depending on the type of ship being tended [Mebane, 1980]. As of December, 1979, surface ships in the Atlantic Fleet received IMA's an average of twice annually [Mebane, 1980].

There were two resource inputs used in the analysis to compare IMA costs for each of the four training ship alternatives. These were maintenance activity man-hours and the cost of repair parts and materials. Other costs such as machine ship equipment wear or a repair ship overhaul were not included due to the nonavailability of cost data.

There was no cost standard available to apply to intermediate maintenance activity man-hours. Unlike shipyards, intermediate maintenance activities are manned with military personnel and, although the labor cost is real, reimbursement for man-hours is not a consideration [Rogers, 1980]. However, intermediate maintenance activity man-hours are recorded and tracked for two reasons. First, the man-hour data can be used either for intermediate maintenance activity workload planning or for maintenance trend analysis is any particular class of ship. Second, because IMA man-hours are used to apply repair parts and other materials

costs to each repair availability at the rate of $6.00 per man-hour [Rogers, 1980].

By using historical work load data compiled between 1975 and 1978 [Rogers, 1980], an average number of IMA man-hours expended on one ship in each of the four classes under consideration was determined. This man-hour average was applied at the Fiscal Year 1980 materials cost standard to provide a means of comparing one alternative with another on the basis of IMA cost. Table 15 provides both IMA man-hour and materials cost data for each of the four training ship alternatives.

TABLE 15

INTERMEDIATE MAINTENANCE AVAILABILITY AVERAGE MATERIALS COST AND REPAIR ACTIVITY MAN-HOURS EXPENDED BY SHIP CLASS

	DD-931	FF-1040	FF-1052	LST-1179
Average Man-Hours Expended Per Availability	18,013	11,484	12,100	10,462
Materials Cost @ $6.00 Per Man-Hour	$108,078	$68,078	$72,684	$62,772

Data Source: [Rogers, 1980]

4. Fuel Costs

Except for nuclear powered cruisers, the standard propulsion fuel used by ships in the Naval Surface Force is marine diesel fuel (DFM). Fuel deliveries are contracted by the Navy on an annual basis. The fiscal year 1980 contract price for a 42 gallon barrel of DFM is $25.65 [Butt, 1979].

Fuel costs used in the analysis were based on each ship's consumption rate at standard speed. Standard speed was chosen because it approximates the mid-point in each alternative's speed capability [COMNAVSURFLANT, 1976]. Table 16 below presents a comparison of each training ship alternative's fuel consumption at standard speed on the basis of seventy-six days at sea each year. Seventy-six days underway corresponds to one underway weekend each month and a two week annual training for the two proposed reserve crews.

TABLE 16

FUEL COST AT STANDARD SPEED
BASED ON SEVENTY-SIX DAYS AT SEA

	DD-931 Class	FF-1040 Class	FF-1052 Class	LST-1179 Class
Total Barrels of DFM Expended	28,723	30,598	29,286	27,646
Fiscal Year 1980 Cost @ $25.65 per BBL	$682,847	$727,412	$696,215	$657,226

Data Source: COMNAVSURFLANT Instruction 3500.2

5. Regular Overhaul Costs

Naval and commercial shipyards allocate costs to customers based on current man-day rates. These man-day rates vary among shipyards depending on their individual overhead costs [Mascaro, 1979]. To estimate the total cost of any ship's overhaul work package, planners use a standard man-day rate. As of December, 1979, the rate was $208.00 per man-day [Nicholson, 1979].

Average overhaul costs were computed by applying the standard $208.00 man-day rate to the average number of man-days [Nicholson, 1979] required to overhaul a ship in each of the four ship classes considered. This average overhaul cost was then divided by the number of years in the overhaul cycle to produce an average annual overhaul cost on the basis of FY 80 man-day rates and a five year overhaul cycle. The average number of man-days required to overhaul a ship in a given class has remained fairly constant over time [Ellis, 1979]. However, changes in average shipyard man-day rates or length of overhaul cycle could affect the cost ranking of the four alternatives. For example, given a $250.00 man-day rate and a three year overhaul cycle, the annual overhaul cost differential between FF-1052 Class frigates and DD-931 Class destroyers increased from $570 thousand to over $1.6 million. The overhaul costs shown in Table 17 are based on overhaul frequency and man-day rates prevailing in the first quarter of fiscal year 1980.

TABLE 17

1980 AVERAGE SHIPYARD OVERHAUL COST
FOR EACH TRAINING SHIP ALTERNATIVE

	DD-931 Class	FF-1040 Class	FF-1052 Class	LST-1179 Class
Average Number of Man-Days Required To Overhaul One Ship In Each Class	52,900	60,140	66,600	38,460
Average Fiscal Year 1980 Overhaul Cost @ $208.00 Per Man-Day	$11,003,200	$12,509,120	$13,852,800	$1,599,936
Annual Overhaul Cost Included In The Analysis	$2,200,640	$ 2,501,824	$ 2,770,560	$1,599,936

Data Source: Nicholson, 1979

6. Pierside Utility Costs

It is common practice in each of the four alternative ship classes considered in this study to shut down their power generating plants and rely on pierside utility services when available [Bridges, 1979]. The three pier services normally provided are heating steam, electricity, and potable water [Bridges, 1979].

The utility charge and standard consumption rates for each class of ship included in the analysis were applicable to the Philadelphis Naval Base as of December, 1979 [Bridges, 1979]. Potable water cost was disregarded because it did not exceed $5.00 per day for any of the four training ship alternatives.

The utility costs included in Table 18 were based upon two constraints imposed to standardize each training ship's operation. The first was that each training ship would be at sea for seventy-six days per year training reservists. The second assumption was that upon returning to port each training ship would shut down its internal power plant and receive utility services from the pier. Table 18 compares each of the training ship alternative's pierside utility costs.

TABLE 18

PIERSIDE UTILITY COSTS
FOR EACH TRAINING SHIP ALTERNATIVE

ANNUAL COST BY SHIP CLASS

Utility	Charge Rate	DD-931	FF-1040	FF-1052	LST-1179
Steam	$ 8.50/MBTU	$549,240	$439,340	$439,340	$219,671
Electricity	66.00/Mwh	$123,015	$109,376	$109,376	$ 82,622
Total Annual Utility Costs		$672,255	$548,716	$548,716	$302,293

Data Source: Public Works Department, Naval Shipyard Philadelphia, PA.

C. SUMMARY

Table 19 is a summary presentation of the six cost areas included in the chapter for each of the four training ship alternatives.

TABLE 19

ANNUAL AVERAGE COST FOR ONE SHIP OF EACH CLASS

Cost Area	SHIP CLASS				
	DD-931 Class		FF-1040 Class	FF-1052 Class	LST-1179 Class
Personnel Billet Cost	$3,670,076	$3,787,292*	$2,907,185	$3,135,430	$2,646,356
Annual OPTAR Cost	495,000	(*indicates DD-931 ASW Mod)	395,000	431,000	314,000
IMA Cost	108,078		69,094	72,684	62,772
Fuel Cost	682,849		727,412	696,215	657,226
Regular Overhaul Cost Per Year	2,200,640		2,501,824	2,770,560	1,599,936
Pierside Utility Cost	672,255		548,716	548,716	302,293
Total Annual Cost	$7,828,898	$7,946,114*	$7,149,231	$7,149,231	$5,582,583

The total costs shown for each training ship alternative were determined on the basis of a set of imposed conditions relating to one or more of the six cost categories. These conditions included defining the training ship's nucleus crew, the underway operating schedule, and the current regular overhaul cycle. As indicated in Table 19, the majority of annual costs incurred were for personnel and regular overhaul.

Based only on the total cost figures shown in Table 19, the LST-1179 class ship appears the most likely choice among the four alternatives. However, the lesser capability of this class ship to provide training for additional reserve crews could make it a less attractive training platform regardless of cost. Further discussion of each training ship alternative and possible homeport assignments is included in Chapter V.

V. ANALYSIS FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

A. ANALYSIS FINDINGS

This study was designed to analyze four alternative ship classes as candidates for Naval Reserve training ship assignments. Twelve of seventeen localities included in the analysis had a current Naval Reserve population of sufficient range and depth to fill at least 90 percent of the mobilization crew billets in one or more of the four training ship alternatives studied. Reserve mobilization crew billets were assigned to each candidate training ship on the basis of conditional manning requirements specified in each Ship Manpower Document (SMD). The SMD was used to provide a standard manpower comparison base for each training ship alternative studied. The requirement to fill 90 percent of reserve mobilization crew billets was chosen because it approximates the reserve manning goal aboard training ships currently in service [McClanahan, 1980]. However, it is recognized that at the 90 percent level some reserve ratings required to fill out the mobilization crew could be seriously deficient.

Of the four training ship alternatives included in the analysis, reserve mobilization crew billets were filled most often in LST-1179 class tank landing ships. The remaining three classes of ships, listed in order of decreasing frequency of filled reserve mobilization crew billets are

FF-1040 Class frigates, DD-931 Class destroyers, and FF-1052 Class frigates. The primary reason for this ordering was limited availability of Naval Reservists in the following ratings:

a. Operations Specialist (OS)

b. Electronic Warfare Specialist (EW)

c. Fire Control Technician (Missiles) (FTM)

d. Gunner's Mate (Technical) (GMT)

None of these four ratings apply to LST-1179 Class tank landing ships, while some or all are required to man the frigates and destroyers. A secondary reason for the ordering was the uneven distribution of other ratings in the reserve seaport population studied.

When required to fill 90 percent of each training ship's reserve mobilization crew billets, the number of available training ship assignment options ranged from sixteen to eighteen depending on which ships were chosen. When this requirement was raised to 95 percent and then to 100 percent, the number of training ship assignment options decreased to fourteen and nine, respectively. At the 90 percent level, LST-1179 Class tank landing ships accounted for about one-half of the available options. At the 95 percent and 100 percent levels, LST-1179 Class tank landing ships accounted for approximately two-thirds of the training ship assignment options. At all three percentage levels, the remaining portion of the training ship assignment options were almost evenly divided among the destroyer and frigate classes.

The availability of critical ratings to form a second reserve crew for each training ship varied in each locality with the rating distribution in the local population. Because of their need for fewer critical ratings, LST-1179 Class tank landing ships consistently had higher reserve manning percentages in the second reserve crew than the other three training ship alternatives. Of course fewer critical ratings can be trained aboard a ship in the LST-1179 Class.

In addition to the four critical ratings affecting the extent to which reserve mobilization crew billets could be filled aboard the destroyers and frigates, shortages of reservists in five other critical ratings caused low manning percentages in the second reserve crew. These five ratings were as follows:

a. Sonar Technician (Surface) (STG)

b. Torpedoman's Mate (TM)

c. Boiler Technician (BT)

d. Fire Control Technician (Guns) (FTG)

e. Gunner's Mate (Guns) (GMG)

All of the five ratings above apply to the destroyer and frigate classes studied whereas only three of the five can be trained aboard LST-1179 Class tank landing ships.

Using the cost inputs included in the analysis, LST-1179 Class tank landing ships are between 25 percent and 30 percent less expensive to operate and maintain than the destroyers and frigates studied. For each training ship

alternative included in the analysis, nucleus crew personnel costs accounted for the largest portion of total annual cost. In order of decreasing magnitude the remaining cost areas were regular overhaul, propulsion fuel, pierside utility service, annual operating target, and Intermediate Maintenance Availability (IMA) materials costs. Shortening the overhaul cycle could change the order of the first two costs since a larger fraction of total overhaul cost would be applied each year.

B. LIMITATIONS OF THE ANALYSIS

The analysis was limited due to nonavailability of data relating to three major resource inputs. First, there was a lack of data available for the training ship alternatives studied. The four training ship alternatives met policy criteria for equipping the Naval Reserve, therefore each was analyzed without regard to combat capability. Each of the four training ship classes studied differ in terms of installed sensors and offensive weapons. As a result, one ship class could be of more value than the others in an overseas deployment status. However, the means by which these different sensors and weapons could be compared and ranked was not available for the analysis.

Second, the rating distribution of the Naval Reserve population may shift over time in each locality as a result of new accessions and attrition. The extent to which this shift will take place is difficult if not practically

impossible to predict. For this reason, the ship and homeport options presented in the analysis are subject to change. However, given more current data, the same method can be used to generate a new set of options at any time.

It is very possible that deferred routine maintenance resulting from undermanned active duty drew will manifest itself in the form of higher overhaul and IMA costs in the long run. For this reason, the cost of deferred maintenance should be factored into the analysis. The same is true of IMA manpower costs. However, even though recognized, estimating these costs to a reasonable degree of accuracy would be extremely difficult due to the number of variables involved.

C. SUGGESTED AREAS FOR FURTHER RESEARCH

Based on the nonavailability of data in portions of the analysis in this thesis, there are at least three additional areas open for research involving the Naval Reserve training ship program. First, development of some means to rank candidate Naval Reserve training ships based on their military contribution to the deployed forces could aid the decision process. The ranking could reduce the field of candidates when more than one training ship alternative appears equally suitable for assignment to the Naval Reserve.

Second, development of a system to predict rating flux in the local Naval Reserve populations could be used for two purposes. One is to aid in choosing a training ship by forecasting the expected rating composition of the Naval Reserve

population in each locality being considered. Another is to provide some means to measure the expected permanance of the Naval Reserve populations to estimate expected training ship assignment duration. Third, the effect of deferred routine maintenance in each training ship could be expanded beyond a man-hour count to include operational reliability and increased regular overhaul and IMA costs.

This thesis has generally viewed the Naval Reserve as a statutory necessity and a drain on fleet operating resources. However, the Naval Reserve could be viewed as a potential source of peacetime manpower for the fleet. The fleet is now in the early stages of an expansion program which will increase its size from about 480 to 600 ships of various types and classes. Unless recruitment and retention incentives improve, the Navy could be forced to idle some ships in the future for lack of a crew [American Enterprise Inst., 1977]. One possible solution to be investigated is the transfer of ships to the Naval Reserve to keep them operating and available in a ready status if needed.

D. CONCLUSIONS AND RECOMMENDATIONS

Although the results of the analysis do not indicate a single answer to the question of which ships should be transferred to the Naval Reserve, two conclusions can be drawn. The first is that after establishing minimum reserve mobilization crew manning level requirements, even at the 90

percent level the Naval Reserve training mission as it is currently defined [Chief of Naval Operations (a), 1978] can be performed with fewer than the 25 destroyers assigned in 1979. The second conclusion is that the economy realized by employing LST-1179 Class tank landing ships in Naval Reserve training assignments is offset by the LST's narrower ability to train a wide range of enlisted ratings.

If elimination of Naval Reserve training ships [Dept. of Defense FY80 Appropriations, House Hearings] is not an option available to the Navy, then rather than replacing the 25 obsolete destroyers on a one for one basis, it is possible to develop a compromise training ship replacement schedule which would minimize the number of ships transferred from the active fleet, continue the Naval Reserve training ship program, and satisfy Congressional intent.

Ships transferred to the Naval Reserve have traditionally remained in a trainer status until retirement regardless of the availability of reserve manpower to fill mobilization crew billets [Evans, 1979]. The change recommended in this thesis is that ship transfers to the Naval Reserve be made conditional on the supply of reservists to keep the mobilization crew manned at a predetermined level. By establishing a minimum manning level standard for the reserve mobilization crew, ships could rotate in and out of Naval Reserve training assignments, governed by reserve manpower availability.

There are four separate steps to the course of action recommended in this thesis. These are as follows:

a. Clearly define the minimum acceptable manning level in a training ship's reserve mobilization crew.

b. Where training ship assignments are feasible subject to the minimum acceptable reserve mobilization crew manning level, utilize the ship to train a second reserve crew.

c. Periodically review the Naval Reserve population to determine whether the training ships assigned can continue to be manned at the minimum acceptable level.

d. Rotate training ships in and out of the Naval Reserve subject to the availability of reserve manpower for the ship's mobilization crew.

The minimum acceptable manning level for the training ship's reserve mobilization crew could be established within the Office of the Chief of Naval Operations (OPNAV) on the basis Required Operational Capabilities (ROC) for each ship class in a wartime environment. Once established, the Navy could then justify the size of its training ship program on the basis of reserve manpower availability.

Identifying the second training crew within the available Naval Reserve Population could be accomplished within the Office of the Chief of Naval Reserve (CNAVRES) based on active fleet manpower requirement inputs from OPNAV. The reorganization of existing reserve training units to provide reservists for both the ship's mobilization crew and the second training crew could be accomplished through the CNAVRES chain of command.

The review of the Naval Reserve population to determine if minimum acceptable reserve crew mobilization crew manning levels have been maintained could be done within OPNAV using manning information provided by the Naval Reserve Personnel Center, New Orleans. This review could be done as often as each year in the POM process prior to submitting the annual budget to Congress. Actual ship movements to and from the Naval Reserve could be accomplished at the Fleet and Type Commander level in order to coordinate assignment rotations with overseas deployment and overhaul schedules.

There are at least three potential advantages which could be realized by implementing the above recommendations. First, the four steps involved in the recommendations could serve to justify the training ship portion of the reserve appropriation request using reserve manpower availability as a single criterion. Second, by setting a minimum reserve mobilization crew manning level standard on the basis of ROC, the Navy could be reasonably sure that the training ship will be sufficiently manned to serve in the fleet during wartime. Third, by training a second reserve crew, the Navy could more effectively utilize its reserve manpower resources and its training ships simultaneously.

APPENDIX A

NAVAL RESERVE (SURFACE FORCE) POPULATION AS OF DECEMBER 1979

Legend

Rating Abbreviation	Rating Title
BM	Boatswain's Mate
QM	Quartermaster
SM	Signalman
OS	Operations Specialist
EW	Electronic Warfare Specialist
STG	Sonar Technician (Surface)
TM	Torpedoman's Mate
GMG	Gunner's Mate (Guns)
GMT	Gunner's Mate (Technical)
FTG	Fire Control Technician (Guns)
FTM	Fire Control Technician (Missiles)
ET	Electronics Technician
RM	Radioman
YN	Yeoman
PN	Personnelman
HM	Hospital Corpsman
SK	Storekeeper
MS	Mess Management Specialist
SH	Ship Serviceman
DK	Disbursing Clerk
MM	Machinist's Mate
EN	Engineman
BT	Boiler Technician
EM	Electrician's Mate
IC	Internal Communications Electrician
HT	Hull Technician

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Boston, Mass. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		1	13	28	11	18	4	1	78
QM	1	2	4	5	6	4			22
SM	1	2	2	3	3	3			14
OS*	1	4	10	9	7	6		1	38
EW*			1	2	1				4
STG*			4		1	4	1		10
TM*	1		1	7	1	1	2		13
GMG*	1	2	3	7	4	1	1		19
GMT*		1	2	1					4
FTG*			5	6	1	4			16
FTM*			1	1	3				5
ET*	1	3	5	10	12	9			40
RM*	4	10	8	14	13	7		1	57
YN		2	25	29	18	5	2	1	82
PN		1	6	5	8	4	1	1	26
HM		1	1	3					5
SK	4		9	25	19	6	2		65
MS		2	24	16	11	2		1	56
SH			6	7	4	1			18
DK		1	6	2				1	10
MM		2	12	10	17	10		2	53
EN*	5	3	16	13	9	12	5	1	64
BT*		3	8	10	8	6	1		36
EM	1	4	22	15	15	10	1		68
IC	1		6	10	4	5			26
HT*	3	10	20	24	26	24	4	1	112

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Quincy, Mass., Worcester, Mass., New Bedford, Mass., Lawrence, Mass., and Providence, R.I.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: New York, N.Y. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		1	43	23	41	17	6		131
QM	1	7	20	18	2	9	3	1	61
SM	1	4	6	12	5	2			31
OS*	2	4	18	25	11	7	1	1	59
EW*	1	3	2	1					7
STG*	12	4	3	2	5	2	1		29
TM*			5	11	6	4	1	1	28
GMG*	5	2	14	21	13	3	5	3	66
GMT*			1	1	2	2	1		7
FTG*	3	3	12	6	5	4			33
FTM*				5		2			7
ET*	1	6	12	13	7	5	1	2	47
RM*	5	16	38	40	19	6			124
YN		8	54	49	21	16			148
PN		2	10	16	11	4			43
HM		4	5	6	6	2	1		24
SK		5	47	37	29	5	3	2	128
MS	4	12	28	29	16	6			95
SH		12	10	2					24
DK		3	2	4	1	2	2		14
MM	4	12	26	41	33	13	9	1	139
EN*	12	10	23	33	30	15	9	1	133
BT*		4	30	34	20	11		1	90
EM	6	5	34	30	21	11	6	4	117
IC		2	16	15	13	2			48
HT*		11	35	41	38	31	5	1	162

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Bronx, N.Y., Brooklyn, N.Y., Whitestone, N.Y., New Rochelle, N.Y., Staten Island, N.Y., Freeport, N.Y., Huntington, N.Y., Clifton, N.J. Perth Amboy, N.J., Elizabeth, N.J., and Bayonne, N.J.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Philadelphia, Pa (see note below)

Enlisted Rating	Paygrade E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		5	25	14	18	11	2		75
QM	1		6	3	4	3	2		19
SM	1	1	7	5	4	2	1		21
OS*	2	1	13	15	4	8		2	45
EW*		1	2	2	1				6
STG*	2	2	2		1	1		1	9
TM*		1	1	1	2	2		1	8
GMG*	3	5	8	14	4	4	1		39
GMT*			1	2		1			4
FTG*	2	1	3	5	3	1	1		16
FTM*		3	1		3	1			8
ET*	1	1	5	11	15	6		1	40
RM*	4	23	19	19	11	9			85
YN	1	3	33	27	17	10			91
PN	1	6	8	16	7	1	1	1	41
HM			2	5	3	6	3		19
SK	4	2	28	24	7	6	3		84
MS	4	4	14	11	6	3			42
SH		1	9	6	4	1			21
DK		1	2	7	1				11
MM	3	5	27	14	7	7	3	3	69
EN*		1	2	2	1				6
BT*	1	2	13	13	10	5	1		45
EM		2	8	18	18	11	5	1	63
IC		1	8	8	13	1			31
HT*	5	9	24	24	20	20	3	1	106

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Philadelphia, Pa., Reading, Pa., Folsom, N.J., West Trenton, N.J., and Wilmington, Del.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Baltimore, Md. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		2	12	11	11	8	1		45
QM			4	5	1	1			11
SM			1	2			1		4
OS*	1	1	1	6	1		2		12
EW*			1						1
STG*	1	2	2	2	3	1	1		12
TM*		1	2	2	2				7
GMG*		3	2	4		1		1	11
GMT*									0
FTG*			1		1			1	3
FTM*					1				1
ET*			5	7	10	4	1		26
RM*		3	4	9	2	1			19
YN	2	1	10	13	7	1	2	1	37
PN		2	1	5				1	9
HM		2		3	1	1	1		8
SK		1	7	11	5	2	1		27
MS	1	4	6	4	6	1			22
SH		1	3	4	2	1			11
DK		1	2		1				4
MM	1	4	4	6	2	2	2	2	23
EN*	1	1	5	7	9	2	3		28
BT*		2	6	8	5	1		1	23
EM		1	6	4	6	3			20
IC				4	7		2		12
HT*	2	2	7	6	10	5	1	1	34

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Baltimore, Md.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Washington, D.C. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM			8	4	1	3			16
QM			4	6	4	4		1	19
SM	1		3			1			7
OS*			1	3	2	1			7
EW*				1					1
STG*	1		1			2			4
TM*	1			4	3	2	1		11
GMG*			1	4		3		1	9
GMT*					1	1			2
FTG*		2	1	1		2	2	1	9
FTM*					1	5	3		9
ET*		2	4	2	11	6	4	1	30
RM*		3	6	13	10	4			36
YN	1	2	28	36	21	10	1	1	100
PN			4	6	4	3	1	1	19
HM			2		1	1			4
SK		2	6	11	14	3	1	1	38
MS		1	3	3	1				8
SH			5	3	4	1			13
DK		2	6	2	2				12
MM			5	8	7	8	1		29
EN*		3	5	3	4	3			28
BT*		1	3	1	1	2			8
EM		4	2	5	4	3			18
IC		1	1	1	3	2			8
HT*			2	6	5	3	1		17

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Alexandria, Va., and Adelphi, Md.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Norfolk, Va. (see note below)

Enlisted Rating (*Indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		2	17	16	13	7	1	1	57
QM		1	4	3	2	2			12
SM		1	3	5					9
OS*	1		6	10	7	6	1		31
EW*		2	1	1	1				5
STG*		1		4	2	3			10
TM*				2		2			4
GMG*	1		5	7	2			1	16
GMT*				2					2
FTG*			3	2		2			7
FTM*			1		3	2			6
ET*	1		3	7	15	7			33
RM*	1	4	14	20	24	2			65
YN			32	31	8	5	1		77
PN			9	12	2	3	2	1	29
HM			3	1	1	2	1		8
SK	1		23	22	9	3			58
MS				5	1		1		7
SH		2	11	6	2				21
DK				6	1		1		8
MM	1	2	12	10	19	12	2		58
EN*	2	2	17	7	8	4	3	1	44
BT*			6	6	9	5	1		27
EM	1	3	10	14	7	6	1	1	43
IC	2		2	6	5	3			18
HT*	1	2	15	20	13	4	4	1	60

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Norfolk, Va., Richmond, Va., and Newport News, Va.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Charleston, S.C. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM			3	3	1	1		2	10
QM	4		3	4	1	1			13
SM		2							2
OS*			1	1	2	2		1	7
EW*	1		1						2
STG*	1	1		1	2	2			7
TM*			1	1	4	1			7
GMG*	1		2			1			4
GMT*			1		1	1			3
FTG*			1	1		1	1		4
FTM*			1						1
ET*		1			6	3		1	11
RM*	1	3	4	7	2	3		1	21
YN		1	7	12	5	1			26
PN			2	2	2	1			7
HM		1	1	2	2	2			8
SK		2	10	6	6	2			26
MS	1	2	2	3	2				10
SH			4	2					6
DK	1		1	2	1				5
MM	1	1	2	9	12	2	2		29
EN*		1	3	1	5	3	2		15
BT*	1			3	5	1	1		11
EM			2	3	8	3	1		17
IC			1	3	3	1			8
HT*	2	1	3	5	11	10			32

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Charleston, S.C.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Mayport, Fla. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		2	6	13	5	3			29
QM			3	2	1				6
SM		1	1		1				3
OS*			6	4	6				16
EW*					1				1
STG*			1	2					3
TM*						1			1
GMG*			1	3					4
GMT*									0
FTG*			1		2	1			4
FTM*									0
ET*			3	7	7	1			18
RM*		5	9	5	3	1			23
YN		1	14	5	5	2			27
PN	1	1	5	2	1				10
HM		2	3	1	2	2			10
SK	2	1	8	8	2	2	1		24
MS	1	1	4	2	5				13
SH			3	2					5
DK			2	1	2	1			6
MM			4	6	5	1			16
EN*		2	3	5	3	2	2		17
BT*	1	2	4	2	2	3			14
EM	2	1	6	2	3	4		1	19
IC	1		2	4	2				9
HT*	2	6	2	5	6	4	3		28

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Jacksonville, Fla.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Tampa, Fla. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM			12	2	9	4		2	29
QM			4	2	2	1	1	1	11
SM	3			1	4	1			9
OS*	2	1	4	4	1	1			13
EW*		1			1				2
STG*	2			4		1	1		8
TM*				2	1				3
GMG*	1	1	3	2	4	2	1		14
GMT*			2	1					3
FTG*	1	2	1	2	2	1			9
FTM*									0
ET*		9	12	10	5	1	1		38
RM*	6	1	6	21	4	1			39
YN		1	45	21	10	5			82
PN		1	2	5	3	4			15
HM			3	1	2	1			7
SK		1	41	35	7	2		1	87
MS	2	1	10	9	4	6		1	33
SH			2	3	1				6
DK		1	1	2	1				5
MM	2	2	1	4	10	4	2	2	27
EN*	4	3	7	8	13	2			37
BT*	1	3	1	5	4				14
EM		2	5	10	12	4			33
IC		1	2	4	4				11
HT*		3	8	7	12	4	4		38

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Tampa, Fla., and St. Petersburg, Fla.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Mobile, Ala. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)	Paygrade E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM			9	10	4	4			27
QM	1	2	7	1	4	3			18
SM			1	2	1	1			5
OS*		3	2	5	3	1		1	14
EW*		1	1		1	2			5
STG*		1		2	2				5
TM*	1		2			1			4
GMG*	2		4	6	2			1	15
GMT*			1	1					2
FTG*			2		2				4
FTM*				1	1	1			3
ET*		2	3	1	11	3			20
RM*		10	10	14	2	1	1		38
YN		1	14	18	6	4		1	44
PN			9	4	2				15
HM			1	2	1	1			5
SK		2	11	12	4	3	1		33
MS		5	6	4	3				18
SH		10	2	1					13
DK		1	2	2	1				6
MM		5	6	4	6	5	1		27
EN*	1	7	4	5	2	5	2		26
BT*		2	4	1	3	1		1	12
EM	1	1	4	3	2	2			13
IC			1	3	4	1			9
HT*		3	4	7	4	8	1		27

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: New Orleans, La., Mobile, Ala., and Pensacola, Fla.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Galveston, Tx. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM			8	7		2			17
QM			6	1	1	1			9
SM	1		5	4		1			11
OS*	1	1	3	2	3				10
EW*			1			1			2
STG*		1	1	1	2				5
TM*				2	2	2			6
GMG*		3	4	2	1	1	2		13
GMT*			1						1
FTG*	1	2	4	1	1		1	1	11
FTM*			1		1	1			3
ET*			5	3	10	3			21
RM*	2	5	17	11	3	4			42
YN		4	9	15	7	1	1		37
PN		1	7	1	6				15
HM		1	1		2	2			6
SK	1	3	9	8	5	1	1		28
MS		1	4	6	2	1			14
SH	2	1	4	2	2				11
DK		2	3	1	1				7
MM		2	7	8	8	3	3		31
EN*	2	1	5	5	3	1			17
BT*		5	2	3	1	1			12
EM	1		5	5	3	2	1		17
IC	1		5	2	4				12
HT*	1	3	5	6	4	3			22

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Houston, Tx.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: San Diego, Cal. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		1	10	17	10	6	1		45
QM	2	3	3	7	3	4		1	23
SM		2	8	5		1			16
OS*	1	1	5	10	3	3	1		23
EW*	1		4		4	1	1		11
STG*	1	1	2	3	4	3			14
TM*			1		5	1			7
GMG*		1	6	10	7	1			25
GMT*					1				1
FTG*		2	2	2	2	3	1		12
FTM*			2	1	2	2			7
ET*		3	3	8	25	1			40
RM*	1	4	18	20	8	8	2		61
YN		1	19	29	18	4	1		72
PN	1	4	11	16	2	1			35
HM		2	1	2		4			9
SK	2	3	14	11	8	2	1		41
MS		3	3	7	7				20
SH	1	1	8	6	4				20
DK		1	1	1	2				5
MM	1	4	14	5	15	3	1		43
EN*	3	4	10	14	4	3		1	49
BT*			2	3	6	2			13
EM	1	3	10	16	18	6	1	2	57
IC			7	3	8	4			22
HT*	1	6	9	14	8	2		1	41

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: San Diego, Cal.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Los Angeles, Cal.(see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		2	28	21	26	10	2	1	90
QM	1	2	8	9	9	6	2	1	38
SM	1	2	4	5	7	1			20
OS*		1	7	9	3	5			25
EW*		1	1	5					7
STG*	1	2	3	6	1	2	1	1	17
TM*			1	2	1	2			6
GMG*	1	4	6	9	3	1			24
GMT*			3	2	3				8
FTG*		6	5	3	2	2	2		21
FTM*			1	2	6	1			10
ET*		3	11	11	21	7			53
RM*	4	9	25	26	14	8		1	87
YN		3	34	33	28	8	2		108
PN	1	6	14	16	5	2			44
HM			2		2	2	1		7
SK	1	4	27	33	19	3	3		90
MS	2	7	11	14	7	6			47
SH	1	17	8	2					28
DK		2		1	1				4
MM		8	14	10	21	11			64
EN*	5	6	9	21	16	9	3	1	70
BT*	1	2	5	6	10	2	1		27
EM	1	7	10	20	15	11	3	1	68
IC		2	8	7	3	4	1		25
HT*	4	4	26	15	18	8	1		76

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Los Angeles, Cal., Long Beach, Cal. Pomona, Cal., and Santa Ana, Cal.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: San Francisco, Cal. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		3	19	15	16	13	2		68
QM		2	10	15	11	6	3	1	48
SM		3	3	6	4	4			20
OS*	2	2	4	8	6	4			26
EW*			2	2	2				6
STG*		2	3	5	2	3	4		19
TM*			2	4	1	3			10
GMG*	3		6	4	4	3	2		22
GMT*			2	3	1				6
FTG*		2	3	6	5	1			17
FTM*		1		2	3				6
ET*	4	11	8	19	31	10	2	1	86
RM*	3	11	15	18	12	6	2		67
YN	1	1	37	33	23	16			111
PN	2	11	7	5	5	2	1		33
HM		1	2	1	4	1			9
SK	2	2	21	48	26	3	2		104
MS	1	7	15	8	8	1	1		41
SH	1	4	11	1	8				25
DK		1	2	1	3				7
MM	1	7	19	13	24	9	6	1	80
EN*	4	10	7	11	23	18	2		75
BT*		3	5	6	7	4			25
EM	1	7	11	15	25	4	1		64
IC		1	7	13	9	6			36
HT*	3	8	24	23	28	10			75

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: San Francisco, Cal., Alameda, Cal., Vallejo, Cal., San Bruno, Cal., and San Jose, Cal.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Portland, Ore. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		1	7	12	3	4			27
QM			6	4	2	2			14
SM	1	1	2	1	1	1			7
OS*		1	3	3	4	2			13
EW*				1	1				2
STG*	1			2	3	1			7
TM*		2		1	1				4
GMG*	1		5	4	1	4			15
GMT*		2				3			5
FTG*	1	1	3	2	1				8
FTM*			1	3	1				5
ET*	1	2	6	2	10	2		1	24
RM*	1	4	5	9	5	3			27
YN		1	7	10	6	3	1		28
PN		3	5	8	8	1			25
HM		1	2	2	4		1		10
SK	1	5	13	11	2	1			33
MS		1	4	2	6	1			15
SH		1	2		2				5
DK			1	2	1	1	1		6
MM	1		7	7	7	5	3		30
EN*		1	4	5	9	7	3		29
BT*			3	7	7	4			21
EM		2	5	5	12	7	1		32
IC	1		2	5	8	1			17
HT*	1	4	11	10	4	8			38

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Portland, Ore., and Salem, Ore.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Seattle, Wash. (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)	Paygrade E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM	1	2	15	9	11	5	1		44
QM	1	2	3	5	2	3	1		17
SM	1		2	2	2				7
OS*	3	2	2	4	5	5			21
EW*			3		1	1			5
STG*		4	1	5	5	3			18
TM*			1	3	5	2	2		13
GMG*			2	2	2	2			8
GMT*				1	1	2			4
FTG*		3	1	4	4	2		1	15
FTM*				1	3				4
ET*	1	3	4	5	21	4	4	1	43
RM*	1	4	11	7	10	5	1		39
YN		1	17	25	16	7	1	1	68
PN			6	9	3	2	2		22
HM		4		3	2	2			11
SK	2	2	13	18	14	4	3		56
MS	1	3	10	11	10	1	1	1	38
SH		2	3	2	2				9
DK	1		3	5	3	3			15
MM		1	7	9	16	5	3	1	42
EN*	8	3	7	9	14	6	4	5	56
BT*			7	9	4		2	2	24
EM		1	10	7	13	7			38
IC		1	7	8	10	3	1		30
HT*	6	2	8	14	13	6	2		51

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Seattle, Wash., Tacoma, Wash., Bremerton, Wash., Oak Harbor, Wash, And Everette, Wash.

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

Appendix A

Naval Reserve (Surface Force) Population as of December 1979

Locality: Hawaii (see note below)

Enlisted Rating (*indicates a rating which is undermanned in the fleet)

	Paygrade								
	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	Total
BM		1	3	2	2	1			9
QM		1	2	2	1			1	7
SM			1		1				2
OS*						2			2
EW*									0
STG*			1						1
TM*				1	1				2
GMG*				1					1
GMT*			1						1
FTG*						1			1
FTM*					1				1
ET*		2	3	3	3				11
RM*		1	4	3	1	2			13
YN				5	5	2	1		13
PN			1	2	1				4
HM		1	2			1			4
SK		2	1	5	1				9
MS	1		3	6	1				11
SH			1						1
DK			2	1	1				4
MM				2	4	2	1		9
EN*		1	2	1	1				5
BT*	1	1							2
EM			3	2	6				11
IC				3		1			4
HT*			2	1	4	1			8

*Note: The data above was obtained from automated personnel assignment counts in the following Naval Reserve training centers: Honolulu, Hawaii

Data Source: NRPC Report - 4080-1050-7D (Data run 12/15/79)

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Thesis
H6553 Hoert
c.1 An analysis of candidate ship classes as potential Naval Reserve trainers.